An Evaluation of Remote Sensing Effectiveness in the Pine Hills of Southeast Mississippi: Ground-Truthing Excavations at 22FO1294 and 22FO1301

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MANAGEMENT SUMMARY

Remote sensing has become a prominent aspect of pre-excision data collection in archaeological investigations. Under appropriate conditions various geophysical prospecting techniques permit recognition of subsurface features such as burned structures, organic pits, cellars, and graves. However, proper methods and accurate interpretations are still under development, particularly as remote sensing is applied to new geological and archaeological contexts. The project described in this report experimented with the application of remote sensing methods to archaeological sites in the upland Pine Hills of southeastern Mississippi, by collecting remote sensing data from two sites, 22FO1294 and 22FO1301, located on the Camp Shelby Joint Forces Training Center, and then “ground-truthing” the interpretations through excavation of identified anomalies. The project was a cooperative effort involving the University of Southern Mississippi, the University of Mississippi, and the Mississippi National Guard.

The project met with mixed results. Remote sensing identified locations of prehistoric features but was less able to predict exactly what they were. Further, and is the case in all applications, natural features were identified as possibly cultural ones, and these may have led to coincidental excavation of the latter in the vicinity. The greatest benefit is that the comparison between remote sensing readings and the excavated contexts will permit better interpretation of remote sensing data in the future.

Nearly all the cultural features excavated during the project appear to be related to various cooking technologies and consist of some combination of burned sandstone and baked clay. They appear to represent more than one cooking method including earth ovens of various configurations and surface facilities. The focused consideration of prehistoric features found in the Pine Hills during this project brought to the foreground the need to systematically evaluate the kinds of cooking technologies represented and explore the implications of the presence or absence of particular classes of features at a site for the resources that might have been cooked, site seasonality, and the longer term process of adaptation to the longleaf pine ecosystem. A preliminary assessment of kinds of cooking features recorded at Pine Hill sites, the results of experimentation with earth oven cookery and its archaeological manifestations, and a consideration of the adaptive significance of using these technologies are presented in this report. Finally, although the investigations were not specifically designed to evaluate eligibility to the National Register, the information potential demonstrated by the described research indicates that the site should be considered eligible.
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This report describes a modest project to determine and improve the utility of remote sensing on the small upland sites typical of the Pine Hills of southeast Mississippi. The overall project design was simple enough: let’s collect remote sensing data from two sites that appear to have good potential for the presence of prehistoric features, interpret that data, and then excavate to determine just what has been recognized. The project was a collaborative between the National Guard, the University of Southern Mississippi and the University of Mississippi. USM Department of Anthropology and Sociology took the lead in the project and provided the excavation, analysis and the preparation of this report. H. Edwin Jackson, Professor of Anthropology at USM, served as principal investigator. The Center for Archaeological Research at the University of Mississippi conducted the remote sensing. The Mississippi National Guard underwrote the project, provided logistical support and participated in the excavation. Byran Haley collected the remote sensing data and provided its interpretation.

The fieldwork was conducted between late August and early December, 2007. The author was assisted by Michael Fedoroff who served as the graduate assistant on the project. Fieldworkers included USM students Nikki Leist, Haley Streuding, and Derek Walters. Mississippi National Guard cultural resources manager Rita Fields, and graduate student intern Tiffany Hensley also participated in the excavation. Rita is especially thanked for facilitating all aspects of the project. Additional help in the field was provided by Jessica Kowalski and Zack Dozier. Former USM student Eugene Chapman and his wife Victoria also joined us one Saturday at 22FO1301. Nikki Leist and Haley Streuding processed the artifacts in the lab, and analysis was performed by Mike Fedoroff and the author.

Much of the research conducted in the Pine Hills has focused on the lithic assemblages collected by excavation. From an organization of technology perspective, lithic tools and the debris produced in their manufacture and maintenance has been seen as the most direct window into the organizational dynamics of prehistoric settlement subsistence strategies. Features, in particular, cooking facilities have been recorded and been used in a binary fashion (present or not present) to distinguish potential functional differences among sites. This project, although primarily aimed at evaluating remote sensing as a pre-excision tool, also focused our attention on the features that are found on sites in the Pine Hills. This consideration of prehistoric features brought to the foreground the need to systematically identify the range of formal characteristics represented in the archaeological record and by doing so evaluate the kinds of cooking technologies represented. A first approximation is offered this report, which will serve as a research design for further research, using archaeological, ethnographic and experimental data. The usefulness of this research will be realized in determining how the variable representation of particular cooking technologies might correlate with other
aspects of the archaeological record. This has important implications for understanding how the presence or absence of particular classes of features at a site may provide clues for the resources that might have been cooked, site seasonality, and the longer term process of adaptation to the longleaf pine ecosystem.

While it may seem that the project deviates from the National Guard’s 106 and other responsibilities, the outcomes presented in this report bear directly on issues of management effectiveness and National Register of Historic Places (NRHP) eligibility. Adding remote sensing as a tool for site evaluation has the potential for reducing excavation costs at the level of Phase II evaluations. This is not to say that sites without features or certain classes of features should *a priori* be considered ineligible for inclusion on the NRHP, but rather that the presence or absence of possible features facilitates identification of the research questions that bear upon eligibility under Criterion D. Further, if we can begin to associate particular classes of features with particular time periods, or assemblage characteristics, or prehistoric settings, understanding the prehistory of the Pine Hills will make a significant advance. The cultural resource management program of the Mississippi National Guard is to be commended for its proactive approach to resources management.

-H. Edwin Jackson
August, 2008
CHAPTER 1

OVERVIEW OF THE PROJECT
H. Edwin Jackson

INTRODUCTION

Remote sensing has become an important tool for pre-excavation determination of site feature locations, permitting a more targeted excavation strategy. Much of the evaluation and development of remote sensing techniques has focused on Historic Euroamerican sites or large late prehistoric sites, both of which are characterized by large architectural features (burned houses, mounds, stockade lines, etc; e.g. Johnson et al. 2000). There are no published attempts to employ remote sensing on the prehistoric sites of the Pine Hills, where sites are more ephemeral, and organic features (trash pits, postmolds, etc) are not readily apparent in the record, primarily as a consequence of the poor preservation probabilities, given the region’s acidic soils. The project reported here began with the simple question, what can remote sensing data tell us about prehistoric archaeological sites in the Pine Hills? However, the question is not simply one of idle curiosity. Effective collection and interpretation of remote sensing data could support excavation strategies maximizing the effectiveness of hand excavation. From a management standpoint, remote sensing could be a valuable tool for collecting data necessary to evaluate archaeological site significance (specifically eligibility for inclusion on the National Register of Historic Places, or NRHP) in the context of Section 106 responsibilities. The project described in this report begins the assessment of remote sensing effectiveness in the Pine Hills through a “ground-truthing” experiment on two prehistoric sites located on the Camp Shelby Joint Forces Training Site, in southeast Mississippi (Figure 1-1). Remote sensing data were collected and interpreted by the University of Mississippi Center for Archaeological Research. University of Southern Mississippi students under the direction of the author and Guard archaeologist Rita Field then excavated remote-sensed anomalies. The project was sponsored by the Mississippi National Guard, partnering with the University of Southern Mississippi and the University of Mississippi.

The remote sensing experiment described in this report led to a centrally related issue, specifically, what are the classes of prehistoric features that can be identified in sites in the Pine Hills and what might their presence or absence suggest about site function, site seasonality, about the adaptive strategies employed by indigenous populations, and how these strategies may have varied over time. Archaeologists use the term “feature” to refer to the constructed aspects of an archaeological site that are not amenable to removal during excavation for later study in the laboratory. From the perspective of those who created archaeological sites as a consequence of leading their lives, features are the built facilities, the human-made environment, that represent
problem-solving technologies of the time. Elsewhere in the Southeastern U. S., commonly encountered features in prehistoric Native American sites include pits dug to store food stuffs (most often serving the secondary function of a trash disposal once their food storage purpose had ceased), remnants of hearths for cooking or heat, elements of house structures (foundations, floors, patterns of post stain, etc), and concentrations of artifacts or ecofacts that are thought to represent a particular episode of activity. In the Pine Hills organic materials are quickly removed from the archaeological record because of high soil acidity and abundant precipitation. Visual recognition of trash-filled pits or post stains is the exception rather than the rule. However, there is growing evidence of one or more classes of features that are thought to be cooking facilities represented by concentrations of baked clay or sometimes burned sandstone. They occur as apparent surface concentrations, concentrations in shallow basins, and sometimes in what appear to be excavated pits (Fields 2005; Jackson 2007; Jackson and Fields 2000a). Carbonized wood is sometimes, but not always associated with these concentrations, and only in rare cases have subsistence remains been identified in association with them (Fields 2005). A sufficient number of recorded examples of these features have accumulated to allow for a taxonomy of feature classes to be outlined, as well as a consideration of the prehistoric technologies that are represented by them. Thus, while the question of remote sensing in this region launched this investigation, it led to a broader, more formal consideration of just what the archaeological record as revealed by both remote sensing and traditional excavation might represent with respect to prehistoric adaptation to the region.

The experimental design was straightforward: two previously identified sites located on the Camp Shelby Training Center were chosen and remote sensing data were collected from them. The sites (22FO1294 and 22FO1301, described below) were chosen for several reasons. First, prior investigations indicated that the sites were relatively intact. Second, Phase I survey data suggested their potential for eligibility for inclusion on the NRHP, so data collection would assist in this determination. Artifact density suggested long term or repeated residential occupations, which would be more likely to have features present than would transient camps or short term task-specific sites. They also appeared to date to two different time periods. Access as well as the ease of clearing a sufficiently large area of the site to facilitate remote sensing (the majority of prehistoric sites on the base are wooded) were both considered as well. Once remote sensing data were collected and analyzed by our colleagues at the University of Mississippi Center for Archaeological Research, small scale excavations were conducted in those locations where remote sensed anomalies had been identified. The goal was to determine what was present that was “recognized” by remote sensing, thereby creating a link between specific readings and specific feature types. Overwhelmingly, the prehistoric features that were picked up by remote sensing were cooking facilities of one or more types, all characterized by concentrations of fire-hardened “baked” clay and/or sandstone. The excavation of features provided by the remote sensing led to additional experimental, ethnohistorical, and comparative archaeological research into the possible cooking technologies represented by these kinds of archaeological features. The focus on prehistoric technologies represented by the features has led to a number of useful insights into the adaptation of prehistoric populations living in the region.

Remote Sensing Effectiveness in the Pine Hills
Figure 1-1. Mississippi physiographic regions and project location.
SITE DESCRIPTIONS

The two sites investigated during the project are 22FO1294 and 22FO1301, both located in a training area near the cantonment area of the Camp Shelby Joint Forces Training Center. They are situated on ridges adjacent to Jacobs Creek about three km south of the Leaf River floodplain (Figure 1-2). They were located during survey conducted after Hurricane Katrina by National Guard archaeologist Rita Fields (Fields and Hudson 2007). Based on shovel test artifact recovery and site condition, Fields regarded the sites as potentially eligible for the NRHP. Phase II excavation of two similar sites in 2006 by the University of Southern Mississippi had demonstrated the presence of several classes of prehistoric features (Jackson 2007), so it seemed likely that the same would be true for these sites.

22FO1294

22FO1294 is located on a toe ridge overlooking Jacobs Creek, a tributary of the Leaf River (Figure 1-3). Elevation is approximately 250 feet above mean sea level. Soils are mapped as McLaurin-Benndale, and the sediments on the ridge are deep sands. Cultural material is found in an area of approximately 1500 m². Phase I shovel testing produced two late Archaic projectile points, a Late Archaic Barbed and a Bradley Spike, as well as three unfinished bifaces, two cores, a hammerstone, and debitage. Pieces of fired clay were also recovered.

Figure 1-2. Physiographic context of 22FO1294 and 22FO1301.
Field investigations at 22FO1294 began in late August (Figures 1-4, 1-5). The site was prepared for remote sensing by clearing brush and removing downed timber. A grid was established and in advance of remote sensing, additional shovel testing was conducted to ensure that the data collection occurred within the site limits. Eighteen STPs were excavated in a cruciform fashion from the datum point. Once remote sensing had been completed and results were in hand, one by one meter excavation units were excavated where anomalies were indicated. Excavation was conducted mainly on Fridays and Saturdays through November 11, 2007. As time and duties permitted, National Guard archaeologist Rita Fields and student intern Tiffany Hensley, moved the project along by excavating during the week.

22FO1301

22FO1301 is also located on a ridge overlooking Jacobs Creek, about a half kilometer downstream from 22FO1294 (Figure 1-65). Elevation is 250 feet above mean sea level. The site covers 3600 m². Soils are mapped as McLaurin-Benndale, with silty sand to sandy silt sediments. Phase I shovel testing produced two Late Woodland sherds, a Collins Point, one unfinished biface and a hundred flakes.

Site clearing, gridding and additional shovel testing began in late August and finished in early September (Figure 1-4). Hand excavation began on November 16, 2007 and completed on December 14, 2007, again working Fridays and Saturdays, with Fields and Hensley digging some during the week. A total of 29 STPs and eight one by one units were excavated.

Figure 1-3. Location of 22FO1294.
Figure 1-4. Mapping at 22FO1294.

Figure 1-5. Feature recording at 22FO1294.
Figure 1-6. Location of 22FO1301.

Figure 1-7. Setting out grid at 22FO1301.
Figure 1-8. Excavation of 22FO1301.

Figure 1-9. Recording soil profile of N105E110-N105E111 at 22FO1301.
CHAPTER TWO

BACKGROUND
H. Edwin Jackson

NATURAL SETTING

GEOLOGY AND GEOMORPHIC SETTING

Camp Shelby Training Center is located in the Pine Hills physiographic province of the eastern Gulf Coastal Plain (Cross and Wales 1974) (see Figure 1-1). The geomorphology of the region is dominated by uplands comprised of surface and near surface sand, gravel, and clay sedimentary deposits of Miocene and Pliocene age that dip toward the coast (Walker and Coleman 1987:51). The exposures of these strata at the surface have been eroded to form a series of arcuate bands of hills that can be distinguished by lithology, soils, and topography. Elevations range from 400-500 feet above mean sea level (famsl) in the north where the Pine Hills give way to the Jackson Prairie, (referred to as the Lime Hills in Alabama) to 200-250 famsl along the southern border with the coastal plain meadows (Brown et al. 1996:32). Dissection of the relatively flat sloping surface of the Pine Hills has created hilly upland ridges with narrow to broad gently sloping summits separated by v-shaped ravines. In southeast Mississippi, the uplands of the Pine Hills are subdivided by the major alluvial plains of the Pascagoula River and its major tributaries, the Leaf and the Chickasawhay. Sites 22FO1294 and 22FO1301 are located on toe ridges overlooking Jacobs Creek, which flows northward to the Leaf River.

In the Pine Hills, Miocene-aged Catahoula, Pascagoula and Hattiesburg and Pliocene-aged Citronelle Formations dominate the surficial deposits (Figure 2-1). Pleistocene and Holocene alluvial fills are found in river and creek floodplains of the area. The Catahoula Formation consists primarily of gray to brown, fine to medium grained sand with variable amounts of gravel (May et al 1974:108). Ferruginous sandstone is common within the formation, often forming at the contact between Catahoula deposits and later deposits. The Hattiesburg and overlying Pascagoula formations occur at the surface and are composed of silts and clays of variable color, with the Pascagoula also exhibiting sandy and gravelly sand facies (Brown et al. 1944).
Vegetation

Longleaf pine forests comprised the dominant presettlement vegetation of the uplands, which based on pollen data (Delcourt and Delcourt 1980) and the recovery of macrobotanical remains from 22PR533 (Brown et al. 1996), appear to have been established by 5000 B.P. Relatively homogeneous longleaf pine stands, characterized by rather open canopies and savanna-like understories were common. Slash, loblolly and shortleaf pines also occur, primarily in lower elevations. More heterogeneous pine-oak forests also existed, with a variety of oaks, as well as hickory (DeLeon 1981:15). Among the variants of the pine-oak forests in the region are those that inhabit excessively drained

Figure 2-1. Geological Map of Southeast Mississippi.
upland soils. These areas, which range in size from patches less than an acre to the Gopher (Tortoise) Farm in Wayne County located on the Chickasawhay District of the De Soto National Forest which covers 180 acres (Keith 1998), have only widely spaced pines but support a variety of scrub oaks, other deciduous species, and prickly pear. Ravines support holly, dogwood, privet, and scattered oaks. Larger stream bottoms and the floodplains of the major watercourses were vegetated by bottomland species sorted on the basis of tolerance to poor drainage and inundation. Taxa include sweetgum, several species of oaks, hickory, tupelo gum, and cypress (DeLeon 1981:29-30). A number of native species potentially served as food sources (Table 2-1). Presently, there is little evidence for prehistoric plant use in the Pine Hills region of Southeast Mississippi. The best are data collected by excavations at sites in Greene County (Fields 2005:335), which recovered hickory nut, wild plum, honey locust, passionflower, grape, and one wild gathered seed identified as sumpweed These are all wild taxa; there is presently no direct evidence for the use of cultivated species, though it is assumed that by the last millennium of prehistory, knowledge of plant husbandry practices documented elsewhere, would have been available to local populations.

Although no local pollen sequences are available, the Pine Hills forests of the Late Pleistocene and early Holocene likely differed by including a greater density and variety of deciduous species than is typical of longleaf pine forests after 5000 B.P. (Delcourt and Delcourt 1980). Oaks and hickories, which produce an edible nut mast in the fall, would have been significantly more prevalent during this interval. They would have provided a productive and potentially storable calorie source for human populations, as well as attracting important wildlife species such as deer and turkey.

FAUNA

The location of sites in the CSTC provided access mainly to upland forest animal resources. Prehistoric faunal use is largely undocumented for the Pine Hills section of Southeast Mississippi for reasons of poor bone preservation. However, terrestrial game including deer, raccoons, turkeys, rabbits, opossums, and squirrels were commonly utilized elsewhere in the southeast (e.g., Jackson and Scott 2002; Scott 1983; Woodrick 1981) and would have been variably distributed in upland and floodplain areas (e.g., Engstrom 1993). Although not on a major flyway, waterfowl, including migratory ducks and geese, as well as resident species such as great blue heron, likely inhabited floodplain lakes along the Leaf River. Turtles, snakes, and alligator would also have been available (Shelford 1963). Fish taxa in the Leaf River include gar, several species of catfish (Ictaluridae), a variety of suckers (Catostomidae), bass and other sunfish (suborder Perciformes), and possibly sturgeon (Carpenter 1961; Ross 2001). Only minimal faunal material was collected from the Greene County mitigations mentioned above (Fields 2005).
Table 2-1. Selected Wild Foods Found In the Gulf Coastal Plain.

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>Product</th>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goosefoot, <em>Chenopodium bushianum</em></td>
<td>Seeds</td>
<td>Disturbed open ground</td>
</tr>
<tr>
<td>Marsh elder, <em>Iva annua</em></td>
<td>Seeds</td>
<td>Disturbed open ground</td>
</tr>
<tr>
<td>Pigweed, <em>Amaranthus</em> sp.</td>
<td>Seeds</td>
<td>Disturbed open ground</td>
</tr>
<tr>
<td>Serviceberry, <em>Amelander arboea</em></td>
<td>Fruit</td>
<td>Dry open woodland</td>
</tr>
<tr>
<td>Pawpaws, <em>Asimina triloba</em></td>
<td>Fruit</td>
<td>Open woodland</td>
</tr>
<tr>
<td>Sugarberry <em>Celtis lavigata</em></td>
<td>Fruit</td>
<td>Floodplain, stream margins</td>
</tr>
<tr>
<td>Mayhaws, <em>Crataegus aestivalis</em></td>
<td>Fruit</td>
<td>Stream margins, open moist areas</td>
</tr>
<tr>
<td>Persimmon, <em>Diospyros virginiana</em></td>
<td>Fruit</td>
<td>Dry open woods, forest edges, floodplains</td>
</tr>
<tr>
<td>Mulberries, <em>Morus rubra</em></td>
<td>Fruit</td>
<td>Floodplain forests</td>
</tr>
<tr>
<td>Maypops, <em>Passiflora incarnata</em></td>
<td>Fruit</td>
<td>Alluvial woods</td>
</tr>
<tr>
<td>Blackberry, raspberry <em>Rubus</em> sp.</td>
<td>Fruits</td>
<td>Disturbed habitats</td>
</tr>
<tr>
<td>Ground nut, <em>Apios tuberosa</em></td>
<td>Rhyzome</td>
<td>Wet woodland soils, pond margins</td>
</tr>
<tr>
<td>Wild potatoes, <em>Ipomea pandurata</em></td>
<td>Roots</td>
<td>Open fields, stream and lake margins</td>
</tr>
<tr>
<td>Greenbrier, chinabrier, <em>Smilax</em> sp.</td>
<td>Roots</td>
<td>Wet woodlands, thickets, stream banks</td>
</tr>
<tr>
<td>Water lotus <em>Nelumbo luteo</em></td>
<td>Roots</td>
<td>Ponds, oxbow lakes</td>
</tr>
<tr>
<td>Duck potato <em>Sagittaria latifolia</em></td>
<td>Tubers</td>
<td>Ponds, lakes, stream margins</td>
</tr>
<tr>
<td>Oak, several species, <em>Quercus</em> sp.</td>
<td>Acorns</td>
<td>Mixed upland forests, floodplain forests</td>
</tr>
<tr>
<td>Hickory, several species, <em>Carya</em> sp.</td>
<td>Nuts</td>
<td>Mixed upland forests</td>
</tr>
<tr>
<td>Pecan, <em>Carya illinoisensis</em></td>
<td>Nuts</td>
<td>Floodplain forests</td>
</tr>
</tbody>
</table>

After Jackson (1995)

**LITHIC RESOURCES**

A number of different lithic raw materials suitable for chipped stone tool manufacture are available in southeastern Mississippi and southwestern Alabama. Descriptions and geographic distributions of lithic material identified in the site assemblages are briefly considered here.
**Citronelle Gravel Chert**

Cobbles of chert from the Citronelle Formation are the single most abundant stone tool raw material in the immediate vicinity of the investigated sites and is the best represented material in site collections. Citronelle chert is fine to coarse-grained, sometimes rough-textured, cryptocrystalline material. Recent geological research indicates that a number of distinctive fluvial formations have been subsumed within the Citronelle rubric, leading some to abandon the term (Bowen 1981: Saucier and Snead 1989), however, since concern here is with availability of suitable material for flintknapping, we can leave this debate to the geologists. Substantial gravel bars of chert cobbles can be found immediately adjacent to both sites in Jacobs Creek as well as in gravel bars on the Leaf River. Gravel cherts can also be found in remnant deposits on ridge tops. Citronelle cherts range in color from dark brown and gray/light gray, to very pale brown and tan/yellow (Keith 1998; Stallings 1989). Heat was often applied to Citronelle chert to improve flaking qualities, resulting in a more glossy internal appearance and often a color change to dark red to light pinkish red (Boyd 1995; Collins 1984, Perkins 1985). In addition to chert, pebbles and cobbles of quartzite and quartz occur in the formation.

**Tallahatta Quartzite**

Tallahatta Quartzite (TQ), sometimes referred to as Tallahatta Sandstone, is a white to gray to tan, often grainy, sedimentary quartzite or sandstone, consisting of fine to medium sand grains cemented together by silica. TQ was used extensively in southwestern Alabama, and southeastern and east central Mississippi, especially during the Archaic (Campbell et al. 1988; Curren 1982; Dunning 1964; Lehmann 1989; McGahey et al 1992; O’Hear and Lehman 1983). Although there is considerable variability (Heinrich 1988), the best quality TQ is sufficiently cemented to be classified as a quartzite, since fracture planes run through individual sand grains, rather than around them (Dunning 1964; Heinrich 1988; McGahey et al 1992). Although surface exposures of the Tallahatta Formation are distributed from central Mississippi to southwestern Alabama, well cemented knappable outcrops are more limited (McGahey et al 1992). Morphological characteristics vary, primarily in cementation, the degree of silica present in each specimen, and the variable amounts of glauconite and feldspars, which produce a salt and pepper speckled appearance in some TQ.

**Quartz**

Quartz is a fine-grained material formed in thin veins of metamorphic rock formations of the Alabama piedmont. It also can be found in the Lime Hills (Jackson Prairie) of southwestern Alabama, where it can be found as large cobbles in stream beds. Smaller pebbles of quartz can be found in the Citronelle Formation gravels. Quartz characteristically has unpredictable fracturing quality. Color varies, ranging from opaque milky white to clear, sometimes with a pinkish hue. Quartz use peaked in the Woodland period when it was used to manufacture small arrow points (Jeter and Futato 1990).
Silicified Sandstone

Silicified (or ferruginous) sandstone is a fine to coarse-grained material cemented by iron oxide, usually black, purple or brown in color. It is a characteristically hard, nearly quartzitic material that has fair conchoidal fracture properties and is thus differentiated from more common, softer sandstones that formed in Miocene aged deposits in the area. Heinrich (1988) refers to the material as a sedimentary quartzite, since fracture planes run through grains of sand rather than around them. The material occurs as a minority type in assemblages in southeastern Mississippi and appears mainly to be associated with Middle and Late Archaic components (Keith 1998, Reams 1995). Prehistorically exploited exposures are reported by Campbell et al. (1988) and Lumpkin (1994; also Stowe 1992) in Washington County, Alabama, approximately 25-35 km east and southeast of 22GN668.

Coastal Plain Agate

Coastal plain agate is a fine-grained, translucent form of variegated chalcedony. The general appearance is usually of a cloudy, “mottled, banded coloring consisting of shades of blue, purple, gray, black and pink” (Ensor 1981). Agate is found in thin laminated beds, often alternating with opal quartzites such as Tallahatta Quartzite (Dunning 1964).

Coastal Plain Chert

White tabular fine-grained chert can be found on the southern coastal plain of Alabama, particularly in southeastern Alabama (Cyril B. Mann, personal communication, 2000). When heat-treated it turns pink to red.

Chalcedony

Chalcedony is a translucent to opaque, generally waxy appearing cryptocrystalline quartz. Color is most often milky pale white to tan, but can be pale blue, brown, or black. Chalcedony can be found in Citronelle Formation deposits.

INVESTIGATIONS OF PINE HILLS PREHISTORY

Even quite recent archaeological investigations in southeastern Mississippi have tended to rely on better known sequences from elsewhere in the Southeast (e.g. Brown et al. 1996), and in the succeeding section, the overarching framework within which local prehistory is examined will rely on that same broader regional view. However, to the extent possible, the overview of the prehistoric context of 22FO1294 and 22FO1301 will attempt to pull together the emerging understanding of the local archaeological record within that broader framework of Southeastern prehistory. For that reason it is useful to briefly review the archaeological investigations that have contributed to the present local knowledge base.
Prior to about 1970, little professional attention was paid to the Pine Hills. C. B. Moore explored the Tombigbee River in Alabama (Moore 1901, 1905), restricting his investigations to sites along the river. Henry Collins conducted the first professional excavations in southeastern Mississippi at the McRae Mound (22CK533) and at three other small mound groups at the headwaters of the Chickasawhay River north of the Pine Hills in Clarke, Lauderdale, and Wayne counties (Blitz 1986, 1988). During the 1930’s, WPA and other federally funded archaeology was carried out in many parts of the southeast but the Pine Hills was largely ignored. In Alabama, WPA archaeologists excavated a number of sites in Clark County (in the Pine Hills, but east of the Tombigbee) (Futato 1989:351) including the McQuorquodale Mound (1CK25) (Wimberly and Tourtelot 1941). Wimberly (1960) used these sites in Clarke County and others in Mobile County to construct the first local ceramic typology.

Activity before 1970 remained intermittent in the Mobile River delta and Mobile Bay area (e.g. Trickey 1958) and nonexistent in southeastern Mississippi. Several studies north of the Pine Hills in southeastern Mississippi were conducted between 1970 and 1980, including small surveys in the Tallahala drainage (Atkinson and Elliot 1979; Tesar 1974), the Tallahoma drainage (Penman 1980) and along Archusa Creek (Marshall 1982b). Marshall (1982a) also tested several sites on Goode Lake, Jackson County, just south of the Pine Hills.

The first systematic archaeological investigation in the southeastern Mississippi segment of the Pine Hills was a transect survey performed by the University of Southern Mississippi to collect data for the purpose of developing a predictive model of settlement location (Padgett and Heisler 1979). A total of 7 transects, 1/4 mile wide and 4 miles long were surveyed, randomly drawn from 128 possible transects. The transects were located in north Forrest, Jones and Covington counties, and three of the seven transects crossed the Leaf River floodplain. Shovel testing was employed in areas of poor ground visibility (Padgett and Heisler 1979:18-19), but excavated matrix apparently was not screened. A total of 51 archaeological sites were recorded. Since the primary objective of the study was to examine the relationship between site location and a series of environmental variables, site testing was minimal. Therefore, site collections and other data are minimal and little effort was expended in site-specific interpretations.

Also along the Leaf River, avocational archaeologist Carey Geiger reported on collections from 15 sites that he recorded in Perry County (Geiger 1980). They are notable in the significant representation of Early and Middle Archaic components. Geiger's activities eventually included a salvage excavation of an extensive multi-component site 22PE504, near Beaumont, which produced a significant late Paleo-Early Archaic assemblage. The collection was analyzed later as part of a master’s thesis (Giliberti 1995).

Construction of the Leaf River Paper Mill near New Augusta occasioned an archaeological survey on the mill property (Wright 1981). Among the sites recorded during the survey, one, 22PE543 the Augusta Bluff site, was deemed eligible for inclusion on the National Register of Historic Places. Excavation there by
Archaeological Research Associates (Wright 1982) recovered a large number of Pontchartrain and Kent projectile points, which along with a paucity of ceramics and a single radiocarbon date of 3620+170 years B.P., indicated that it was predominantly Late Archaic in age. The site covered approximately 100 by 50 meters.

In southeastern Mississippi, archaeological survey was mainly restricted to the national forests in the area until well into the 1980s. DeLeon (1981) used land management-based reconnaissance data from the DeSoto National Forest to identify the physiographic variables most likely to have played a role in settlement locations along the Black Creek basin. DeLeon's analysis identified distance to water and topography to be the most important variables for predicting site location. He suggested that a particular landform, ridge spurs, were significantly correlated with the site location. Unfortunately, inadequate sampling of other landforms reduces the predictive value of DeLeon's site location model.

In the early 1980's, the University of Southern Mississippi under the direction of Jerome Voss conducted limited survey and several small excavations. Among the sites investigated were the Sims (22FO578) and Robinson (22FO580). Although these have not been reported completely, materials from Robinson were used in an intersite examination of hunter-gatherer mobility trends (McMakin 1995, 1997). Lithic materials from the Sims excavation were analyzed by Fields (2000). USM returned to Sims in 2001 and 2003 (Jackson 2001), though the results have not been published.

In the 1980’s and 1990’s, survey of the Alabama portion of the Pine Hills increased. Among the largest scale survey and testing programs was conducted by New World Research along a corridor of the proposed Mobile Bay pipeline (Thomas and Campbell 1987; Campbell et al. 1988). The surveyed right-of-way traversed Mobile, Washington, and Choctaw counties, roughly paralleling the state line and just east of the Escatawpa River. It crossed five physiographic zones, the coastal plain meadows, the Pine Hills, the Lime Hills, the Burhstone Hills, and the southern Red Hills, permitting an evaluation of variation in the prehistoric use of the zones over time. The northern part of the survey encountered the formations that produce the ubiquitous Tallahatta Quartzite. This provided an opportunity to examine quarrying and the importance of TQ during different periods of prehistory. Finally, the northern terminus of the survey extended almost into the better-investigated west-central portion of Alabama, where much of our understanding of the prehistoric sequence derives (Jenkins and Kraus 1986). The archaeological data from the survey and testing provided as means of assessing the variable contributions and impacts of populations living to the north on those living in southwestern Alabama (and by extension on those inhabiting southeastern Mississippi. The survey recorded 216 sites, of which 199 had prehistoric components ranging in age from Paleindian to Mississippian. A total of 77 sites were selected for Phase II testing (Campbell et al. 1988). The data provided important new information on cultural historical issues, differences in lithic material use, and also changes in how the uplands were used over time. Unfortunately, the report of investigations is not widely distributed and has not made much of an impact on the archaeology west of the state line.
CRM activity in southeastern Mississippi has increased since the late 1980’s. In particular, the systematic survey of timber sales conducted in the DeSoto National Forest since the mid-1990s has increased dramatically the number of recorded archaeological sites and added to our understanding of site and cultural distributions (e.g., Fields 2002, Jackson, Reams and Reams 2002; McKenzie 2006; Reams 1995), and shifts in the organization of settlement systems (Dunn 1999 Fields 2001). Excavations there have produced important new information (Fields 2001, 2004; Fields and Rochester 2003; Keith 1998). The most extensive and thoroughly reported excavations were Phase III mitigations conducted by PBS&J, Inc, on three sites in Greene County related to a MDOT highway improvement project (Fields 2004, 2005). These excavations documented intrasite artifact and feature distributions corresponding to models of household organization at 22GN680, as well as producing the first systematically recovered archaeobotanical assemblages from sites in the region (Fields 2004, 2005). Additional excavations, often as part of U.S. Forest Service PIT projects have been reported by Reams (e.g., 2001, 2002, 2005). A large survey adjacent to Camp Shelby for geo-prospecting was conducted by Stowe and Gibson (Stowe 2001) although no report from this work appears to be available.

Prior to the mid 1990s, systematic survey in areas utilized by Camp Shelby was hit or miss. Several small surveys were conducted in the late 1970s-early 1980s (Padgett 1979; Winn 1981a, 1981b). USFS archaeologist Mark Deleon surveyed a 27% sample of an area on the Desoto NF slated for a tank maneuver range. While 34 sites were recorded, none were considered NRHP eligible, indicative of the prevailing bias against the potential of archaeological resources to be found in southeast Mississippi. This view was perpetuated by the USACE Mobile District, which, in a report prepared in 1988 summarizing archaeological investigations on Camp Shelby, concluded that NRHP eligible sites were unlikely to be present on the base and recommended that no further work was necessary. The SHPO concurred with this assessment. However, in 1990, Special Use Permit negotiations between the National Guard and the USFS concluded that archaeological survey should be conducted in areas of the National Forest impacted by training activities.

By the mid-1990s an apparent shift in philosophy regarding cultural resource responsibilities at Camp Shelby resulted in what might be considered the modern period of resource management. Beginning with a limited survey of firing point locations in 1994 by the University of Southern Mississippi (Keith and Jackson 1995), a number of important surveys, and site evaluations ensued. One of the largest, by the University of Southern Mississippi was 4000 acres for the proposed Multi-Purpose Range Complex-Heavy (MPRC-H) training facility, conducted in 1995 (Jackson 1996). A total of 130 archaeological sites were located, of which five were recommended as potentially eligible for the National Register of Historic Places. Eligibility determinations were evaluated by further testing by the USFS archaeologist Robert Reams. Another survey in 1995 by Brockington and Associates of 1700 acres located 14 archaeological sites, though none were deemed NRHP-eligible (McMakin et al 1996). Several smaller scale surveys have also been conducted (Harvey 2002; Shah 2005). In 2004, the Mississippi National Guard hired an archaeologist to oversee cultural resources, reflecting the increased awareness of
the historic and prehistoric properties within the boundaries of training activities. A significant consequence was the National Guard’s ability to respond to the aftermath of Hurricane Katrina: Guard archaeologist Rita Fields and her coworkers surveyed 1,120 acres in advance of timber salvage occasioned by the storm, identifying 75 previously unrecorded sites, as well as an area that had been used for training during World War I (Fields and Hudson 2007). Two sites identified by this survey work were tested for NRHP eligibility in 2006 (Jackson 2007) Additional survey associated with storm damage was conducted in 2006-2007 by Pan American Consultants (Carruth et al 2007).

Other excavations in the Pine Hills also provide new comparative data. Excavated sites include Burkett’s Creek, (22FO748) (Jackson 1995), the GWO site in Jones County (Jackson and Scott 1992), and two gravel deposit lithic reduction sites, 22FO815 and 22FO819, near Hattiesburg (Jackson and Keith 1996, 1997), 22PR533 in Pearl River County (Brown et al. 1996), 22JO699 in the northern part of the DeSoto National Forest, Chickasawhay District (Jackson, Reams and Wright 1999), 22FO1023 (Jackson and Wright 2001), 22GN668 (Fields 2002; Jackson and Fields 2000), the Seed Tick Site (1WN106) (Lumpkin 1992, 1994; Stowe 1992) and, 22GN680, 22GN685, and 22GN687 sites by Fields (Fields 2005; Fields and Rochester 2003).

CULTURE-HISTORICAL FRAMEWORK

Beyond basic chronology and some preliminary and quite broad inferences regarding settlement organization, present evidence remains insufficient to be very confident about any general statements regarding the basic cultural features of the prehistoric societies that occupied south Mississippi. Continued research is needed to build adequate models of prehistoric human adaptations that incorporate the range of site function variability, demography, the character of settlement systems, subsistence strategies, or the nature of social organization. Among the obstacles to clarifying such fundamental features of prehistoric cultures is poor preservation of organic remains (both subsistence evidence and burials), the tendency for sites to be multi-component without clear vertical or horizontal stratification, and inadequate investigation of the range of sites for any time period.

Table 2-2 presents one of several competing schemes depicting cultural chronological divisions of southeastern prehistory (see Jeter 1989 for an extended review of the history of culture-historical frameworks in southeastern archaeology). While a suggested absolute chronology is included in Table 2-2 as well as in the ensuing discussion, it should be viewed as a heuristic device, since local chronometric dates are virtually non-existent. For better or worse, periods are culture periods as applied to south Mississippi (e.g., Jeter 1989:59), implying that assignment of sites is based on cultural content rather than actual dates. As Phillips (1970:14) noted in his outline of the cultural chronology of the Lower Yazoo Basin, “periods are still mainly intelligible in terms of culture rather than time.” The statement remains true for southeast Mississippi thirty years later. Periods are grouped into larger time units codified for eastern North American by Griffin (1967), as modified by Walthall and Jenkins (1976; Walthall 1980) to accommodate the
early appearance of pottery in the Southeast. The Mississippi State Plan (Giliberti 1994, Morgan 1992) and other overviews of Mississippi prehistory (e.g., Brown et al. 1996) refer to these larger units as “stages”, a practice that is followed here. Other schemes have avoided the cultural evolutionary implications of the term by renaming these broad subdivisions and labeling them “eras” (Brain 1971, Stoltman 1978; Williams and Brain 1983:349). In the present study area, the term stage should not be misconstrued as

Table 2-2. Regional Chronological Framework of the Mississippi Gulf Coastal Plain.

<table>
<thead>
<tr>
<th>Years</th>
<th>Stage</th>
<th>Period</th>
<th>Culture/Tradition</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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<td></td>
<td>Mississippi Gulf Coast</td>
</tr>
<tr>
<td>1500</td>
<td></td>
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<td>N.E. Mississippi/</td>
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<tr>
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necessarily implying that these units differentiate either modes of adaptations or levels of cultural complexity. Nor should it be inferred that a particular “stage” refers to a culturally homogeneous span of time. In fact, current evidence suggests that major cultural transformations may be as likely to have occurred in the midst of stages as to have marked transitions between them (see for instance Russo 1994; Smith 1986). Despite adhering here to current practice, a more productive approach might be to abandon the stage concept altogether (e.g., Jeter et al. 1989).

PALEOINDIAN STAGE

The Paleoindian Stage represents the initial spread of human populations across the North American continent. Initial colonization of eastern North America is generally believed to have occurred sometime between 15,000 and 12,000 years ago (Anderson and Sassaman 1996). Anderson (1996) has suggested that the first colonists entered the eastern U.S. via corridors provided by the major river valleys. Initial eastern Paleoindian populations are hypothesized to have concentrated in the Ohio, Cumberland and Tennessee valleys, which Anderson refers to as “staging areas”. Anderson hypothesized only periodic movement beyond the river valleys and a general reduction in mobility that permitted population growth. By the Middle Paleoindian period, increased projectile point variability suggests the emergence of distinctive populations scattered in some parts of the southeast, with intervening areas less utilized (Anderson 1996:37). The distribution of Late Paleoindian projectile points suggest that by the end of the Paleoindian stage population had begun to inhabit the previously unoccupied parts of the southeastern U.S.

Early Paleoindian diagnostics include Clovis, Cumberland and Redstone types, all of which are large lanceolate points sharing a distinctive channel flake removed from the base. In a study of the distribution of Paleoindian projectile points in Mississippi, McGaheey (1996) determined that early Paleoindian material is mainly distributed in the northern part of the state. Roughly 70% of Early and Middle Paleoindian points recorded by McGahey come from the northern half of the state (McGahey 1996:18.2). Of those tabulated as being from south Mississippi, (McGahey 1996:382; also 1987: Figures 1-3), the majority were collected in the Loess Hills physiographic region. Likewise, in an overview of Paleoindian and Early Archaic in Alabama, Futato (1996) indicated that that the vast majority of recorded components are above the Fall Line. However, several recorded Early or Middle Paleoindian points indicate at least minimal use of the Pine Hills region. Padgett and Heisler (1979:9) reported a fluted point from Jones County in the possession of a local amateur. Tesar (1974) reported a Clovis point in the Lauren Rodgers Museum in Laurel. Surveys in the DeSoto National Forest south of Hattiesburg (Robert Reams, personal communication, 2000) have produced at least two early Paleoindian specimens, one unfluted Clovis point from 22PE1404 in Perry County and a preform from 22ST676 in Stone County. Reams has recorded two additional Clovis points (both unfluted) that were found by collectors along Red Creek in Stone County. The identification of the points as Clovis relies on McGahey’s (2000) assertion that technology and morphology rather than fluting are sufficient to recognize a Clovis point. The three points are made from apparently nonlocal gravel (?) cherts, while the preform is made from Tallahatta quartzite. McGahey identified as Middle Paleoindian a heat-
treated chert point fragment from the G.W.O. Site (22JO568) in Jones County (Giliberti 1999; Jackson and Scott 1992; McGahey 1996).

In contrast to Early and Middle Paleoindian materials, Late Paleoindian diagnostic artifacts occur throughout south Mississippi (Geiger 1980; Giliberti 1995; Jackson and Scott 1992, McGahey 1987, 1996). In Mississippi, the most commonly found artifacts from this time range are projectile points, including Dalton and San Patrice (Geiger 1980). Unlike earlier Paleoindian lanceolates, which are almost exclusively made from high quality non-local materials, San Patrice and Dalton points found in the Pine Hills are made primarily on local chert, presumably collected from gravel bearing Citronelle Formation deposits, at least in southeastern Mississippi. Sites producing late Paleoindian material are located in a variety of settings. At present, knowledge about late Paleoindian lifeways in Mississippi relies heavily on excavations at the Hester site (22MO569) in Monroe County. The site, which is located on the floodplain of the Tombigbee River, apparently served as a temporary or special purpose Dalton occupation (Brookes 1979).

Locally, several sites with San Patrice components are located in the uplands (Brown et al. 1998:334; Keith 1998:64; Reams 1995:51) and river terraces (Geiger 1980). An important site for our understanding of Late Paleoindian-Early Archaic technology is the Beaumont Gravel Pit (22PE504) (Giliberti 1995), where one obvious focus of its occupants was the exploitation of the local chert deposits for stone tool manufacture. Exhausted tools of Tallahatta Quartzite, ferruginous sandstone, and non-local cherts found their way into the Beaumont Gravel Pit deposits, suggesting rearmament of weapons by relatively far-ranging foragers. Other sites on older terraces of the Leaf River have been reported, including the Sims Site (22FO582; USM site files) south of Petal, as well as others north of Hattiesburg (Ray Clarke, personal communication, 2007). San Patrice and Dalton points have been recorded at several upland sites in the Desoto National Forest in Perry and Forrest Counties (Jackson and Scott 2007; Robert Reams 2000, personal communication). In addition, a Dalton adze was recovered from 22PE668, and several sites have produced unifacial thumbnail scrapers that are considered to date to the Paleoindian or Early Archaic time range. One site, 22PE665 produced 15 thumbnail scrapers, all made from local gravel chert (Robert Reams, personal communication, 2000). At the Sandhill Site (22WA676) located on an expansive sub-xeric area, Keith (1998) reported a sparse possible Paleoindian component represented at the base of cultural material-bearing deposits, which he interpreted as an ephemeral occupation. Other upland sites characteristically exhibit low stone tool diversity and low debitage frequency, which is interpreted to represent task specific or limited occupations (Fields and Hudson 2007). How these sites articulated as nodes of a settlement system is presently unclear. The Beaumont Gravel Pit, which may or may not be typical of other floodplain sites, was an extensive site associated with an abundant source of Citronelle chert that produced a diverse formal tools assemblage. The site displayed ample evidence of retooling in the form of exhausted tools of non-local stone. This contrasts with upland sites, which are generally small in size, and seem to produce few formal tools (e.g., Keith 1998:91). Floodplain sites may represent seasonal base camps, while upland sites may represent either smaller, seasonal, foraging residential camps or limited function extraction camps tied to the floodplain bases.
ARCHAIC STAGE

The Archaic Stage spans the time from roughly 8000 to 2000 B.C. The Early Archaic is generally interpreted as a continuation of hunter-gatherer adaptations, modified as a response to changed food resource conditions associated with the establishment of Holocene environments. Though still sparse in their distribution, human populations were now present throughout the continent. Models of Early Archaic settlement describe continued high mobility and seasonally shifting procurement organization, but within the confines of more regular territories (e.g., Anderson and Hansen 1988). Side-notched, corner-notched, and bifurcate based points were made during the Early Archaic. Initial Early Archaic diagnostic projectile points include side notched Big Sandy I and Cache River, followed by a variety of corner notched types including Jude, Decatur, Pine Tree, Lost Lake, Hardin, Plevna, and Stillwell. In southeastern Mississippi these are almost entirely made from local materials including gravel cherts and Tallahatta quartzite (McGahey 1996), while in southwestern Alabama Tallahatta Quartzite dominates assemblages (Campbell et al. 1998). Groundstone implements, including mortars and anvil stones, appear to be an Early Archaic innovation (Bense 1994:69). The Hester site (22MO569) in the northern part of the state currently provides the best documentation of the Early Archaic in Mississippi (Brookes 1979). In contrast to the preceding ephemeral Dalton occupation, the Early Archaic component at Hester produced a wide range of both diagnostic projectile points and other stone tools, suggesting its use as a residential camp. Early Archaic populations are documented in south Mississippi, primarily by the presence of diagnostic points. Big Sandy, Lost Lake, Cache River, Bolen, Palmer and other Early Archaic forms have been identified at Beaumont Gravel Pit (22PE504) (Gilberti 1995), 22GN639 (Brown et al. 1997) and the Sandhill site (22WA676) (Keith 1998). The Early Archaic component at the G.W.O site included several grinding stones, leading the excavators to suggest that the site represented a recurrent residential location (Jackson and Scott 1992). The Early Archaic component at the Sandhill site is interpreted as a foraging residential camp (Keith 1998:148). Excavations at 22GN668 produced two Haradaway side-notched points of TQ, as well as associated broken and expedient tools suggestive of a forager residential camp (Jackson and Fields 2000; Fields 2001). New World Research (Campbell et al 1998) reported eight sites with early Archaic components in the Pine Hills segment (Washington and northern Mobile Counties) of the Mobile Bay Pipeline corridor. Recovered points included Big Sandy, Kirk, Hardaway, and Crawford Creek. Interestingly, more Early Archaic components were identified in the Pine Hills than in the other physiographic regions to the north crossed by the pipeline ROW. Like Keith’s interpretation of Sandhill, site distribution is interpreted to represent the residential camps of an indigenous population of foragers, utilizing primarily the hilly interfluves rather than major river valleys (Campbell et al 1988:10-36).

The Middle Archaic coincided with the middle Holocene climatic episode known as the Hypsithermal, during which worldwide and regional temperatures peaked and rainfall diminished (Smith 1986:5). In the southeast, the warmer drier climate resulted in a pattern of summer thunderstorms, which increased the frequency of forest fires. According to Bense (1994:74) fires "literally burned away the hardwood forest in the
southern half of the region except those in permanently wet (fire-protected) areas such as floodplains and marsh islands”. Burning was instrumental in the establishment of the southern pine forest at this time. In some areas of the south (though locally it has not been documented), there was a shift to increased floodplain use and greater settlement permanence (Bense 1994:82-83, Smith 1986:25-27). Archaeological indications of more intensive site use include substantial midden development (Otinger et al. 1982) and the occurrence of prepared house floors at a number of sites (e.g., Bense 1983). In south Mississippi, identified Middle Archaic points include Alachua, Benton-like, Sykes/White Springs, St. Tammany, Denton, and Opossum types (McGahey 2000). Among the most common points considered to be Middle Archaic is a distinctive, though unnamed, wide-based form, most often made from Tallahatta quartzite or ferruginous sandstone (Brookes 1984), which is locally referred to as a Craine point (M. Reams, personal communication, 2000).

Sam Brookes and Melissa Reams (1996) have argued that the Hypsithermal may have had a significant impact on the adaptations of aboriginal populations living in Mississippi, not only in terms of food resources but also lithic raw material selection. West and southwest of the project area, most points continue to be made from local Citronelle cherts. However, several other materials appear to be more extensively utilized, particularly locally. These include coastal plain agate, Tallahatta Quartzite, and a well-cemented ferruginous sandstone. Known source locations of Tallahatta quartzite form a broad arc from south central and southwestern Alabama through east central Mississippi south of Meridian, Mississippi (Curren 1982; Maudsley 1998; Lehman 1989). Coastal plain agate, occurs in many of the same outcrops at Tallahatta Quartzite and is found in slabs near Jackson, Alabama (Lumpkin 1994). The sandstone used for chipped stone tools may have a number of sources in southwest Alabama. Campbell et al. (1998) map the greatest concentration of sandstone in the northern part of the Pine Hills. Lumpkin (1994) has documented outcrops and quarry sites Washington County, Alabama, used extensively during the Early and Middle Archaic and Fields (personal communication) has documented a sandstone quarry associated with 22GN687 in Greene County. While use of these materials dates to the Paleoindian era at least near source areas (Lumpkin 1994; Maudsley 1998; McGahey 1987), the geographic distribution of these materials increased during the Middle Archaic. In extreme southeast Mississippi and southwest Alabama, for instance in Wayne, Greene and eastern Jones Counties, Tallahatta quartzite can be the primary material (e.g., Carr et al. 1998; Keith 1998) and continues to be used well into the Woodland stage. Sandstone may make a substantial contribution (Fields 2005). As one moves westward, where present, Tallahatta quartzite and ferruginous sandstone are mainly restricted to finished artifacts, often in exhausted condition (suggesting rearmament at the site) or else as small resharpening flakes. Sites in the vicinity of Hattiesburg generally have less than one percent Tallahatta quartzite (e.g. Fields 2000; Jackson 1995; Jackson and Wright 2000). There are indications that even as early as the Middle Archaic, Tallahatta Quartzite was beginning to be moved away from the source areas via trade. At 22FO506, a site located north of Petal on the eastern margin of the Leaf River floodplain, collectors encountered a cache of 22-28 Tallahatta quartzite artifacts, most of which are identified in MDAH site records as Morrow Mountain points. Giliberti (1995) suggests they are Shumla preforms. In either
case, a relatively rare point type for the area made from non-local material dominates the cache. Elsewhere, for instance, the Boozer site (22CV608) in southern Covington County, where a number of oversized TQ bifaces were collected, seems to indicate a widespread local exchange network (Jackson 2004). Although the data are limited, the pattern suggests that during the Middle to Late Archaic, Tallahatta quartzite and perhaps other materials such as ferruginous sandstone (e.g., Jackson 1995: 37) arrived in the Hattiesburg area in finished or near finished form, and likely was obtained via trade.

In south Mississippi, the Middle Archaic is represented mainly by scattered occurrences of isolated points and small sites, probably representing the camps of mobile foragers. Middle Archaic sites with significant midden development have not been documented in the region. Several sites with Middle Archaic components have been investigated. Tanya’s Knoll (22WA642) in Wayne County is located on a knoll overlooking Big Creek, a tributary of the Chickasawhay River. The Middle Archaic component is represented by an Alachua point of high quality ferruginous sandstone (Fields 2000b; Reams 1996). A Middle Archaic component is represented at the Sandhill Site (Keith 1998), and a single Middle Archaic point of ferruginous sandstone was recovered at the base of excavations at Ables Creek (22FO748) outside of Hattiesburg. On the DeSoto National Forest investigations at 22PE668 recovered a number of so-called Crane points of local and non-local stone (Reams 2001).

Evidence for an intensification of intra- and inter-societal interaction in some parts of the Southeastern U.S. is suggested by two trends that have their roots in the Middle Archaic. One is the growing importance of long distance trade, and presumably the social and adaptive implications of such patterns of intersocietal exchange. Trade in ceremonial Benton points and "turkey tail" points has been documented for northeastern Mississippi (Johnson and Brookes 1989). Elsewhere in Mississippi, there is evidence of the development of stone lapidary for producing beads (Connaway 1977, 1981; McGahey 2007). These items, often with zoomorphic shapes, served as trade goods, and are thought to have had a role in ritual activities (Blitz 1993). Blitz (1993:22) reported examples of locust beads from three sites in southeast Mississippi, two in Jackson County and a third in Greene County. Presently there is only scant data to suggest that local populations participated to any degree in long distance exchange systems, with the possible exception of being among those quarrying TQ for trade. Collectors at an unrecorded site in Greene County have found a number of oversized TQ bifaces, which may reflect that local participation. Evidence for this exchange system has been found as far away as Covington County (Jackson 2004).

A second innovation is mound construction, which not long ago archaeologists wholly attributed to Woodland peoples. However, new research, particularly in Louisiana, has demonstrated that moundbuilding dates as early as 4000 B.C. (Russo 1994; Saunders et al. 1997). To date one investigated mound in Copiah County appears to have an Archaic affiliation, others are suspected of dating to that time range (Saunders 1994). Recent investigation of the Deathly Silent Mound (22FO826) suggests that it may have a preceramic origin. Although the surrounding archaeological materials mainly appear to date to the Gulf Formational period, no ceramics were recovered either from

Remote Sensing Effectiveness in the Pine Hills
mound fill or the ground surface buried by mound construction. Thus, it could conceivably pre-date the adjacent occupation (Robert Reams 1999, personal communication).

Modern climatic conditions were established about 3000 B.C., coinciding with the beginning of the Late Archaic. The end of this period, which here is suggested to be approximately 1500 B.C., varies widely from region to region, and depends a great deal on the criteria used to differentiate late Archaic from later cultural periods. By 1500 B.C. in the mid-continent area of the U.S., domestication of several indigenous plants formed the basis of a hunting-gathering-gardening complex that supported larger human populations than previous periods. However, reliance on cultigens was extremely variable, with many areas apparently remaining solely dependent on wild resources. Settlement patterns are variable as well. Local Late Archaic site characteristics suggest the persistence of mobile foraging adaptations. A variety of stemmed and corner-notched projectile points were manufactured during the Late Archaic. According to Giliberti (1994), the most common point types in the Pine Hills region are Pontchartrain, Flint Creek and Gary (types that persist through the subsequent Gulf Formational period), Kent, Shumla, Ledbetter, Edwards, Little Bear Creek, and Carrolton.

A number of sites with Late Archaic components have been investigated in the Pine Hills. A single component Late Archaic site, Augusta Bluff (22PE543) is located on a bluff overlooking the Lear River in Perry County (Wright 1984). Point types collected during investigations include Pontchartrain, Kent, and Gary types. In addition to artifacts, a number of hearths were attributed to the Late Archaic component. McMakin (1997) analyzed the lithic assemblage recovered from the Jeff Parker site (22FO608) in Forrest County. He interpreted the site to be a small upland residential camp, based on the presence of fired clay, a wide range of formal and expedient tool types, and chipping debris representing the full reduction sequence. McMakin (1997) compared the Jeff Parker assemblage to that from Robinson Site (22FO580) dating to the Late Gulf Formational period, and concluded that residential mobility declined after the Late Archaic. McMakin (1997:60) notes that other factors, including site function and seasonality could be responsible for assemblage differences.

Another site with a significant Late Archaic component is 22PR533 in Pearl River County (Brown et al. 1996). It is an upland site located on a bench above a small stream. Diagnostic projectile points include Little Bear Creek, Gary, Wade, Flint Creek, and Pontchartrain. Sparse faunal remains include deer and turtle. Blood proteins extracted from a clay ball document the use of rabbit. A large number of small utilized flakes displayed steep “wear” on the dorsal surface at the distal termination (Brown et al. 1996:419). The small size (mean =146 mm) suggested their use in a composite tool, possibly multiple flakes set in a slab of wood to create a grater. The pattern was interpreted to be evidence of starchy plant processing (Brown et al. 1996:420). The presence of fired clay and sandstone, abundant evidence for flake core reduction, use of expedient flake tools, and a number of features suggest the site was used as a logistical camp (Brown et al. 1996:437).
GULF FORMATIONAL STAGE (TERMINAL ARCHAIC, EARLY WOODLAND)

The invention of pottery containers in the southeast marks the onset of what archaeologists call the "Gulf Formational Stage" (Jenkins and Krause 1986; Walthall and Jenkins 1976). The Gulf Formational Stage was inserted into the chronological scheme codified by Griffin (1967) for eastern North America when it became clear that ceramic production began in parts of the southeast more than two millennia earlier than in the northeastern U.S. The construct incorporates what had been included previously as the latter half of the Late Archaic and the Early Woodland period and geographically encompasses the Gulf Coastal Plain from South Carolina to Louisiana (Walthall and Jenkins 1976:43). North of the Fall Line, the Early Woodland period is retained (Jenkins and Krause 1986:48).

The earliest pottery, found in Georgia, South Carolina, and Florida, is tempered with vegetal fibers and dates to the middle of the third millennium B.C. By the middle of the second millennium B.C., pottery technology spread from the Atlantic coast westward. In Mississippi and Alabama, fiber tempered Wheeler series pottery is the earliest pottery now recognized, making its appearance between 1500 and 1100 B.C. Its appearance coincides with the beginning of the middle Gulf Formational (Jenkins and Krause 1986; Morgan 1992).

In southeast Mississippi, a distributional study of Wheeler sherds suggests they are more prevalent in eastern counties, although this is also where the majority of survey work has been conducted (Jackson, et al 2002). A number of sites have produced Wheeler ceramics, including the Sandhill (22WA676) site and nearby 22WA678 (Keith 1998). Wheeler ceramics are also recorded for sites south of the Leaf River on the Black Creek District of the DeSoto National Forest (Jackson, et al 2002). A survey by Marshall (1982b; also Hodge 2007) of Archusa Creek produced examples of Wheeler ceramics from four sites. Archusa Creek, a tributary of the Chickasawhay River, is located in Clarke County, just north of the Pine Hills physiographic region. The early Gulf Formational settlement pattern, at least where better documented, appears to represent spring-summer base camps on or near river floodplains and smaller fall-winter camps in the uplands (Bense 1994; Brown et al. 1996; Walthall 1980).

The middle Gulf Formational period coincides with the fluorescence of the Poverty Point culture in the Lower Mississippi Valley and along the Gulf Coast. Poverty Point components are characterized by the presence of non-local lithic materials used for manufacturing chipped stone tools, steatite bowls, and molded clay cooking “balls” called Poverty Point objects. Several large Poverty Point components are recorded on the Mississippi coast including Claiborne (22HA501) on the Pearl River and Applestreet (22JA530) in Jackson County (Blitz and Mann 2000; Morgan 1992). No Poverty Point sites are recorded in the Pine Hills region, although at least three sites have produced sherds from steatite vessels, a diagnostic trade item of the Poverty Point interaction sphere. Among these are the Robinson Site (22FO580) and Burkett’s Creek (22FO748), both near Hattiesburg. Hand molded clay objects from features at 22GN680 were interpreted to be analogous to Poverty Point objects (Fields 2005).
The interval between 800 B.C. and 100 B.C. is considered to be the late Gulf Formational. Pottery comes into wider use locally and during this time three different series of ceramic wares were being made in south Mississippi. Each series is comprised of a number of decorated types that share paste and temper characteristics and vessel shapes. Decorative techniques, designs, and vessel attributes such as podal supports (vessel "feet") are shared among the series. The Tchefuncte series is an untempered or clay tempered ware that seems to have developed in the Mississippi Valley. A second series, defined in the Mobile Bay area, is comprised of coarse grit or sand tempered wares, known as Bayou La Batre (Walthall 1980; Wimberly 1960). The third ware group, the Alexander series, is also sand tempered but is distinguished by fine sand tempering, generally finer workmanship, and complex design configurations (e.g., Haag 1942; O’Hear 1990). A recent reanalysis of ceramics from Archusa Creek excavated by Marshall (1982) augmented by collections from the Chickasawhay District of the Desoto National Forest, indicates a strong local Alexander tradition, which decorative modes that occur widely further north, but on local coarse sand and grit tempered ware (Hodge 2007). The Alexander series is most prevalent in northern Mississippi and Alabama, but occurs as far south as the Lake Pontchartrain area on Tchefuncte culture sites (Ford and Quimby 1945; Weinstein and Rivet 1978).

There are few excavations of sites with late Gulf Formational components in and near the Pine Hills of Mississippi. At the Sandhill Site (22WA676), Alexander Pinched and Bayou La Batre Plain were identified, but not Tchefuncte series types (Keith 1998:154). Excavation at Burkett’s Creek (22FO748) (Jackson 1995: 65-66) produced a small number of Tchefuncte Plain sherds, which were assigned to two new varieties based on the presence or absence of sand in the paste, as well as Pontchartrain or Flint Creek points. Sand tempered plain sherds were also recovered that could date as early as the late Gulf Formational, although the site’s primary component is Middle Woodland with diagnostic sand tempered ceramics. South of the project area, Marshall (1982a) excavated several sites with Tchefuncte components on Goode Lake.

WOODLAND STAGE

As noted in the previous section, the insertion of the Gulf Formational Stage between the Archaic and Woodland stages, forces the Woodland discussion to begin with what traditionally has been referred to as the middle Woodland period (200 B.C.-500 A.D). In general, the period is marked by renewed intersocietal trade of exotic items, particularly in the early half of the period (e.g., Toth 1988). These items, including galena, copper artifacts, mica cutouts, and non-local lithic materials were intended for or at least often ended up as burial inclusions. A broad similarity in ceramic decorative motifs further suggests broad interaction (e.g., Toth 1988), though the decorative techniques and artistic roots can be found in the preceding time period (Shenkel 1984). In addition, burial mound construction intensifies. Nearby excavated examples include the McRae Mound (22CK533) in Clarke County (Blitz 1986) and the McQuorquodale Mound (1CK25) near...
Southeastern Mississippi is on the margins of three distinctive Middle Woodland culture areas. To the west in the Lower Mississippi Valley and south along the Gulf Coast is the Marksville culture (Blitz and Mann 2000). To the southeast in the Mobile Bay area is what is called Porter Middle Woodland culture or the Porter Phase of the Santa Rosa culture of the eastern Gulf coastal region (e.g., Walthall 1980). North, along the Tombigbee River in west central Alabama and northeastern Mississippi is the Miller culture. Miller II corresponds to the Middle Woodland time interval. All shared mound use in burial ceremonialism and evidence of links to the broader exchange system, at least in the early half of the period. Specific burial programs, material culture traits, and presumably also local adaptations differed in these three cultures. By late Middle Woodland times, interaction beyond the local level decreased significantly.

As in the preceding period, ceramics in southeast Mississippi suggest influences from the Lower Mississippi Valley, Mobile Bay area, and west-central Alabama-northeast Mississippi. Both grog tempered and sand tempered ceramics are present in Middle Woodland site collections. The most common decorated types are those with wide-lined curvilinear designs, which are classified as Marksville Incised when grog tempered or Basin Bayou Incised when sand tempered. Grog tempered Marksville decorated types found in the area include Marksville Stamped and Churupa Punctated. Other Porter sand tempered decorated types include Alligator Bayou Stamped, Santa Rosa Punctated and Santa Rosa Stamped (Wimberly 1960). Marksville types commonly occur in Porter assemblages (Campbell et al. 1988; Wimberly 1960) and would seem to represent a continuum of east-west interaction in the Pine Hills and along the Gulf Coast. A possibly local variant resulting from this interaction is Mossy Ridge Zone Incised, defined by Fields (2008), based on her excavations in Greene County. Fields has documented Mossy Ridge elsewhere in the Pine Hills as well as on the Gulf Coast and the Lower Tombigbee-Mobile River basin.

Sand tempered Baldwin Plain, Saltillo Fabric Impressed and Furr’s Cordmarked are considered to be Miller II Middle Woodland types, but are also found in southeastern Mississippi (Keith 1997; Keith 1998:153; Jackson et al. 2002). Another Middle Woodland Miller ceramic series, bone tempered Turkey Paw Plain and Turkey Paw Cordmarked (Jenkins and Krause 1986:66; also Atkinson, Phillips and Walling 1980:127-129; Rafferty 1986:47), first identified at 22PR533 in Pearl River County (Brown et al. 1996) and 22JO699 in Jones County (Jackson Reams and Wright 1999), is apparently a consistent minority in Pine Hills Middle Woodland sites as well. Survey data from the Pine Hills suggests that the local population may have peaked during the Middle Woodland period.

The Late Woodland period encompasses the time span from roughly A.D. 500 to 1200. During the early part of the period, southeastern Mississippi appear to abandon sand tempering in favor of grog, and abandon broad curvilinear decoration in favor of cordmarking. Exactly when sand tempering drops out of the local ceramic technology is not understood; in the Tombigbee valley, the Late Woodland Miller III period is
considered to begin when grog use exceeds sand as temper (Jenkins and Krause 1986). The prevalence of cordmarked pottery in the Pine Hills suggests the area is part of a broad horizon of cordmarked ceramics encompassed by what is termed the “Baytown variant” which stretches from the Lower Mississippi Valley eastward into west central and northwestern Alabama (Jenkins 1981:25; Jenkins and Krause 1986). In coastal counties and sometimes further north, Florida Gulf Coastal Weeden Island ceramics are sometimes included in Late Woodland assemblages, suggesting contacts with populations to the east.

In southeast Mississippi, grog tempered plain and cordmarked wares are typical for the first half of the Late Woodland period, though use of sand tempered wares may persist (Jackson, Reams and Wright 1999). Late Woodland ceramic wares are technically differentiated from those of the Middle Woodland, although many sites have both Middle and Late Woodland components, suggesting the same continuum of occupation found east of the state line. Among the most common local ceramic varieties is Mulberry Creek Cordmarked, var. Tallahala (Atkinson and Blakeman 1975; Atkinson and Elliott 1979). In southeastern Mississippi, it is often associated with Collins points, which appear to be the earliest true arrow point in the area and is taken by some archaeologists to indicate the local introduction of the bow (Blitz 1988; McGahey 2000). Keith (1998) has suggested that the Middle-Late Woodland components at the Sandhill site (22WA676) reflect decreased mobility and a shift to greater reliance on logistically organized procurement. In this interpretation, the Sandhill site represents a residential base camp. Dunn (1999) has proposed a similar interpretation of the Woodland settlement system that included the Swamp Child site (22FO666).

By the latter half of the Late Woodland period, some parts of the southeast, notably the Lower Mississippi Valley, see the appearance of large ceremonial centers, marked by truncated pyramidal mounds organized around central plazas. Increased apparent social and political inequality replaced prior more egalitarian social orders. These changes are harbingers for the transformation of Native American societies in the Southeast that is represented by the subsequent Mississippian culture. Late Woodland mounds were constructed at several sites on the Pearl River to the west, but none have been identified in the Pascagoula River basin.

For southeast Mississippi, the latter half of the Late Woodland period is presently somewhat enigmatic. Wares and decorated types thought to represent this period are equivalent to Coles Creek varieties found in the Pearl River Valley (Mann 1988) and Lower Mississippi Valley (e.g., Phillips 1970). Types identified included Coles Creek Incised, Mazique Incised and L’eau Noire Incised (Jackson et al. 2002). However, the number of sites producing these materials is drastically lower than the number of early Late Woodland sites (Jackson, et al 2002). One possible explanation is that Cordmarking persisted longer in the area than to the west (Morgan 1992:262), a hypothesis supported by the occasional cordmarked sherd tempered by a combination of shell and grog. Alternatively, there may have been a shift in population to larger river valleys.
MISSISSIPPIAN STAGE

In the second millennium A.D. a shift to intensive maize agriculture, appearance of a powerful politically active and religiously sanctioned elite, and development of towns around significant ceremonial and political centers are all changes in the political, social, and economic landscape that characterize the Mississippian Stage. In the mid-south these changes occur mainly along major river valleys after about 1200. Populations appear concentrated on fertile floodplains of major river valleys, presumably to accommodate increasing demands of agricultural production. Interriverine areas served as hunting grounds or were left to persisting Woodland populations.

A number of large centers appeared, which served as the chiefly residences and political capitol of sometimes quite expansive polities. Those most likely to have influenced populations in the area under consideration include Bottle Creek in the Mobile River Delta (Brown and Fuller 1993), the Pevey site on the Pearl River in Jefferson Davis County, and other smaller centers on the Mississippi Gulf Coast (Blitz and Mann 2000) and lower reaches of the Pascagoula River. Further afield, ephemeral influences from prominent chiefly centers such as Moundville on the Black Warrior River (Knight and Steponaitis 1998) could also have affected local populations.

Mississippian pottery throughout much of the mid-south shares the use of shell as a tempering agent. Archaeological evidence also demonstrates intensified trade, but of a different sort. It now articulated the ruling elites, who used their surplus resources to produce craft goods in order to exchange for non-local prestige items that served as symbols of their legitimate claim to political power and higher social and economic position (Barker and Pauketat 1992).

While significant population concentrations are well documented along major river valleys, Mississippian occupation of the Leaf River and Chickasawhay drainages and adjacent uplands appears to have been limited to small farmsteads or temporary camps. No large Mississippian sites or sites with mounds have been reported. Campbell et al. (1988) report a dramatic decrease in site density after Miller III. Sites appear to be transitory or special purpose camps, with single or only a small number of vessels represented in shell tempered samples. Sites in the Pine Hills are all in close proximity to “fairly large streams with wide terraces” (Campbell et al. 1988:10-62). These could reflect agricultural use of the broad bottoms or else simply the use of larger drainages as transportation corridors.

The Burkett’s Creek (22FO748) (Jackson 1995) and the Sims site (22FO582) (Jackson 2001) have Mississippian components. Both are located on terraces adjacent to the Leaf River near Hattiesburg. A Mississippian component has also been identified at Swamp Child (22FO666) on Black Creek and more recently at the Gopher Nation site both in the Desoto National Forest (Reams personal communication, 2006). A site file-based study of Mississippian component in the area (Jackson 2001) found that along the Leaf River known Mississippian sites are identified based on ceramics, but that in the uplands more often than not component identification is based on diagnostic projectile
points. This dichotomy suggests that residential sites were limited to floodplains or adjacent terraces of the major drainages, while upland camps or stations served mainly for hunting.

Since no Mississippian components have been excavated, nothing can be said about the occupation or activities in the local area during the period. However, it is likely that either local populations were part of polities with centers elsewhere (on the Pascagoula, for instance) or else local residents persisted in a basically Woodland lifestyle free from the direct domination of Mississippian chiefs. There are what appear to be local Mississippi period ceramics as well as nonlocal varieties. An important as yet unanswered research question is whether the Pine Hills region supported a significant local population or else served mainly as an extractive territory that was visited by task groups or seasonal transients from the coast or elsewhere.

PROTOHISTORIC/HISTORIC PERIOD

The historic aboriginal occupants of the Pine Hills are not well documented ethnohistorically or archaeologically, compared with lands occupied by the Mobile, Biloxi, or Natchez, which saw the earliest colonization by Europeans. It is likely that Indian groups related to the Historic Choctaw lived in the Pine Hills at the time of contact. Extensive historic Choctaw occupation is documented archaeologically just to the north of the Pine Hills (e.g., Chambers and Ford 1941; Penman 1980; Tesar 1974) and to the northeast near the Tombigbee (e.g. Coblentz 1979). A number of Native American groups inhabited the coast, including the Biloxi, and Pascagoula on the Mississippi Gulf Coast, the Mobile, Naniaba and Tohome on the Mobile River and Mobile Bay, and the Pensacola further east.

RESEARCH ISSUES

Most cultural resources excavation is related to National Register eligibility. For most prehistoric sites eligibility rests on their potential for significantly contributing to knowledge about local and regional prehistory (Criterion D). It is therefore fruitful to outline research issues that would serve as a possible yardstick for site evaluation. For the Pine Hills, where a basic prehistoric cultural historical framework is only now emerging after a decade of sporadic but intensified investigations, a range of issues remain to be better documented. Among the most pressing tasks of archaeologists working in the area are refining local typologies and chronology, understanding adaptation, and documenting how populations that lived at different times articulated with surrounding societies all remain important issues. Identification of lithic and ceramic types continues to rely on those defined for other regions. In some cases this is entirely appropriate, but in others, local types associated with chronometric determinations would provide a significantly better basis for chronology building. Hafted biface (projectile point/knives) found in the region include types well established elsewhere, but there remains an assortment of biface forms that lack adequate locale characterization. Contemporaneity of types established outside the area with examples found locally continues to be assumed rather
than demonstrated. For ceramic-producing periods, research has demonstrated external influences that shifted geographically over time, rendering locally specific assemblages for any period. Radiocarbon or other dating of ceramic types is still woefully inadequate.

For any period, there is much still to be learned about landscape use and regional settlement patterns. Our understanding of changes in settlement and technological organization is still very coarse-grained (Archaic versus Woodland, for instance). Past research suggests gradually decreasing territory sizes and reduced residential mobility, but for any particular period it is not yet possible to speak of territory size, frequency of movement, or seasonally changing economic foci. Site functional variability (permanent or semi-permanent settlement, hunting camp, special purpose camp, etc) can only very generally be inferred. Expectable seasonal differences in site location (upland versus lowland, for instance) related to subsistence objectives is poorly documented for any time period. Fission and fusion of regional population as social groups aggregate in or disperse from residential sites remains can only be assumed from analogous data elsewhere or ethnographically based models. Resident population size, and variability in the economic focus associated with different site classes remain to be elucidated. The technology of adaptations, including not only weaponry but also facilities used to process and store foods remains to be adequately documented, although in the absence of well preserved faunal and botanical evidence, offer the most potential for further our understanding of prehistoric adaptations.

A potentially fruitful approach to understanding both site function but also its role in the regional settlement patterns is to examine how specific lithic resources were used during different time periods in light of possible changes in access. Accessibility to particular lithic materials is affected by the geographic proximity of a particular site to that material’s source areas, as well as how settlement or logistical movement may articulate a group with that source area generally. Scale of mobility as well as the geographic limits of the settlement systems (e.g., territorial boundaries) likely changed over time. Increasing regional population may have reduced mobility and restricted groups’ foraging territories. In the study area there is an abundance of local gravel cherts, so that we may assume that local tool-making efforts took advantage of this material. But during periods of high mobility acquisition and use of other materials can also be assumed, occasionally persisting as part of the tool kit until returning to this locality. How technology was organized to make use of potentially change lithic resources over the span of group of migration is liable to change relative to territory size, foraging direction, and the frequency of residential moves. If as assumed, territories became more circumscribed over time as the region’s population grew, more exclusive use of local cherts can be predicted. Did site location favor local stone resources, and if not do the technological characteristics of stone tool and production/maintenance waste vary relative to distance to chert sources? Do, for instance, we find different contributions of curated versus expedient technologies through time and for any time period variation among sites?

Another research issue directly related to the present project is the identification of the range and function of features manifested in prehistoric sites. Increasingly the
presence of several kinds of features, commonly manifested as concentrations of sandstone or pieces of baked clay, are being recognized in moderate to large scale excavations. These are assumed to represent one or more classes of cooking facilities. Other kinds of features that might exist in Pine Hills archaeological sites include basin and pit facilities, stone thermal processing areas, refuse dumps, and post molds. Documentation of feature types and a better understanding of the potential differences as they relate to different forms of cooking, as well as their associated artifact assemblages should lead to a better understanding of site variability, and possibly also issues of seasonality. As anchors for human activities, fires, hearths and earth ovens may be associated with particular distributions of other classes of artifacts, reflecting the organization of activities of households. When this information can be coupled with that of structure locations (evidenced by postmold patterns or even voids in artifact distributions) household and community organization can be inferred.
CHAPTER 3

METHODOLOGY

H. Edwin Jackson

FIELD METHODOLOGY

In preparation for the remote sensing, both sites had to be sufficiently cleared of fallen timber, brush and trees to permit close interval measurements within a set grid. This was accomplished in the first two weekends of the project. Once clear, a datum was established and a grid was laid out using a Leica T-307 total station. The datum point was designated N100E100, with an assigned arbitrary elevation of 100 m. Shovel tests were then excavated to ensure that the cleared areas did contain cultural materials.

Following the remote sensing (described in Chapter 4), the interpreted results were used to set initial excavation unit locations. One both sites, several of these initial units were expanded by adjacent units in order to establish the margins of exposed features. Units were excavated in arbitrary 10 cm levels. Artifacts recovered from a 10 cm level were treated as a lot and assigned a catalog number in the field. Catalog numbers were also assigned to piece plots, samples and material recovered from features. All matrix was screened through .3 cm (.125 in) mesh hardware cloth. Exposed profiles (at least one unit wall) were recorded and photographed. Sediment colors were recorded using Munsell Color Charts, and sediment texture was estimated using basic field determinations.

As would be expected, features were given primary attention in the excavation. Each feature was assigned a number, mapped and photographed. Most cultural features were comprised of some combination of sandstone and clay. Measured distribution maps were drawn in the field. Large features and those with multiple layers of artifacts generated multiple maps of artifact or baked clay distributions. A horizontal layer was exposed and the distribution of materials was recorded. The layer was removed and the underlying layer was exposed and the process was repeated. Each layer was assigned a unique catalog number, so that they could be compared in the laboratory. In some cases, one half of the feature was removed, exposing its cross-section, which was mapped before removing the remaining half.

LABORATORY METHODS

Artifacts were returned to the Prehistoric Archaeology Laboratory at the University of Southern Mississippi, where they were washed, sorted, and inventoried according to broad artifact categories. Artifacts other than debitage and baked clay were labeled with site and catalog numbers. A small number of larger flakes in each debitage lot were
labeled. Once sorted, each artifact category was analyzed. Analysis was performed by Ed Jackson.

CERAMICS

Ceramics provide a relatively sensitive temporal marker for the last 2000 years of prehistory in the region, as well as provide data regarding the activities at the site that incorporated used of ceramic containers such as food preparation, cooking and storage. For each sherd the following data were collected: temper, decoration, vessel portion, sherd thickness, and culture-historical type.

*Temper*

Temper is an aplastic material that is added to clay to reduce shrinkage during drying and firing. What is used for tempering ceramics varies over time. Temper categories expectable in the Pine Hills included fiber, sand, grog, bone, and shell, along with occasional combinations of tempering materials.

*Exterior Decoration*

Techniques and designs used to decorate pottery changed over time, and some specific combinations of technique and design can be associated with relatively short spans of time. Decoration also suggests the geographic and cultural realms of interaction. Decorative styles, in combination with ware characteristics provide a basis for defining ceramic types that were produced during specific time spans in specific geographic areas. To recognize the presence of types, it is often necessary to have a minimal sherd size; small sherds may offer evidence of technique (i.e., incision) but not design. In the Pine Hills, common decorative techniques include cord marking (marks made by a cord-wrapped paddle), incision, stamping, and punctuation. Not all pottery was decorated or decorated only within a specific area of the vessel, the rim for instance, so that a great majority of ceramic sherds are classified as plain.

*Vessel Portion*

Rim sherds were differentiated from body and base sherds. For the latter, if it was possible to distinguish base sherds they were noted, though it is not always possible to discern whether a somewhat thicker sherd is in fact a base sherd or else simply a body sherd from a larger and generally thicker-walled vessel. For recognizable base sherds the form of the base was also recorded.

*Sherd Thickness*

A digital caliper was used to measure sherd thickness, except for those specimens that lacked exterior surfaces because of weathering or the way it was broken. These were included in counts, but not in calculating average sherd thickness.
Type

Typologies created for the Lower Mississippi Valley (Phillips 1970), the Gulf Coast (Blitz and Mann 2000), Southwest Alabama (Wimberly 1960), and the Tombigbee River valley (Jenkins 1981) were consulted to identify type, as well as local discussions of ceramic cultural and chronological distributions (Jackson et al. 2002, Fields 2005). Local varieties of broadly distributed types have rarely been defined for the Pine Hills, although the need exists.

LITHICS

Stone artifacts generally included ground and/or polished stone specimens and flaked stone artifacts. Flaked stone technologies are abundantly represented in sites in the Pine Hills, with artifacts derived from the production and use of flaked stone tools being the most commonly occurring artifacts on most sites.

Flaked stone artifacts can be divided into two broad categories. Tools includes both formal tools defined by specific morphological and sometimes inferred functional attributes as well as tools with minimal expenditures of production effort to create a serviceable instrument for the task at hand. Production byproducts include artifacts created, broken, or discarded in the course of flake tool manufacture, and include cores, debitage, and artifacts—most often bifacially flaked cores—that represent unfinished tools discarded at some point along the production trajectory. Other waste material includes flakes, blocky fragments, and irregular shatter.

Lithic analysis consisted of sorting flaked stone into the appropriate technofunctional category:

Projectile Point/ Knife

Bifacially flaked artifacts with acutely angled margins where the faces meet, modification at the proximal end to permit attachment to a handle or shaft (“hafting” in archaeological parlance) and an acute pointed tip at the distal end, are classified as projectile point/knives PP/Ks. In the absence of microscopic wear analysis or diagnostic breakage it is often not possible to known how these artifacts were used, though we are confident they sometime tipped projectiles (darts, spears, arrows) and were sometimes used as cutting tools (Ahler 1971). They often served double duty. PP/Ks are distinguished as types based on size, hafting configuration, flaking details, and inferred chronological association. Whenever possible, PP/K type was assigned to specimens. Typological assignments, which often provide chronological information, followed McGahey (2000), Cambron and Hulse (1975), and local research. Metric data, including length, width, thickness, and blade length, were recorded as specimen completeness allowed, as well as information on material type, and flaking attributes.
Other Flaked Tools

A variety of morphologically differentiated flaked stone tools made on flakes or cores or even from recycled bifaces. These include cutting, scraping, and drilling tools, these uses inferred from attributes such as edge angle, flaking pattern and shape. Tools other than bifaces include both formal categories (“scraper”, “drill”, “adze”) that may though may not reflect their actual use, as well as more expedient modified edges on otherwise unshaped flakes. Broadly these may be distinguished according to whether they are unifacially or bifacially retouched. In addition, flakes with no further modification often exhibit edge damage resulting from use. Utilized flakes were noted as part of the debitage analysis.

Unfinished Bifaces

The apparently important role of formal bifaces in the prehistoric flaked tool technology is manifest in often significant representation of unfinished bifaces with various degrees of flaking before they were ultimately abandoned or broken. How many and what segments of the continuum of production steps offers clues as to the function of a prehistoric settlement and the interplay of site activities, off site objectives, and access to raw material. Bifaces were classified using a modified version of a trajectory scheme laid out by Johnson (1989) (Figure 3-1). In Johnson’s original scheme three categories of unfinished bifaces were defined—Blank, Preform I, and Preform II. Blanks exhibit bifacial flaking that only incompletely establishes the later margin needed to further thin a biface. A Preform I exhibits a completed bifacially flaked margin but still retains cortex on one or both faces of the artifacts. A Preform II has had all cortex removed. Finished bifaces (PP/Ks) are distinguished by having sufficient secondary marginal flaking to straighten the edges of the biface.

[Diagram of biface classification]

Figure 3-1. Johnson’s (1989) scheme for unfinished biface classification.
Johnson’s model was created for use with quarried raw material. In south Mississippi, where often less than ideally sized cobbles are used as raw material, the criteria of complete cortex removal to classify a biface as a Preform II is too restrictive and greatly underestimates the representation of this category. This assertion is based on the high percentage of finished, typable PP/Ks that retain cortex on the base of the stem, or on one or even both faces. Because material is small, cobbles with flat cross sections were used to reduce the amount of biface thinning (and overall size reducing) flaking necessary.

To accommodate this, Preform II specimens had to have all cortex removed from the margins of the biface and that the boundary of the remaining cortex and biface thinning flake scars was flush. The modified biface trajectory model is schematically presented in Figure 3-2.

![Figure 3-2. Modified unfinished biface classification scheme.](image-url)

**Cores**

Cores are nodules of raw material from which flakes have been removed, with the implication that it was the flakes that were the intended product, and the core is simply a byproduct. In some cases, the intention may have been to shape the core into a tool (such as bifaces discussed above, which are after all, simply cores with specific attributes), but that intent is not recognizable, perhaps because it was abandoned too soon.
to establish a bifacial edge. In other cases it is clear that the pieces removed was the goal of core flaking. Amorphous cores exhibit random flaking from on or more striking platforms. Blade cores have specific shape and platform configurations to permit the production of multiple long, parallel edged flakes, or “blades”. Successive blades are removed from a single striking platform using prior scars to guide the applied force in a way that will produce the intended shape. These may have single or multiple platforms as well. Occasionally, there is evidence that a core was placed on an anvil to be reduced in what is referred to as bipolar flaking.

Tested Cobbles

Cobbles with 1-3 removals were categorized as tested cobbles rather than cores. As the name suggested they appear to have been flaked to evaluated the quality of chert hidden beneath cortex. If testing indicated good quality material, then perhaps they were cached, but if bad likely simply discarded.

Debitage

Debitage refers to the flakes and other byproducts of tool production. Composition of debitage assemblages as well as characteristics of the different constituents provide clues as to manufacturing tasks, tool maintenance, raw material use strategies, and activity area or site function. Since debitage is simply waste byproducts, they are not likely to have been transported far from their origin. Thus debitage may offer insights about site activities that may not be reflected by the recovered tool assemblage (Andrefsky 1998; Schott 1999).

Time and budget constraints precluded an attribute analysis such as that outlined by Bradbury and Carr (1995) and Magne (1985) and used previously for analyzing excavated debitage from sites on Camp Shelby. Instead, debitage from 22FO1294 and 22FO11301 was analyzed in using a modified form of the “mass analysis” method espoused by Ahler (1989) to characterize the entire assemblage. Material was first run through a series of graduated screens to sort by size, and then separated by material type and whether the specimen was a whole or broken flake or a piece of irregular debris (blocky fragments or shatter). Flakes thus sorted were then divided into those exhibiting cortex on the dorsal surface and those lacking cortex. Each of these final groups was counted and weighed. Specimens were also examined for retouch or utilization using low power magnification, most often a magnifying glass but also a low powered binocular microscope. Finally the number of characteristic biface thinning flakes was recorded. Data were entered into an Excel file for manipulation. Although this approach does not have the utility of a full attribute analysis for looking at multiple lines evidence, it does allow the collections to be compared with other site assemblages across a number of previously demonstrated characteristics. These include size grade distribution, the proportions of flakes by size grade exhibiting cortex, the proportion of irregular debris, and the proportion of biface thinning flakes. Each of the dimensions provides insight into the range and relative importance of different flintknapping activities.
CHAPTER 4

GEOPHYSICAL INVESTIGATION
OF 22FO1294 AND 22FO13011
Bryan Haley

INTRODUCTION

The University of Mississippi Center for Archaeological Research conducted geophysical investigations at two sites (22FO1294 and 22FO1301) at Camp Shelby Joint Forces Training Center. The work was performed for the University Of Southern Mississippi Department Of Anthropology in conjunction with the Camp Shelby Environmental Directorate. The purpose of the survey was to identify archaeological features for further investigation.

METHODS

MAGNETIC GRADIENT

Magnetometers are passive instruments that measure the magnetic field strength at a specific location on the surface of the Earth. The Earth’s magnetic field varies depending on location relative to the Earth’s equator and can be visualized as a large bar magnet that is tilted 11 degrees from the axis of rotation (Heimmer and Devore 1995:12). Over a small area and in homogeneous soils, the magnetic field is expected to be uniform (Weymouth 1986:341). A subsurface target can be detected with magnetic survey as a deviation from this background field reading. The resultant anomaly often has a dipolar form aligned with the dip and direction of the Earth’s field (Figure 4-1). The most common unit of measure is the nanoTesla (nT).

The magnetic signal of a target is composed of two parameters: induced and remnant magnetism (Reynolds 1997:122). The magnetometers measure the remnant magnetism of a target, which is permanent and may be caused by the presence of highly magnetic rock compounds or thermal alterations to soils which have high iron content (Heimmer and Devore 1995:12). Magnetization caused by thermal alteration is called thermoremanence and it occurs at maximum expression at temperatures above about 600 degrees Celsius, but there is some effect at any elevated temperature (Aitken 1964:19). Electrons,

1 In this chapter the report of geophysical investigations provided by Bryan Haley prior to excavation is reproduced with only minor editing.

Remote Sensing Effectiveness in the Pine Hills 40
demagnetized when temperatures are elevated, become aligned to the Earth’s field as the temperature lowers (Clark 1996:64-65).

![Diagram of magnetic anomaly produced by a kiln](image)

Figure 4-1. The magnetic anomaly produced by a kiln is aligned to the dip and direction of the Earth’s field (from Clark 1996).

Induced magnetism is only visible in the presence of magnetizing field. However, the Earth serves as a constant magnetizing agent and, therefore, it can be sensed by a magnetometer. The induced magnetism is generally referred to as magnetic susceptibility. Magnetic susceptibility is greater in the topsoil and soils that are organically rich, but often produces relatively subtle anomalies (Clark 1996:65-66). Therefore, excavations that rearrange the topsoil are sometimes evident in magnetic surveys, but these are rather weak in strength. The Geonics EM38B can measure the induced magnetism of the ground.

Magnetic anomalies produced by archaeological targets are often much weaker than signals produced by other sources, usually between 1 nT and 100 nT (Aitken 1961:2). However, anomalies produced by historic period targets are usually much greater than this range. Archaeological objects that may produce magnetic anomalies include fireplaces, furnaces, burnt clay floors, hearths, kilns, daub, bricks, and walls composed of magnetically anomalous rocks such as basalt (Aitken 1964:3; Hasek 1999:7).

Another type of targets visible magnetically is ferrous, or iron containing materials (Aitken 1964:35). Archaeological targets such as historic nails can sometimes be mapped using magnetometers. However, more recent ferrous objects, such as power lines, cars, buried pipes, and surface trash, can easily obscure archaeological targets (Heimmer and De Vore 1995:12).
A commonly used type of magnetometer is the fluxgate. These instruments are composed of two parallel cores made of materials with strong magnetic properties, primary coils wound in opposing directions, and opposing secondary coils (Reynolds 1997:142). The magnetic field is measured by determining the difference between the primary and secondary coils (Reynolds 1997:142). Some advantages to the use of fluxgate instruments are their relative insensitivity to steep magnetic gradients and their speed of acquisition is better (Reynolds 1997:142). Fluxgate instruments have become the workhorse for archaeological geophysical survey in Britain and the United States (Clark 1996:68).

The magnetic gradiometer was developed in the 1990s and uses two sensor heads. The primary advantage of a gradiometer system is that no correction for diurnal drift is necessary (Reynolds 1997:148, Bevan 1998:19). In addition, they are much less affected by nearby objects with steep magnetic gradients, such as large masses of iron (Bevan 1998:19). Also, gradiometers tend to emphasize shallow anomalies, a benefit for archaeological survey. One disadvantage is that the accuracy is dependent on a consistent orientation of the sensors (Bevan 1998:19, Hasek 1999:8).

Interpretation of magnetic imagery begins by identifying anomalies, which may have strong high and low amplitude values (Bevan 1998:23). Next, metal objects can be identified from the shape and amplitude. Anomalies with strong, narrowly spaced dipoles or strong monopoles are usually produced by ferrous metal objects. If targets are relatively large and the amplitude is not extreme, the shape may be approximated in the magnetic imagery (Bevan 1998:26). For example, the shape and location of pre-European houses can often be accurately ascertained (Figure 4-2).

Little information about the depth of a target is obtained with magnetic survey. In some cases, the half-width rule can be used to estimate target depth. The half-width rule depends on the amplitude drop off for readings over a target and assumes a simple and regular target shape (Bevan 1998:25). However, except for buried iron targets, this technique is often not useful for archaeological targets. There is, however, a practical limit to the depth that can be sensed with magnetic instruments because the signal falls with $1/D^3$ for a dipolar target or $1/D^2$ for a monopolar target (Breinner 1973:20).

The University of Mississippi Center for Archaeological Research operates a model FM-36 fluxgate gradiometer manufactured by Geoscan Research (Figure 4-3). The FM-36 is a British instrument designed specifically for use in archaeological applications. Readings are typically acquired automatically with a metronome controlled sample trigger every .25 meters along transects spaced .5 m or 1 meter apart. The instrument contains a memory of 16,000 readings that is downloaded to a computer.
Figure 4-2. The magnetic gradient image of a Mississippian house at the Hollywood site. With some large features such as this, an accurate shape of the target may be apparent. From Johnson et al. 2000.

Figure 4-3. The Geoscan FM-36 Fluxgate Gradiometer in use at 22FO1294.
for processing, which is performed primarily with the Geoscan Geoplot 3.0 software.

ELECTROMAGNETIC INDUCTION

Like resistivity instruments, electromagnetic induction instruments measure how readily electrical current flows through the soil; conductivity is the reciprocal of resistivity. However, the method that is used to measure conductivity is much different. Electromagnetic instruments use a transmitter and receiver that generate and read the response of an electromagnetic field which is induced into the soil without actual contact (Heimmer and De Vore 1995:34). The response in a material is proportional to the electrical conductivity. Readings are usually measured in milliSiemens (mS), a unit that can be converted and directly compared to resistivity unit; 100 Ohm-meters is equivalent to .01 mS (Bevan 1998:29).

The conductivity distribution is closely related to the amount of moisture contained in the subsurface material (Weymouth 1986:319, Clark 1996:27). The prevalence of moisture, which can conduct electrical current in a material, is related to grain size for soil and porosity for rocks. Therefore, clays will have high conductivity, sands will have low conductivity, and most rocks will have very low conductivity. Salinity increases electrical conductivity.

Electromagnetic instruments operate by passing an AC current through a coil (Bevan 1998:30; Reynolds 1997:564). The induced electromagnetic field penetrates the ground and produces eddy currents in conducting subsurface bodies (Reynolds 1997:565). A secondary field is generated by the eddy currents that is then read by the receiver coil (Figure 4-4). Phasing occurs with the ground field and the primary field, which travels through the air. The conductivity measurement is derived from the out of phase, or quadrature, signal (Reynolds 1997:566).

In a way that is similar to resistivity instruments, depth is related to the separation of the sender and receiver. The most common setup includes a coil separation of 1 meter which enables a maximum sensitivity at about .4 meters and some sensitivity to about 1.5 meters (Clark 1996:34). Depth may also be related to the frequency of the transmitter and some multifrequency instruments have been produced with this in mind (Geophysical Survey Systems 1998). However, the utility of these instruments have not been proven at shallow depths (McNeill 1996).

Depth can be controlled to some degree by using the horizontal or the vertical dipole mode. Vertical dipole is the standard mode, allowing the 1.5 meter maximum depth. The instrument is carried on its side, for the horizontal dipole mode. Shallower depths are recorded in horizontal mode, with a maximum depth of about .75 meters, and surface disturbances have a greater effect (Dalan 1995:22; Bevan 1998:40).

One advantage of electromagnetic survey over resistivity survey is that there is no need to make contact with the ground, which increases survey speed (Weymouth 1986:327; Bevan 1998:29). Moreover, the equipment is often lighter and less cumbersome, especially when compared to resistivity setups that require remote cables and electrodes.
The types of archaeological features that may be detectable with conductivity survey are similar to resistivity. These include ditches, buried walls, foundations, tombs, voids, compacted floors, humus zones, daub concentrations, mound stratigraphy, and shell deposits (Aitken 1961:71, Weymouth 1986:321, Geoscan Research 1996b:6-8, Thompson et al 2002).

Interference sources can, however, be much different with electromagnetic instruments than electrical resistance. Because they involve an induced magnetic field, they can detect ferrous and nonferrous metallic objects. Therefore, they can be adversely affected by metal debris, nearby cars, power lines, and pipes. Also, spherics, or lightening interference, can influence readings (Bevan 1998:31). In addition, electromagnetic survey works in a more limited range of soil conditions than resistivity (Weymouth 1986:327).

Another benefit to electromagnetic survey is that another property, magnetic susceptibility, may be measured with the instruments (Dalan 1995:12). Magnetic susceptibility is the induced portion of the magnetic field and is the in-phase component of the electromagnetic signal. On Native American sites, the technique can be particularly helpful since pit features exhibit elevated levels of susceptibility (Figure 4-5). Furthermore, comparing magnetic susceptibility and magnetic gradient data can be used to refine the interpretation of anomalies on these sites (Haley and Johnson 2006, Haley and Johnson 2007).

Figure 4-4. Electromagnetic fields (from Reynolds 1997).
The largest maker of electromagnetic instruments for archaeological prospecting is Geonics, which is based in Ontario, Canada. Unlike the Geoscan magnetic and resistivity instruments, Geonics electromagnetic instruments are wide range of applications. The two Geonics instruments most commonly used in archaeology are the EM38 and the EM31. The University of Mississippi owns an EM38 variation called the EM38B, which simultaneously measures the quadrature and in phase components (Figure 4-6). The instrument has a 1 meter coil separation and is suitable for most archaeological applications.

RESULTS

22FO1294

The results of the magnetic gradient survey from 22FO1294 are shown in Figure 4-7. Several high amplitude anomalies are visible in the data. A surface plot (Figure 4-8) better reveals the strength and shape of these anomalies. Expect for the two strongest of these, the anomalies all exhibit signatures consistent with Native American features. The strongest two anomalies are dipolar and not oriented to magnetic north, which suggests they are fired features such as brick or daub. It is impossible to say for certain if these are modern or archaeological based on these signatures. Several of the anomalies that appear in the magnetic gradient also appear in the induced component (magnetic susceptibility) produced by electromagnetic induction (Figure 4-9). The quadrature component (conductivity) reveals little except for one strong low anomaly (Figure 4-10).

![Figure 4-5. Magnetic susceptibility showing Chickasaw pits.](image-url)
Two areas were surveyed at 22FO1301 on the same grid system. Overall, the data from the magnetic gradient survey of 22FO1301 contains fewer significant anomalies than 22FO1294 and all of these are located in the eastern portion of the survey area. Only two peaks are visible in the surface map presentation of the data (Figures 4-11, 4-12). One of these also appears in the magnetic susceptibility data (Figure 4-13). The conductivity does not contain any meaningful anomalies (Figure 4-14). The western side of the survey area lacks any significant variation in any of the data sets.
Figure 4-7. Magnetic gradient results from 22 FO1294.

Figure 4-8. 3D representation of magnetic gradient results from 22 FO1294.
Figure 4-9. Magnetic susceptibility results from 22 FO1294.
Figure 10. Conductivity results from 22 FO1294.

Figure 4-11. Magnetic gradient results from 22 FO1301.
Figure 4-12. 3D representation of magnetic gradient results from 22 FO1301.

Figure 4-13. Magnetic susceptibility results from 22 FO1301.
CONCLUSIONS

22FO1294

Anomalies of potential interest have been identified and labeled for Figure 4-15. Additional information about the targets is obtained by comparing their appearance in the various geophysical data sets. Anomalies B and C are characterized by moderately high magnetic gradient, random dipole orientation, and no visibility in magnetic susceptibility data, which reinforces their interpretations as being features magnetically enhanced by firing. However, Anomaly B is also visible in the conductivity as a strong low, which is usually caused by shallow metal targets. This is contradictory to the magnetic gradient signature of the anomaly since metal always has a dipole with negative facing magnetic north. It is possible that this is the result in some erroneous reading on either instrument. In contrast, anomalies A, D, E, F, G, and I exhibit moderate magnetic gradient values and magnetic susceptibility values, suggesting they are caused by organic-rich pit features. Anomaly H is rather small in size, moderately high in magnetic gradient, and not visible in the magnetic susceptibility data, which could be caused a deeper fired feature or simply a defect in the magnetic gradient data collection.
Figure 4.15. Geophysical anomalies from 22 FO1294.
Four anomalies were identified on the eastern side of 22FO1301 (Figure 4-16). Based on the gradiometer data, Anomaly A appears like B and C from FO1294, again suggesting a thermally altered feature. However, it is also partly visible in the magnetic susceptibility data. Perhaps the target is a pit containing both thermal enhancement and heavy organic content. Anomaly C exhibits the combination of moderately elevated magnetic gradient and magnetic susceptibility often found with pit features. Anomaly B is linear shaped and borders Anomaly A. It is a very subtle magnetic low, however, which is not often found on Native sites. A ditch or data collection defects could be responsible for this feature. Anomaly D is a broad magnetic high that could indicate a thermally enhanced feature, although its position on the edge of the survey prevents a complete view of the signature.
Figure 4.16. Geophysical anomalies from 22 FO1301.
CHAPTER 5

RESULTS OF FIELD INVESTIGATIONS

H. Edwin Jackson

22FO1294

Archaeological fieldwork preceding the remote sensing consisted of establishing a grid system, producing a topographic map of the site and shovel testing to ensure that the grid for remote sensing was situated over archaeological deposits (Figure 5-1). A total of 18 STPs were excavated, ranging in depth from 55 to 75 cm. below surface (b.s.). Following the remote sensing, 12 one by one meter units were excavated, based on remote sensing results (Figure 5-2).

![Figure 5-1. Topographic map of 22FO1294 and location of shovel test pits.](image-url)
UNIT DESCRIPTIONS

N99E104, N100E105. These units were excavated to encounter remote sensing anomaly D. It was excavated to a depth of 40 cm b.s. Prehistoric pottery, debitage, a preform, two unfinished bifaces, a biface fragment, sandstone fragments and baked clay were recovered. Feature 6 was encountered in N100E105. The soil profile consisted of a 10-20 cm thick pale brown (10YR6/2) sand (Stratum I), overlying mottled yellowish brown (10YR5/4) to dark brown (10YR 4/6) clayey sand to the base of the excavation (Strata II and III) Stratum III in the north wall of N99E104 is affected by Feature 6 in N100E105 (Figure 5-3).

N101E103. This unit was excavated to test an area that did not produce a “hit” by the remote sensing. It was excavated to a depth of 30 cm. Debitage, a Duval Point, a retouched flake, sandstone and baked clay were recovered. Feature 9, a sandstone and bake clay concentration was encountered in Level 3. The soil profile recorded in this unit consisted of a 5-8 cm stratum of pale brown silt loam (Stratum I), overlying a yellowish brown (10YR5/4 trending downward to 10YR5/6) stratum of sandy silt to a depth of 20 cm b.s. (Strata II, III), overlying a dark yellowish brown (10Y4/6) stratum of sandy loam to the base of the excavation (Stratum IV) (Figure 5-4).

Figure 5-2. Location of excavation units.

Remote Sensing Effectiveness in the Pine Hills
Figure 5-3. Profile, N99E104.
Figure 5-4. Profile, N101E103.
N105E98. This unit was excavated to explore remote sensing anomaly H. It was excavated to 40 cm b.s. Features 7 and 8 were recorded in this unit. A biface fragment, debirage, four pieces of petrified wood, and two tested cobbles as well as sandstone and baked clay were collected. Stratigraphy exposed by the excavation consisted of an uppermost layer of light brownish gray (10YR6/2) silty sand to a depth of 12 cm (Stratum I), overlying a stratum of very dark grayish brown (10YR3/2, moist) sandy silt to a depth of 20 cm (Stratum II), which overlies a dark yellowish brown silty sand stratum to a depth of 30 cm (Stratum III), which in turn overlies a yellowish brown (10YR5/8) sandy loam exposed only in the west end of the profile from 20-30 cm b.s. (Figure 5-5).

N105E107-N106E107-N106E108. These three units were excavated to expose remote sensing anomaly G. Each unit was excavated to a depth of 50 cm b.s. Prehistoric pottery, a projectile point, a chert bifacially flaked scraper, a pebble bifacially flaked to produce a chopping or scraping tool, a hammerstone, four unfinished bifaces, debitage, thermally fractured chert, baked clay and sandstone fragments were recovered. Features 2, 4 and 5 were recorded, although Feature 2 was ultimately determined to be non-cultural. The exposed soil profile consists of an uppermost stratum of light brownish gray (10YR6/2) silty sand from the surface to 5-7 cm b.s. (Stratum I), a pale brown (10YR6/3) silty sand to a depth of 13-15 cm b.s. (Stratum II), a stratum of light yellowish brown (10YR6/4) silty sand to a depth of 27-30 cm b.s. (Stratum III), and a stratum of yellowish brown (10YR5/8) sandy loam to the base of the excavation (Stratum IV) (Figure 5-6, 5-7).

N108E100-N109E100-N109E101. These units were placed to record remote sensing anomaly E. N108E100 and N109E101 were excavated to 30 cm b.s., while N109E100 was excavated to a depth of 40 cm b.s. One potsherd, a fragment of a possible Lost Lake point, seven unfinished bifaces, a biface fragment, a core, debitage, a piece of petrified wood, thermally fractured stone, sandstone and baked clay were recovered from this group of units. Features 1 and 3, both small concentrations of baked clay and sandstone were recorded as was a large highly organic stain that was determined to be a rotted stump. Stratigraphy exposed by the units consists of a uppermost pale brown (10YR6/3) to brown (10YR5/3) silty sand to a depth of 10-12 cm b.s. (Strata I, II), a layer of brown (10YR4/3) to dark yellowish brown (10YR4/6) sandy silt to a depth of 30-35 cm b.s. (Strata III, IV), and a stratum of yellowish brown (10YR5/6) sandy loam to the base of the excavation (Statum V) (Figure 5-8).

N112E93-N113E93. These units were excavated to record remote sensing anomaly C. N112E93 was excavated to a depth of 30 cm, while N113 was excavated only to a depth of 10 cm b.s.. At 5 cm b.s. a large burned root system was encountered (Figure 5-9), which accounts for the remote sensing reading in this spot. Two unfinished bifaces, debitage, thermally fractured stone, sandstone and fired clay were recovered. The soil profile exposed here consists of an uppermost layer of brown (10YR4/3) silty sand to a depth of 10-14 cm b.s. (Stratum I), a stratum of yellowish brown (10YR5/4) trending downward to brownish yellow (10YR6/6) sandy silt to a depth of 20-25 cm b.s. (Strata II, III), and a stratum of dark yellowish brown (10YR4/4) sandy loam to the base of the excavation (Stratum IV) (Figure 5-10).
Figure 5-5. Profile, N105E98.
Figure 5-6. N105E107-N106E107, West Profile.

Figure 5-7. N106E107-N106E108, North Profile.
Figure 5-8. N108E100-N109E100 West Profile.

Figure 5-9. Burned root and tree stump in N113E93.
Figure 5-10. N112E93, East Profile.
FEATURES

Nine features were recorded by excavation, eight of which were interpreted as being cultural in origin and one the product of a burning tree. One other burned root was located by remote sensing; it was photographed but not treated as a feature.

Feature 1. Feature 1 is a cluster of sandstone and baked clay, along with a flake and an unmodified cobble first noted at 26 cm b.s. in the northeast corner of N108E100 (Figures 5-11, 5-12). The cluster covers an area approximately 25 cm in diameter. The unit was expanded to the north but the cluster did not continue in that direction. Rather a second concentration was encountered (Feature 3) at the same depth. Feature 1 appears to be the result of a cleaning episode of Feature 3 or another nearby feature, rather than a cooking facility.

Figure 5-11. Plan view of Feature 1.
Feature 2. Feature 2 is a non-cultural concentration of baked clay surrounding charcoal that was ultimately discerned to be a burned root system (Figures 5-13, 5-14). The feature covered the west half of N105E107. Matrix with charcoal flecks extends across the eastern half of the unit. It was first noted at 36 cm b.s. and completely exposed at a depth of 44-50 cm b.s. Although the feature is composed of the same constituents as cultural ones (baked clay, charcoal), it is interpreted to have been caused by a burning stump.
Feature 3. Feature 3 is a concentration of baked clay and sandstone encountered at 26 cm b.s. in the southwest quadrant of N109E100 (Figures 5-15, 5-16). The exposed portion of the scatter is approximately 40 cm by 25 cm in extent and appears to extend westward beyond the unit wall. It was not completely exposed. As noted it may be related to Feature 1.

Feature 4. Feature 4 is a concentration of baked clay lumps in the southwest corner of N106E107, which was encountered at 23 cm b.s (Figures 5-17, 5-18). It extended westward beyond the edge of the excavation. The exposed portion of the feature measured 30 by 25 cm.

Feature 5. Feature 5 is a concentration of seven sandstone fragments in the southeast corner of N106E107 (Figures 5-18, 5-19). It was mapped at 26 cm b.s. Its relation to Feature 4 is unknown, but it is possible it represents a cleaning or unpacking episode (see discussion below and Chapter 7).
Figure 5-15. Plan view of Feature 3.

Figure 5-16. Feature 3.
Figure 5-17. Plan view of Feature 4.

Figure 5-18. Features 4 (above signboard) and 5 (below).
Feature 6 Feature 6 is a large multi-layered concentration of primarily baked clay in N100E105 (Figures 5-20 through 5-25). The shallowest layer was exposed at 12 cm b.s. Clay extended to a depth of 30 cm. It covers an area approximately 65 cm in diameter. The upper two layers of baked clay consisted of small fragments generally less than 10 cm in length. Layer 3 in contrast appeared to be in situ baked clay with a basin shaped profile. One piece of baked clay has the impression of a stick or pole suggesting part of a framework. Layer 3 was bisected, exposing a smaller final layer of fragmentary baked clay presumably at the base of the feature. A charcoal sample from the feature was submitted for radiocarbon dating. It returned a calibrated two sigma range of BC 40-AD 130, pointing to an Early Middle Woodland age for the feature (Table 5-1).

Feature 7 Feature 7 is the amorphous edge of a concentration of baked clay uncovered in the southwest corner of N105E98 (Figures 5-26, 5-27). The feature was only recognized in the exposed profile wall. The portion of the feature that was exposed by excavation was 33 by 15 cm. Baked clay was distributed from 20 to 38 cm b.s.

Feature 8 A group of three pieces of baked clay between 30 and 40 cm b.s. in the southeast corner of N105E98 was designated as Feature 8 (Figures 5-28, 5-29). They were clustered within an area 15 cm in diameter. The feature does not appear to be a cooking facility, but may be the product of a cleaning or unpacking episode. These could be associated with Feature 7.
Figure 5-20. Plan view of superimposed layers of Feature 6.

Figure 5-21. Layer 3 of Feature 6 (left) and Layer 4 exposed after cross-sectioning Layer 3 (right).
Figure 5-22. Layer 1 of Feature 6 at 12 cm b.s.

Figure 5-23. Feature 6 at 20 cm b.s., Layer 3 exposed.
Figure 5-24. Close-up of \textit{in situ} pole or stick impression in clay, Feature 6.

Figure 5-25. Cross Section of Layer 3, Feature 6.
Figure 5-26. Feature 7, profile retained in west wall of unit.

Figure 5-27. Feature 7.
Figure 5-28. Plan view of Feature 8.

Figure 5-29. Feature 8.
Feature 9. Feature 9 is a scatter of mainly sandstone fragments but also baked clay lumps is the north half of N101E103 (Figures 5-30, 5-31). The feature was distributed between 24 and 26 cm b.s. and covered an area 90 cm long and 50 cm wide. A radiocarbon sample of wood presumed to be associated with the feature rendered a calibrated age range of AD 1430-1520 and AD 1580-1630 (Table 1). This date is too recent to accept uncritically, particularly in view of the absence of any artifactual evidence that would support such a late occupation (see Chapter 6). Clearly the feature is cultural, as the sandstone had to have been transported to the site. The radiocarbon date predates historic land clearing in the area. Two possibilities thus pose themselves. Either the date and feature are related and we have evidence of an occupation that falls squarely in the Protohistoric era, which otherwise is extremely rare in the Pine Hills, or else the feature and charcoal sample are not associated, and the latter represents a later natural burning event (lightening strike or forest fire). There is at present no basis for choosing the better explanation, although the question would be one to try to evaluate in the context of future investigation of the site.

Figure 5-30. Plan view of Feature 9.
Table 5-1. Summary of Radiocarbon Dates from 22FO1294 and 22FO1301.

<table>
<thead>
<tr>
<th>Beta Analytic #</th>
<th>Provenience</th>
<th>Radiocarbon Age</th>
<th>Calibration Intercepts</th>
<th>One Sigma Range</th>
<th>Two Sigma Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>24098</td>
<td>22FO1294 Feature 6</td>
<td>1950±40 BP</td>
<td>AD 60</td>
<td>AD 10-80</td>
<td>BC 40-AD 130</td>
</tr>
<tr>
<td>24099</td>
<td>22FO1294 Feature 9</td>
<td>390±40 BP</td>
<td>AD1450</td>
<td>AD 1440-1480</td>
<td>AD 1430-1520, AD 1580-1630</td>
</tr>
<tr>
<td>240500</td>
<td>22FO1301 Feature 2</td>
<td>2080±40 BP</td>
<td>BC 60</td>
<td>BC 160-40</td>
<td>BC 190-AD 10</td>
</tr>
<tr>
<td>24501</td>
<td>22FO1301 Feature 3</td>
<td>1290±40 BP</td>
<td>AD 690</td>
<td>AD 670-770</td>
<td>AD 660-810</td>
</tr>
</tbody>
</table>

Two non-cultural features were not assigned feature numbers, but likely were responsible for the response by the remote sensing. One, in N101E93 was a broad organic stain representing a rotted tree stump (see Figure 5-31). The other was a burned root in N113E93 (Figure 5-9), encountered in the first 10 cm level.
Prior to the geophysical study was conducted a grid system was established, measurements were taken for a topographic map of the site, and 29 STPs were excavated to ensure that remote sensing would be done over archaeological deposits (Figure 5-32). The STPs ranged in depth from 35 to 60 cm b.s. Twenty four were positive.

After remote sensing was completed, 7.5 one by one meter units were excavated to explore remote–sensed anomalies, N100E106, N104E106, N105E110, and N108E104 were excavated initially, and the latter two were expanded to better document exposed features (Figure 5-33).
UNIT DESCRIPTIONS

N100E106. This unit was excavated to a depth of 40 cm b.s. to examine an area of moderate readings in this location. Debitage, thermally fractured chert, sandstone and baked clay were collected. Stratigraphy consisted of an uppermost horizon of dark brown (10YR3/3) sand to a depth of 10-16 cm (Stratum I), a large but diffuse apparent disturbance of dark yellowish brown (10YR4/4) sand with some charcoal flecking from approximately 8 to 34 cm b.s. (Stratum II), and a dark yellowish brown (10YR4/6) fine sand to the base of the excavation (Stratum III) (Figure 5-34). Stratum II may be an extension to the south of the linear anomaly B.

N104E106. This unit was excavated to a depth of 50 cm. b.s. in an attempt to bisect anomaly B. Debitage, a flaked cobble, a finished Maybon projectile point, thermally fractured stone, sandstone, and baked clay were collected. Stratigraphy consists of Stratum I, a pale brown (10YR6/3) silty sand from the surface to 15-25 cm b.s. (Stratum I), Stratum II, yellowish brown (10YR5/4) silty sand) to a depth of 35-45 cm b.s., overlying Stratum III, dark yellowish brown (10YR4/6) slightly loamy sand to the base of excavation (Figure 5-35). Anomaly B is interpreted to be a collapsed gopher tortoise burrow.

N104E110-N105E110-N105E111. N105E110 was excavated to examine anomaly C, and when a concentration of baked clay and sandstone (Feature 1) was encountered the unit was expanded by N104E110 and N105E111. The units were excavated to a depth of
The blade of a large (Late Archaic?) projectile point, three flaked cobbles, debitage, a piece of petrified wood, sandstone and baked clay were collected. The exposed profile consists of Stratum I, a brown (10YR4/4) silty sand to 10-15 cm b.s., Stratum II, yellowish brown (10YR5/4) silty sand from 15-20 cm b.s., Stratum III, yellowish brown (10YR5/8) silty sand to 30-35 cm b.s., and Stratum IV, strong brown (7.5YR5/8) slightly loamy sand to the base of excavation (Feature 5-36).

N107.5E103-N108E103-N108E104. Initially N108E104 was opened to explore geophysical anomaly A. By the third level a dark organic area (Feature 3) in the east half of the unit appeared to be the phenomenon at least in part responsible for the readings. However, also exposed was an apparently massive concentration of baked clay including a in situ mass in the western edge of the unit (Feature 2). It was decided to expand westward with N108E103, then south with N107.5E104 to expose Feature 2. N108E104 was excavated to a depth of 50 cm b.s. allowing a cross section of Feature 2 and exposure of Feature 3. N108E103 and N107.5E103 was excavated to 40 cm except in the location of Feature 2, which was cleaned to the in situ bottom layer, then mapped and left in place. Artifacts collected in these units include three unfinished bifaces, seven flaked cobbles, debitage, sandstone, and baked clay. Debitage was particularly dense in levels two and three of these units, with level 3 of N108E103 producing 239 pieces.

Stratigraphy consists of Stratum I, pale brown (10YR6/3) silty sand to 10 cm b.s., Stratum II, mottled dark yellowish brown (10YR4/4) silty sand to 10-15 cm b.s., Stratum III, yellowish brown (10YR5/8) silty sand to 25-30 cm b.s., and Stratum IV, strong brown (7.5YR5/8) loamy sand to the base of excavation (Figure 5-37). This stratigraphy is modified by the presence of Feature 3 in the west wall of N108E104 (Figure 5-38).

FEATURES

Four cultural features were recorded by excavation. One (Feature 3) is complicated by the presence of a burned tree root, but does appear that part of it is cultural (see below). A unit placed so as to transect a linear remote sensing anomaly did appear to do so at least once the walls were cleaned for profiling, but it was not considered cultural. Rather it is interpreted as a collapsed gopher tortoise burrow, and was not assigned a feature number.

Feature 4. Feature 1 (Figures 5-39 through 5-41) is a concentration of baked clay, sandstone and several cobbles covering a 1 m. diameter area. The northwest portion was first encountered in N105E110, which was subsequently expanded to the south with N104E100 and east with N105E111. Approximately three quarters of the features was uncovered and recorded. It occurred in several layers from 17 to 37 cm below surface. No evidence of a pit could be discerned, although the lowest layers tended to be smaller in diameter and within the central area of the overall concentration, suggesting there could have been a pit.
Figure 5-34. Profile N100E106.
Figure 5-35. Profile N104E106.
Figure 5-36. Profile N105E110-N105E111.

Figure 5-37. Profile N108E103-N108E104.
Figure 5-38. Profile N108E104.
Figure 5-39. Plan view of Feature 1.
Figure 5-40. Feature 1 exposed in N105E110.

Figure 5-41. Feature 1 exposed in N105E111.
Feature 2. Feature 2 (Figures 5-42 through 5-46) is a large concentration of baked clay which appear to be within a pit. It was first encountered in N108E104, which was extended west with N108E103, and this unit in turn was expanded to the south with a 1 by .5 m unit, N107.5E103. The feature is unique in that the baked clay surrounds and is in a slightly more organic and charcoal fleck-strained matrix that contrasts with surrounding non-feature sediments. The organic-stained matrix is approximately 100 cm from north to south at 35 cm, and baked clay fragments extend 25-30 cm beyond the stained earth’s boundary. Also, some of the clay in the lower portion of the feature appears to remain in situ, similar to Feature 6 at 22FO1294. There is little doubt that this is a relatively intact and in-place facility. A charcoal sample provided a calibrated two sigma radiocarbon date of BC 190-AD 10, placing the feature in late Gulf Formational.

Figure 5-42. Plan view of Feature 1.
Figure 5-43. Profile of Feature 2 in west wall of N108E104.

Figure 5-44. Feature 2 exposed in N107.5E103 and N108E103.
Figure 5-45. Feature 1 with southeast quarter removed.

Figure 5-46. Feature 1 profile, west wall of N108E103.
Feature 3. Feature 3 (Figures 5-47 through 5-49) was first encountered as an amorphous organic strained area with charcoal in the eastern third of N108E104 at 25 cm b.s. By the end of level 3 a clearly darker (10YR2/2) charcoal rich stain was recognized in the northern half of the exposed portion of the feature. The charcoal appeared modern and it was assumed that the feature was the result of a burned tree root. In the south half at 30 cm b.s. several sandstone fragments were mapped. The feature matrix was removed in 10 cm levels, and at 50 cm b.s. the burned root persisted but to its south was a second circular stain, less organic (10YR3/4 in color) within which were baked clay and sandstone fragments. At this point the southern circular stain and the northern black tree root were treated as separate units profile that bottomed out at 70 cm b.s. Matrix was screened as a unit and found to have a particularly high amount of artifacts. Feature 3a is interpreted as a cultural feature, the upper portion of which was damaged by disturbances caused by the burned root system. It almost certainly originated at a higher elevation than the point at which it was recognized. The cluster of sandstone at 30 cm b.s. could well have been part of the Feature 3a contents. The feature appears to have been a pit, the last use of which was for trash disposal. A charcoal sample from the 3a portion of the feature provided a date of AD 660-810 (calibrated, two sigma), or early in the Late Woodland period.

Figure 5-47. Feature 3, plan view at 50 cm below surface, and profile of Feature 3a.
Figure 5-48. Feature 3 (bottom of picture) at 30 cm b.s.

Figure 5-49. Feature 3 at 50 cm. Two distinct stains are visible at this depth.
Feature 4. Feature 4 was located in N104E100. It was first encountered at 20 cm b.s. and covered an area 35 by 25 cm in extent. It is not a particularly large accumulation and could represent a cleaning or clay removal episode related to Feature 1 (Figures 5-50, 5-51).

Figure 5-50. Plan view of Feature 4.

Figure 5-51. Feature 4.
REMOTE SENSING AND FEATURES IN THE PINE HILLS

A systematic assessment of the baked clay and sandstone cooking facilities is postponed until Chapter 7, which considers not only the archaeological record of the Pine Hills but also other regions as well as experimental and ethnographic information relevant to our understanding of these prehistoric technologies. Here it will suffice to distinguish apparent categories of features encountered in this project. First, is a basin or pit shaped feature lined with clay which in the course of use became baked, as represented by Feature 6 at 22FO1294 and Feature 2 at 22FO1301. In addition, to the clay lined basin, effective temperature control may have required a layer of either sandstone or clay on top of the food to conserve the heat over long periods of cooking. We believe that these cooking pits or earth ovens were important technological accommodations to plant and animal resources available in the Pine Hills and may represent a key to the successful adaptation to this region particularly after the Middle Holocene Hypsithermal. In anticipation of the discussion in Chapter 7, these clay lined pits, with or without the addition of sandstone would have required a significant investment of effort in their construction, since sandstone and even the clay may have had to be transported to the site. This investment would only bear fruit if the facility was used multiple times. If as we suspect one component was a layer of clay or sandstone above the cooking food, then we might expect there to be scatters of cover material removed to access the cooked food. Thus a second category of features is produced by “unpacking” and also cleaning episodes, during the course of earth oven us. A final category is a flat clay surface, represented by a thin layer of closely aggregated clay lumps. Intact baked clay surfaces are unlikely to be encountered regularly due to incomplete baking and post use degradation.

COMPARING REMOTE SENSING DATA TO EXCAVATION RESULTS

As noted, the primary goal of the project is to assess the value of conducting remote sensing on sites of the nature found in the Pine Hills regions for predicting subsurface archaeological features. Remote sensing data structured our limited excavations at 22FO1294 and 22FO1301, and indeed we did encounter and document a number of prehistoric features at both sites. We look here at the correspondence between remote-sensed anomalies and the excavation data.

22FO1294

At 22FO1294 remote sensing produced nine hits worthy of flagging. Six of these, A, D, E, F, G, and I were interpreted to be possible organic rich pit features. B and C were interpreted to be features created or enhanced by firing, although B might alternatively indicate metal objects too deeply buried to be picked up by metal detection. H was small and somewhat anomalous, though believed to be a possible more deeply buried fired feature. We selected A, C, D, E, G, and H for excavation.
In N101E93 placed on Anomaly A (Figure 5-53) we did indeed find Feature 9, a concentration of sandstone that appears to have been burned (all recovered sandstone seems burned). However, the remote sensing predicted an organic pit. A slightly organic stain resolved itself in Level 3 on the south side of the unit, possibly a rotted tree stump. It did not appear to be cultural. It is unclear whether this organic stain, the sandstone concentration, or some combination of the two, was responsible for the remote sensing “hit”.

Excavation of N113E93 to expose Anomaly C was terminated once it became clear that it was a burned tree root. This is an example of a natural feature mimicking an archaeological one.

Significantly better remote sensing and archaeological feature correspondence was found in N100E105 which was excavated to expose Anomaly D. Excavation revealed Feature 6, a large concentration of baked clay. Upper layers were loose tennis ball-sized and smaller fragments. Below this was what appears to be the in situ base of a clay feature. The cross-sectional profile suggests a basin-shaped bottom. The instruments likely reacted to the mass of the feature. The remote sensing reading of the feature, however, predicted an organic pit. Aside from modern charcoal in the upper 10 cm of the units (not appreciably different from elsewhere, there was relatively little organic material associated with this feature.

Anomaly E appears to identified a pair of features, 1 and 3 in N108E100. Both are small concentrations of baked clay. Unlike Feature 6, neither appears to be in situ, or else they were more ephemeral to begin with and more completely disturbed by post depositional processes. E was also predicted to be an organic rich pit feature.

Anomaly G also appears to be two separate features, 4 and 5, in N106E107 and N106E108. To the south of these was another burned tree root, in N105E107, which might account for the remote sensing readings that suggests another pit feature. Features 4 and 5 are both concentrations of baked clay, with Feature 4 the more westerly of the two appearing to be an in situ feature formed in placed.

The final anomaly we tested was H. In the unit placed over the anomaly a concentration of baked clay and sandstone, Feature 7, was found in the southwest corner of the unit, exactly where the remote sensing predicted it should be. However a second baked clay and sandstone concentration, Feature 8, was found in the southeast corner of the same unit, which did not show up on the remote sensing. Feature 7, as shown in the photo, extends south and west and is likely sufficiently large to have been picked up by the remote sensing. Unfortunately, we didn’t have time to completely excavate the features to determine how size might be a factor in recognition.
Figure 5.53. Identified anomalies and placement of excavation units at 22FO1294.
22FO1301 was less productive in terms of the number of anomalies (Figure 5-54). Only four were identified, all in the eastern portion of the site. That there were no features in the western sensed area is somewhat odd, as shovel tests were productive there and we collected a number of artifacts on the surface while we were clearing the area. Unfortunately, time did not allow any excavation in this area of the site.

Anomaly A was suggested to be a thermally altered feature, although the fact that it showed up in the magnetic susceptibility data suggested heavy organic content. Anomaly C exhibited the combination of moderately elevated magnetic gradient and magnetic susceptibility often found with pit features. Anomaly B is linear in shape and was interpreted as a ditch. Foxholes and trenches are certainly not unknown at Camp Shelby, but another possible excavator may be responsible, the federally protected gopher tortoise. D is a broad magnetic high that could indicate a thermally enhanced feature.

In N108E104, Anomaly A appears to represent Feature 3, and charcoal filled depression which quickly resolved into two distinct deposits. The strength of the signature could be a function of the close proximity of Feature 2, but it is likely that it is primarily the organic fill of especially Feature 3b that was recorded.

Anomaly B was tested even though at the outset we didn’t expect it to be a cultural feature. Although no conclusive results were forthcoming, or we aren’t exactly sure just what a filled and collapsed gopher tortoise den might actually look like when encountered in a one-meter square, we are reasonably sure that this is what the remote sensing data picked up.

Anomaly C identified another concentration of baked clay and sandstone, Feature 1. It is oval, about 60 by 40 m in extent. It is not as dense as Feature 2, and unlike Feature 2 does not appear to have been in a pit or depression. Importantly, there was no evidence of natural burning or rotted stumps in this location, suggesting that it was indeed Feature 1 that was recorded.

At D we found a burned tree that we presume caused the reading in that location. The darker more charcoal rich portion on the north side is a burned tap root. The stain on the south side, associated with fragments of sandstone appears to be a prehistoric feature, possibly a small pit. The prediction was that the feature was organically enriched, and this feature complex accounts for this part of the prediction. Also predicted is a thermal feature. This appears to be a second feature exposed in the west margin of the excavation unit, Feature 2. We excavated a unit to the west of the original unit and then a half meter extension to the south of this second unit. Exposed was a large in situ baked clay and sandstone feature, nearly a meter in diameter. It is similar to Feature 6 at 22FO1294. This feature also consisted of loose clay fragments in the upper layer of the feature overlying large chunks of clay that form a round bottomed facility. Matrix interspersed in the feature was slightly darker, presumably stained by charcoal.
Figure 5.54. Identified anomalies and placement of excavation units at 22FO1 301.
DISCUSSION

Remote sensing, any of its specialists will tell you, tends to be site-specific. The work at 22FO1294 and 22FO1301 provides an important baseline for interpretative discrimination of collected data at sites such as these. There is no simple “cookbook” for interpreting remote sensing data, and it is often the case that it is the variable relationships between gradient and magnetic susceptibility may provide the most useful information, for instance on Chickasaw sites in Lee County Mississippi, recently investigated by the University of Mississippi Center for Archaeological Research (Haley and Johnson 200). At Camp Shelby, the understanding of this relationship was put to the test on a new type of feature and in a new geomorphological setting. Although remote sensing was reasonably successful at identifying features, this may have led to some incorrect interpretations. As the remote sensing library expands, however, accuracy will improve. In sum, we are reasonably confident that the remote sensing is picking up the features most of the time—ignoring the burned trees that produce false positives. If this is not the case, then our units were randomly placed, which would suggest that the sites are fairly riddled with prehistoric features. An obvious test of this suggestion would be to place excavation units in locations where no anomalies were indicated. Unfortunately time and funds precluded this next step in the evaluation although any future work on these sites should. In spite of this, it is clear that remote sensing offers an important pre-excavation (or non-excavation) tool for assessing site characteristics that will be of value in future research and/or assessment in the Pine Hills region, which includes the Camp Shelby Joint Forces Training Center.

CONCLUSIONS

The archaeological records at 22FO1294 and 22FO1301 resemble that of other sites in the region. At the same time investigations at these sites point to the likelihood that there are important, though subtle differences that may ultimately help us to interpret site functions over time within the context of prehistoric settlement systems: feature density, feature differences, the association of particular constellations of feature types and tool and tool manufacturing assemblages, and site settings are all potentially valuable clues to the prehistoric use of the South Mississippi landscape.
22FO1294

A total of 3532 prehistoric artifacts, mainly lithic debris from stone tool manufacture, but also a small number of ceramic sherds and stone tools, were recovered during the course of the excavation. In addition, nearly 5300 g of sandstone and 8500 g of baked clay were collected from feature contexts and level excavation.

CERAMICS

A total of nine undecorated grog tempered sherds, 1 plain rim with rounded lip and 8 body sherds were collected from STPs and excavation units. The rim is from a straight-sided jar. They are classified as Baytown Plain, var. unspecified, and indicate minimally a Woodland era occupation of the site.

LITHICS

*Projectile Point/Knives*

Eight fragmentary bifaces appear to be portions of finished tools. Four retain the base and some portion of the blade (Table 6-1), allowing for some measurement, and in all but one case, a stab at classifying. The remaining four are too fragmentary to hazard a guess as to type.

Table 6-1. 22FO1294, Projectile Point/Knife Attributes.

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Unit</th>
<th>Level</th>
<th>Portion</th>
<th>Length</th>
<th>Width</th>
<th>Thickness</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Surface</td>
<td></td>
<td>Proximal half</td>
<td>2.70</td>
<td>.05</td>
<td></td>
<td>Gary</td>
</tr>
<tr>
<td>30</td>
<td>N106E108</td>
<td>2</td>
<td>All but tip</td>
<td>4.51</td>
<td>1.91</td>
<td>1.07</td>
<td>Indeterminate</td>
</tr>
<tr>
<td>75</td>
<td>108E100</td>
<td>3</td>
<td>Proximal Frag</td>
<td></td>
<td></td>
<td></td>
<td>Lost Lake?</td>
</tr>
<tr>
<td>80</td>
<td>N101E103</td>
<td>2</td>
<td>All but tip</td>
<td>4.85</td>
<td>1.72</td>
<td>.90</td>
<td>Duval</td>
</tr>
</tbody>
</table>
Figure 6-1. Stone tools from 22FO1294. a (Cat. No. 15), Gary; b (Cat No. 75), possible Lost Lake; c (Cat. No. 80), Duval; d (Cat No. 30), unclassified; e (Cat Nos. 43, 49) scraper on flat pebble; f (Cat. No. 33), bifacial scraper; g (Cat No. 93), percoir.
Gary (n=1)

A single Gary Point was collected (Cat. No. 15; Figure 6-1, a). Gary points are large contracting stem points with generally weak shoulders that date to the Late Archaic period (McGahey 2000). The one collected from the surface at 22FO1294 is made from brown cobble chert.

Lost Lake (n=1)

One specimen (Cat No. 75; Figure 6-1, b) is tentatively identified as a Lost Lake, since only the base and one shoulder are represented. It is certainly a member of the Early Archaic varieties corner notched points, but distinctions based on blade attributes are not possible to make. It was made from heat treated chert.

Duval (n=1)

One point (Cat No. 80; Figure 6-1, c) is identified as a Duval point. Duvals or the morphologically and temporally closely related Edwards points are moderate to small stemmed points that date the Late Woodland period. It is made from chert that has been thermally altered. However, a large potlid on one of its faces may be an indication that thermal alteration occurred after its manufacture (and loss?).

Unidentified Finished Biface (n=1)

One stemmed projectile point/knife (Cat No. 30; Figure 6-1, d) is unclassified. It has only one shoulder, rendering an asymmetrical hafted biface that may have served as a knife blade. In size and configuration is it similar to an Edwards point.

Finished Biface Fragments (n=4)

Three blade fragments of chert and a straight stem with a rounded base of Tallahatta Quartzite were recovered.

Unfinished Bifaces

A total of 17 pieces have evidence of bifacial removals, but were not completed. These include 7 blanks, one preform Is, three preform IIs, and six fragments for which stage of completion could not be determined.

Other Chipped Stone Tools

Several other tools were collected, including a chert bifacially flaked scraper (Cat No. 33, Figure 6-1, f), a unifacially flaked chert piercing tool (perçoir, Cat. No. 93; Figure 6-
A 66 mm long cylindrically shaped cobble appears to have been used as a hammerstone (Cat. No. 49).

**Cores, Tested Cobbles, and Unmodified Cobbles**

A total of 14 cores or core fragments and 12 tested cobbles (minimally flaked cobbles that were not further reduced) were collected. It is possible that some number of core fragments were from early stage biface production, but if no bifacially flaked margin was noted it was categorized simply as a fragment of a core. All were local cobble chert. In addition to the specimens with evidence of having been worked 27 cobbles were collected that were likely brought to the site, but for whatever reasons were not flaked.

**Debitage**

Excavation produced 2984 pieces of debris from flintknapping. Of these 2835 (95.0%) were flake or flake fragments and 149 (5.0%) were irregular pieces (shatter or blocky fragments). Twenty two specimens had evidence of utilization and two were retouched to produce specific edge morphologies. Of the fraction identified as flakes, 44 (1.5%) displayed attributes consistent with bifacial thinning. In terms of raw materials represented (Table 6-2), locally available cherts comprise nearly 99% of the recovered sample, either in raw form (54%) or with obvious thermal alteration (44.7%). The latter should be considered a minimal number of pieces subjected to thermal alteration, since it is possible that some heat treated material did not undergo an obvious color change and was therefore categorized as unheated chert. Other materials represented include gravel quartzite, also locally available (n=28, or nearly 1%), Tallahatta quartzite (n=6, 0.2%), Quartz (n=5, 0.17%), and an indeterminate gray chert that is probably local as well (n=1, 0.3%). With respect todebitage size, Size Grade 4 (3.2-6.4 mm) is the most abundant (nearly 49%), followed by Size Grade 3 (12.8-6.4 mm, 46.5%) With one exception (gravel quartzite assumed to be locally available) only local cherts are represented in the two largest size grades. Non local materials are concentrated in the smaller categories, probably representing tool refurbishing rather than production. Finally it should be noted that the presence of Size Grade 5 in the sample is serendipitous, since 3.2 mm hardware cloth was used for matrix screening.
Table 6-2. 22FO1294, Distribution of Debitage: Size Grade and Material Type.

<table>
<thead>
<tr>
<th>Material Type</th>
<th>SG 1</th>
<th>SG 2</th>
<th>SG 3</th>
<th>SG 4</th>
<th>SG 5</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tan/Brown Chert</td>
<td>2</td>
<td>57</td>
<td>785</td>
<td>761</td>
<td>6</td>
<td>1611</td>
<td>53.99</td>
</tr>
<tr>
<td>%</td>
<td>0.12</td>
<td>3.54</td>
<td>48.73</td>
<td>47.24</td>
<td>0.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat Treated Chert</td>
<td>5</td>
<td>53</td>
<td>585</td>
<td>680</td>
<td>10</td>
<td>1333</td>
<td>44.67</td>
</tr>
<tr>
<td>%</td>
<td>0.38</td>
<td>3.98</td>
<td>43.89</td>
<td>51.01</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tallahatta Quartzite</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>0.2</td>
</tr>
<tr>
<td>%</td>
<td>0.50</td>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel Quartzite</td>
<td>1</td>
<td>11</td>
<td>16</td>
<td></td>
<td></td>
<td>28</td>
<td>0.94</td>
</tr>
<tr>
<td>%</td>
<td>3.57</td>
<td>39.29</td>
<td>57.14</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Quartz</td>
<td>3</td>
<td>2</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>0.17</td>
</tr>
<tr>
<td>%</td>
<td>60</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indeter. Gray Chert</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td>0.03</td>
</tr>
<tr>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total of Size Grade</td>
<td>7</td>
<td>111</td>
<td>1388</td>
<td>1462</td>
<td>16</td>
<td>2984</td>
<td></td>
</tr>
<tr>
<td>Percent Total</td>
<td>0.23</td>
<td>3.72</td>
<td>46.51</td>
<td>48.99</td>
<td>0.54</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 6-3. 22FO1294, Comparison of Proportions of Cortex Covered and Non-Cortex Covered Debitage.

<table>
<thead>
<tr>
<th>Debitage Type</th>
<th>Tan Chert</th>
<th>%</th>
<th>Heat Treated Chert</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortical Debitage</td>
<td>756</td>
<td>47.19</td>
<td>504</td>
<td>37.81</td>
</tr>
<tr>
<td>Non-cortical Debitage</td>
<td>846</td>
<td>52.81</td>
<td>829</td>
<td>62.19</td>
</tr>
<tr>
<td>Totals</td>
<td>1602</td>
<td></td>
<td>1333</td>
<td></td>
</tr>
</tbody>
</table>

The raw and thermally altered local cherts display a difference in size composition, with Size Grade 3 being modal for the former and Size Grade 4 being modal for the latter. A chi-square statistic was calculated using the counts in these two size grades, producing a probability of 0.17 that the differences are a function of chance. This implies somewhat of a difference in reduction method, or size of raw materials or intended finished tools, or both.

This conclusion is borne out by comparing the two categories of chert by the proportion of specimens that retain cortex on the dorsal surface (Table 6-3). While both categories of chert have significant amounts of cortical debitage, the heat treated chert is more likely to have been removed once cortex has been removed, again a statistically significant difference. The patterning in size grade and in proportion of cortical flakes may point to heat treating occurring at an intermediate stage of biface reduction.

Looking at the proportions of cortical versus interior flakes by size grade (gravel chert only), there is an expectable pattern of decreasing percentage of the former with
decreasing size range (Table 6-4). Nearly 83% of Size Grade 2 chert flakes retain some cortex, compared with 56% in Size Grade 3 and 27.5% in Size Grade 4. Smaller interior flakes are more likely to be produced further along in the production process, with less likelihood that whatever cortex remains will be captured on the dorsal surface when the flake is removed. This parallels the increased proportion that heat-treated flakes comprise in successively smaller size ranges.

<table>
<thead>
<tr>
<th>Size Grade</th>
<th>Cortical</th>
<th>Non-Cortical</th>
<th>Total</th>
<th>% Cortical Flakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>91</td>
<td>19</td>
<td>110</td>
<td>82.7</td>
</tr>
<tr>
<td>3</td>
<td>772</td>
<td>598</td>
<td>598</td>
<td>56.4</td>
</tr>
<tr>
<td>4</td>
<td>398</td>
<td>1048</td>
<td>1048</td>
<td>27.5</td>
</tr>
</tbody>
</table>

*Other Lithic Artifacts*

Seven fragments of petrified wood were recovered. There is growing suspicion that petrified wood was at least in part broken into thin slivers following the “wood” fibers to produce drilling or piercing tools.

**22FO1301**

Excavation at 22FO1301 produced a total of 4224 artifacts, mainly debris from stone tool manufacture, but also stone tools and ceramics. Additionally, 537 pieces of thermally shattered stone, over 9 kg of sandstone fragments, and 10 kg of baked clay.

**CERAMICS**

Two conjoining rims and 29 body sherds were recovered.

*Baytown Plain, var. unspecified (N=14)*

Fourteen grog tempered body sherds exhibited no decoration and are classified as Baytown Plain. Average sherd thickness is 6.0 mm.

*Mulberry Creek Cordmarked var. Tallahalla (n=7)*

Seven small body sherds probably representing a single vessel were recovered from Level 1 of N108E103. They represent the thin wall vessels included in the variety Tallahalla. Thickness averages 3.7 mm. This variety dates to the Late Woodland period.
Mulberry Creek Cordmarked, *var. unspecified* (N=9)

Two conjoining rims and seven body sherds from excavation units as well as STPs are thicker examples of Mulberry Creek cordmarked. The rims represent a bowl with an interior thickened rim. Body sherds average 5.8 mm. This variety dates to the Late Woodland period.

Unclassified Grog Tempered Excised

One grog tempered sherd appears to have an excised decorative treatment, possibly on the interior of the vessel wall. The sherd is simply too small to determine more.

LITHICS

Lithic artifacts comprise the bulk of the collection and include three classifiable projectile points, an unclassified projectile point blade, eight incomplete bifaces, ten core or core fragments, a tested cobbble, and 3613 pieces of debitage. Also collected were 19 cobbles that may have been transported to the site.

*Projectile Points*

Maybon (n=2)

Two Maybon projectile points (Cat No. 27, 37) are made of local chert (Table 6-5; Figure 6-2, a, b). These date to the Middle Woodland time period.

Edwards (n=2)

One Edwards point (Cat. No. 23) is made from local chert. It is missing the distal end (Figure 6-2, c). The base of the stem retains cortex. Edwards points date to the Late Woodland time range.

Finished Biface Fragment (n=1)

A finished biface lacking the hafting element (proximal end) was collected from level 4 of N104E110 (Cat. No. 59; Figure 6-2, d). Based on its larger size, it could be somewhat earlier than the identified specimens.
Table 6-5. 22FO1301, Projectile Point/Knife Attributes.

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Unit</th>
<th>Level</th>
<th>Portion</th>
<th>Length</th>
<th>Width</th>
<th>Thickness</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>N105E80</td>
<td>STP</td>
<td>All but distal tip</td>
<td>2.33</td>
<td>0.90</td>
<td></td>
<td>Edwards</td>
</tr>
<tr>
<td>27</td>
<td>Surface</td>
<td></td>
<td>Complete</td>
<td>4.75</td>
<td>1.80</td>
<td>0.71</td>
<td>Maybon</td>
</tr>
<tr>
<td>37</td>
<td>N104E106</td>
<td>L. 3</td>
<td>Complete</td>
<td>3.97</td>
<td>1.63</td>
<td>0.68</td>
<td>Maybon</td>
</tr>
</tbody>
</table>

Figure 6-2. Bifacial tools recovered from 22FO1301. a (Cat. No. 37), b (Cat. No. 27), Maybon; c (Cat. No. 23), Edwards; d (Cat. No. 59), Unclassified.

Unfinished Bifaces

Recovered unfinished bifaces include one preform I fragment of heat-treated chert, and seven chert blanks, two of which have been heat-treated.

Cores

Eight local chert cores and two core fragments were collected, seven of which have been teat treated. In addition, one cobble with minimal flake removals is classified as a tested cobble.
Debitage

Excavation accumulated a collection of 3613 pieces of debitage, 3295 (91.2%) of which are flake or flake fragments and the remaining 318 (8.8%) are blocky fragments or irregular shatter. Eighteen flakes show macroscopic indications of use and five were retouched. Of the specimens identified as flakes, 34 (1.0%) displayed attributes consistent with bifacial thinning. In terms of raw materials, 3588 or 99.3% of the sample is local gravel chert, and 53% of that was clearly altered by heat treating (Table 6-6). The remaining identified raw material includes Tallahatta Quartzite (n=16), gravel quartzite (n=4) an indeterminate gray chert, probably also locally obtained (n=4), and quartz (n=1).

Size Grade 3 contains the greatest fraction of the debitage sample (53.7%) followed by Size Grade 4 (40.6%) and Size Grade 2 (4.4%). Only local chert is represented in Size Grades 1 and 5, which together comprise only 1.2% of the sample.

Unlike the sample from 22FO1294, Size Grade 3 is the modal size range for both heat treated and unaltered cobble chert debris, making up more than 50% of each material category. Correlated with this pattern is a greater proportion of cortical flakes in both of the gravel chert categories (Table 6-7). The higher percentage of cortical flakes is found across size grades: 93% of Size Grade 2, 68.1% of Size Grade 3, and 41.1 of Size Grade (Table 6-8).

Table 6-6. 22FO1301, Distribution of Debitage: Size Grade and Material Type.

<table>
<thead>
<tr>
<th>Material Type</th>
<th>SG 1</th>
<th>SG2</th>
<th>SG 3</th>
<th>SG4</th>
<th>SG 5</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tan/Brown Chert</td>
<td>1</td>
<td>81</td>
<td>929</td>
<td>638</td>
<td>12</td>
<td>1661</td>
<td>45.97</td>
</tr>
<tr>
<td>Percent</td>
<td>0.06</td>
<td>4.88</td>
<td>55.93</td>
<td>38.41</td>
<td>0.72</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Heat Treated Chert</td>
<td>2</td>
<td>75</td>
<td>996</td>
<td>823</td>
<td>31</td>
<td>1927</td>
<td>53.34</td>
</tr>
<tr>
<td>Percent</td>
<td>0.1</td>
<td>3.89</td>
<td>51.69</td>
<td>42.71</td>
<td>1.61</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Tallahatta Quartzite</td>
<td>1</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>16</td>
<td>100</td>
<td>0.44</td>
</tr>
<tr>
<td>Percent</td>
<td>6.25</td>
<td>62.5</td>
<td>31.25</td>
<td></td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel Quartzite</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent</td>
<td>75</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quartz</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indeter. Gray Chert</td>
<td>4</td>
<td></td>
<td>4</td>
<td>0.11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total of Size Grade</td>
<td>3</td>
<td>160</td>
<td>1940</td>
<td>1467</td>
<td>43</td>
<td>3613</td>
<td></td>
</tr>
<tr>
<td>Percent Size Grade</td>
<td>0.08</td>
<td>4.43</td>
<td>53.69</td>
<td>40.6</td>
<td>1.19</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

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Table 6-7. 22FO1301, Comparison of Proportions of Cortex Covered and Non-Cortex Covered Debitage.

<table>
<thead>
<tr>
<th></th>
<th>Tan Chert</th>
<th>%</th>
<th>Heat Treated Chert</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortical Debitage</td>
<td>987</td>
<td>58.42</td>
<td>1075</td>
<td>55.80</td>
</tr>
<tr>
<td>Non-cortical Debitage</td>
<td>674</td>
<td>40.58</td>
<td>852</td>
<td>44.20</td>
</tr>
<tr>
<td>Totals</td>
<td>1661</td>
<td></td>
<td>1927</td>
<td></td>
</tr>
</tbody>
</table>

Table 6-8. 22FO1301, Percentage of Cortical Flakes by Size Grade (Local Gravel Cherts).

<table>
<thead>
<tr>
<th>Size Grade</th>
<th>Cortical</th>
<th>Non-Cortical</th>
<th>Total</th>
<th>% Cortical Flakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>146</td>
<td>11</td>
<td>157</td>
<td>94.0</td>
</tr>
<tr>
<td>3</td>
<td>1310</td>
<td>615</td>
<td>1925</td>
<td>68.1</td>
</tr>
<tr>
<td>4</td>
<td>600</td>
<td>861</td>
<td>1461</td>
<td>41.1</td>
</tr>
</tbody>
</table>

Other Lithic Artifacts

Eight fragments of petrified wood were collected during excavation.

INTERSITE COMPARISONS

As noted, there are differences between the two debitage samples with respect to modal flake size range and proportions of cortical flakes. One difference between 22FO1301 and 22FO1294 is the greater proportion of cortical flakes in the former sample, which varies from 10% and 13% depending on size grade. Greater emphasis on earlier stages of biface production, or alternatively, more frequent core reduction rather than biface manufacture, may be responsible for the pattern. The latter possibility is supported by the greater percentage of blocky fragments and shatter (8.8% from 22FO1301 versus 5% from 22FO1294), the higher ratio of cores to unfinished bifaces (1.25 versus 0.8), and the (slightly) lower proportion of biface thinning flakes (1% versus 1.5%). A number of factors could be involved in the differences. These include a somewhat different suite of toolmaking objectives at the two sites, dependent on tasks at hand or perhaps differences in access to raw material. Time may also play a role, since there are indications that 22FO1294 may have early and late Archaic components. Ceramics are difficult to compare in the absence of decorated examples from 22FO1294; however, absence of ubiquitous cordmarked ceramics may reflect that the Woodland component at that site is somewhat earlier as well. There is accumulating evidence that Archaic mobility strategies based on frequent residential moves may have relied more heavily on a formal curated technology (Fields 2000; McMakin 1995). Caution is
warranted in interpreting the flintknapping differences between the two sites, since they may not be so profound as to indicate fundamentally different site functions. In addition it is well to note that excavation strategies at both sites may not have produced truly representative samples.

With this comment as a caveat, it is interesting to compare assemblage characteristics of 22FO1294 and 22FO1301 with two other recently analyzed sites at Camp Shelby, 22FO1234 and 22FO1235 (Jackson 2007). Size grade composition is very similar between 22FO1294 and 22FO1234, in particular the higher percentage of Size Grade 4 flakes, and even more similar between 22FO1301 and 22FO1235 (Table 6-9). This could potentially be an important correlation, if feature density reflects a difference season of occupation and/or sets of activities. Like 22FO1301, 22FO1235 had a lower density of baked clay features (in comparison with 22FO1234). Thus, debitage differences might reflect those differences in activities at sites associated with baked clay feature use and those without. It is not at all a clear picture, however. When the percent of non-cortex bearing flakes by size (Table 6-10) is compared, 22FO1301 stands out from the other three in the smaller percentage of Size Grade 2 flakes bearing no cortex. This would seem to support the greater reliance on flake production that this site and thus contradict the similarity of 22FO1301 and 22FO1235, since using the expanded range of attributes recorded for its analysis pointed to a greater emphasis on biface manufacturing there than at 22FO1234.

<table>
<thead>
<tr>
<th>Table 6-9. Comparison of Size Grade Distributions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Size Grade</td>
</tr>
<tr>
<td>Size Grade 1 22FO1294 22FO1301 22FO1234 22FO1235</td>
</tr>
<tr>
<td>Size Grade 2 .23 .08 .03 .05</td>
</tr>
<tr>
<td>Size Grade 2 3.72 4.43 4.03 5.41</td>
</tr>
<tr>
<td>Size Grade 3 46.51 43.69 41.41 39.22</td>
</tr>
<tr>
<td>Size Grade 4 48.99 40.60 50.93 39.22</td>
</tr>
<tr>
<td>Size Grade 5 .54 1.19 3.59 1.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 6-10. Percentage of Non-Cortical Flakes by Size Grade.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size Grade 2 22FO1294 22FO1301 22FO1234 22FO1235</td>
</tr>
<tr>
<td>Size Grade 2 16 18.4 17.3 6.0</td>
</tr>
<tr>
<td>Size Grade 3 40.3 49.4 43.6 31.0</td>
</tr>
<tr>
<td>Size Grade 4 67.4 75.0 72.5 68.9</td>
</tr>
<tr>
<td>Size Grade 5 86.4 91.4</td>
</tr>
</tbody>
</table>
INTRODUCTION

The two sites located on Camp Shelby, Mississippi where baked clay and sandstone features had been found were closely examined in 2007. Both sites were located on an upland ridge line with creeks surrounding the area, and the primary goal of this research was to determine whether remote sensing techniques could be used to uncover archaeological features with degrees of accuracy. This experiment was conducted with the hopes of calibrating remote sensing techniques for the Pine Hills area in order to locate possible feature locations quickly, economically, and accurately, yet other sets of questions were posed in relation to the features themselves.

The first set of questions involved furthering our understanding of prehistoric baked clay and sandstone features revealed during excavation. This broad class of features is ubiquitous throughout the Pine Hills, and while similar features are found in other places, they appear to be more common here and must represent an important technology for their makers. A close examination of these techno-functional classifications could provide key information on the available technology and resources employed as parts of subsistence strategies of the Pine Hills region. Much is lacking in the way of subsistence strategy evidence from the Pine Hills region of southeast Mississippi (Jackson and Fields 2000), so the careful examinations of these features could illuminate the possible use of a regional prehistoric cooking technology. Delineating the construction methods and possible uses of prehistoric cooking technologies represented by these features might provide indirect evidence for addressing questions of subsistence strategy, site function, and length of occupation, resource availability, population densities, and seasonal experiences among sites. Understanding the adaptive advantage of the represented technology may help explain the evidence for apparently high population levels at certain times in prehistory, which is contrary to past suggestions that the region was merely a temporary stopping point enroute to better resource areas (Keller 1982).

CLASSIFICATION OF FEATURES

Typically, large sandstone and baked clay features have been classified simply as hearths in the Pine Hills region, yet there is some potentially important variability that has been overlooked, defeating efforts to document their varied configuration within the broader context of technological innovation and resource exploitation. An examination
of existing excavation records suggests there are at least four main categories. Each of these four types may reflect a different possible cooking application available for prehistoric subsistence usage.

The four main sandstone/clay feature types which have been uncovered throughout the Pine Hills area are outlined below:

- Small basin or cylinder shaped clay lined pits with sandstone and/or baked clay. (Figure 7-1, 7-2)
- Large to midsize circular basin shaped clay lined pit features consisting of sandstone and/or baked clay. (Figure 7-3 through 7-6)
- Sandstone concentrations or baked clay slabs on the surface. (Figure 7-7)
- Twin sandstone baked-clay concentrations located near each other with one possibly representing a scatter. (Figures 7-8, 7-9)

Examples of the four types are from sites in Greene, Forrest, and Pearl River County, and represent typical features uncovered in the Pine Hills region.

Although most of the features shown in the photos are typically classified as hearths when encountered in the Pine Hills area, it is the argument of this author that better understandings of these feature types are needed in order to accurately delineate their formation as cooking facilities and interpret their distribution with respect to overall site composition, function, and seasonality. In order to accomplish this task, a theoretical framework for prehistoric cooking facilities in the Pine Hills region must be created and applied to the interpretation of excavated sites throughout the area.

Multiple sites have recorded features bearing the characteristics shown in the preceding photos (e.g. 22FO1234, 22FO1235, 22GN680, 22GN687, 22FO582, 22PR533, 22FO666, 22FO1027), and these features span several counties within the Pine Hills area as well as different time periods. Other excavated sites appear to have had similar features but lack the documentation to determine which type might have been represented. Cooking facilities employing clay or sandstone are not unique to the Pine Hills area but are documented in other regions of the Southeast (Bruseth 1991; Sassaman 1993). Kenneth Sassaman notes the occurrence of similar feature types located around the Savannah River Valley during his research on early cooking technology and pottery. Sassaman’s work suggests that these features have roots in the early Archaic period, and he further provides evidence of features with clay linings:

Clay-lined pits have been reported from sites in the middle Savannah River Valley (Bowen 1978; Claflin 1931). Examples from Stallings Island measured 45-55 centimeters in diameter and 25-30 centimeters deep. The sides of one pit “were plastered smooth with clay and were burned brick red” (Claflin 1931:8). Shallow basin features have also been

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2 It is beyond the scope of the present project to do more than establish the major categories of features which seem to capture much of the observed variability. Further planned research by the authors will collect more quantitative data.
James Bruseth also has noted the common occurrence of clay-lined hearths found on the Cedarland site of the Mississippi Gulf Coast:

Another distinctive trait found at the Cedarland site is the occurrence of clay-lined hearths, indicating a technique of food preparation unique for this area. Numerous examples have been uncovered over the years, but few have been carefully excavated. An exception to this was the discovery of three such features during excavations by the author in the spring of 1972. The hearths varied in diameter form 50-65cm, were basin shaped, and occurred on a common horizontal plane. The walls consisted

Figure 7-1. Small basin clay feature, 22GN680.

Figure 7-2. Small basin clay feature, 22GN685.
of oxidized orange soil. However, the tops were found at variable depths below the surface. This factor is interpreted to be the result of digging in and around the hearths after their initial use” [Bruseth 1991:11].

The Southeast does not hold a monopoly on these feature types, and the work of Craig S. Smith and William Martin reveals the large body of archaeological data relating to earth-oven subsistence in the Western and Northwestern United States:

Archaeological evidence for camas processing comes from the remains of pit ovens with large quantities of fire-cracked rock, charcoal-stained sediment, and, at times, camas bulbs situated along wet meadows containing camas. These ovens typically date over the past 5500 years and are basin-shaped pits, circular to oval in plan view, 1.2 to 3.5 m in diameter, and 17 to 57 cm in depth” [Smith and Martin 2001:169].

Plant foods such as camas, sotol, lily bulbs and a variety of cacti were exploited by many prehistoric peoples of Western North America, and the use of earth-oven technology has been well documented archaeologically.

Figure 7-3. Large circular shaped consisting of sandstone and baked clay, 22GN680.
Figure 7-4. Large circular shaped feature consisting of sandstone and baked clay, 22GN685.

Figure 7-5. Midsized circular feature consisting of sandstone and baked clay, 22GN680.
Figure 7-6. Midsized circular feature consisting of sandstone and baked clay, 22GN687.

Figure 7-7. Sandstone slab on the surface, 22GN685.
Figure 7-8. Twin sandstone and baked clay concentrations, 22PR533.

Figure 7-9. Twin sandstone/baked clay concentrations, 22FO1294.
EARTH OVEN CONSTRUCTION

Figure 7-10 shows some of the different possible cooking facility configurations which can be tied to the archaeological photos of Pine Hills clay and sandstone features shown above. As the illustration delineates, several different types of cooking facilities and/or earth-oven models could have been available for prehistoric foragers to implement (Thoms 2005). The different designs shown below directly correlate to the amount of heat needed to cook specific resources. The inclusion of sandstone or a thermal element into the pit feature design provides a further clue into amount and duration of heat needed to cook the intended resource. As noted by the Wadsnider and Sodha experiments, “…pit ovens containing a rock element indicate that they sustain moderate heat for extended periods of time” (Smith and Martin 2001:170). Furthermore, each different facility design bespeaks the amount of invested labor cost in both the residence and the resource exploited. One assumption that could be made from the level of complexity of the uncovered feature is the proximity of the cooking facility to the resource being exploited, the availability of the materials used to build the facility, and the premeditated longevity of the facility being built.

Certain features as shown above could be interpreted as diagnostic of the illustrated facilities below. For instance, feature type 1 (Small basin or cylinder shaped clay lined pits with sandstone and/or baked clay) could represent facility Type A or C. Feature type 2 (Large to midsize circular basin shaped features consisting of sandstone and/or baked clay) could represent facility Type A. Feature type 3 (Sandstone or baked clay slabs on the surface) is represented by facility Type C. Furthermore, feature type 4 (twin sandstone and baked clay scatters) could represent facility Types B or D as shown below.

What resources would need a facility this specific? How long would they take to construct? How long would the facility last? Would it even be worth the trouble? We know what these features look like in the archaeological record, yet how do they look when used. In order to answer these questions, a review of ethnographic accounts of resource exploitation and cooking facility construction is needed.

ETHNOHISTORICAL ACCOUNTS

Many ethnographic accounts of prehistoric subsistence technology and strategy exist, and some of these accounts go as far back as Cabeza de Vaca’s travel narratives of North America (Thoms 2005). One of the more widely read accounts exist in the travel journals kept by the famous explorers Meriwether Lewis and William Clark during their travels across the American West, and their descriptions of Native American diets and culinary practices are abundant. One aspect of the Lewis and Clark narrative that applies to early subsistence patterns is the relatively high dependence on vegetable and root resources by the native populations. In Elliot Coues 1893 edition of the Lewis and Clark travels, Lewis notes the following resource used by the Columbian River tribes:
“But the most valuable of all the Indian roots is the wappatoo, the bulb of the common sagittafolia, or common arrowhead. It does not grow in this neighborhood, but is in great abundance in the marshy grounds of that beautiful valley which extends from near Quicksand river for 70 miles westward, and is a principal article of trade between the inhabitants of that valley and those of the seacoast” [Coues 1893:824-25].

Arrowhead is known to be a resource that would have been available to tribes of the Southeast, and its importance in a larger subsistence economy should not be discounted. One resource known in the Pine Hills region as the Duck Potato is a close relative of the Arrowhead family Sagittafolia, and would have occurred in similar habitats. Possible methods of harvesting this resource cannot be gleaned directly from the archaeological
record, yet descriptions from the Lewis and Clark expedition of possible prehistoric scenarios have survived:

But the chief wealth of this island consists of the numerous ponds in the interior abounding with the common arrowhead (sagittaria sagittifolia) to the root of which is attached a bulb growing beneath it in the mud. This bulb, to which the Indians give the name of wappatoo, is the greatest article of food, and almost staple article of commerce on the Columbia. It is never out of season; so that at all times of the year the valley is frequented by the neighboring Indians who come to gather it. It is collected chiefly by women...She takes one of these canoes into a pond where the water is as high as the breast, and by means of her toes separates from the root this bulb, which on being freed from the mud rises immediately to the surface of the water, and is thrown into the canoe. In this manner these patient females remain in the water for several hours, even in the depth of winter” [Coues 1893:929].

Although Lewis and Clark’s journals do not mention how the natives developed this technique of using their feet to harvest, it is interesting to note that there are accounts of Southeastern tribes harvesting catfish by muddying the water with their feet (Byrd 1991). Once the water is muddied to the point that the fish cannot intake enough oxygen, they simply float to the surface. These techniques are hypothesized for fishing the marsh areas of Mississippi and Louisiana, thus using ones feet to gather resources, especially in ponds, streams, or marshes would make sense. One question still remains, which is how did the prehistoric populations know to eat resources such as Arrowhead and Duck Potato? The answer to this question resides in the name of the resource itself. Lewis and Clark make reference to swans, ducks, and other waterfowl feasting on aquatic resources found in ponds and marshes specifically wappatoo. “In the course of the day we saw great numbers of geese, ducks, and large and small swans, which last are very abundant in the ponds where wappatoo grows, as they feed much on that root” (Coues 1893:915). The combination of waterfowl, fish, roots, and bulbs all in one location would make a convenient spot for resource utilization.

The ethnobotanist Charles Saunders recounts the plight of John Colter, a member of the Lewis and Clark expedition, surviving entirely from Bread-root tubers as he escaped the Blackfeet tribe, “…who were intent upon killing him...as he made his painful way, afoot, wounded, and absolutely naked, back to the settlement of whites” (Saunders 1920:9). This highlights the ease at which someone can be learn to recognize and exploit root resources.

Many ethnographic accounts of plant resources mention the taste transformation that plants undergo as a product of baking or roasting. Wild Onion (Allium cernuum), Wild Potato (Ipomera pandurata), and Water Chiquapin (Nelumbo lutea) are some examples (Saunders 1920). Lewis and Clark even mention that roots taste better after they are prepared in the Indian “kiln”. One such root was listed as pasheco-quamash, and was
also said to be dried and made into a sweet tasting cake attesting to the versatility and long-term use of root resources by native peoples (Coues 1893:985). An early account of such transformative properties of baking was recorded in Purchas’s Pilgrimage in relation to the Virginian Tuckahoe (*Peltandra Virginica*) as noted by Saunders, “Tockawhough...of the greatness and taste of a potato, which passeth a fiery purgation before they may eate it, being poison whiles it is raw” (Saunders 1920:37). The cure for this poison potato was baking in an earth-oven for 24 hours. Other hunter-gathers across the globe discovered this baking trick as well. Australian Aboriginal peoples baked bitter tubers in earth-ovens, “…to break down the toxic compounds and make them taste sweet” (O’Dea et al. 1991:77).

Although many references to the exploitation of roots were made during early contact, few outlines of actual cooking facilities were given. Perhaps the best known example was included by the explorers Lewis and Clark of an earth-oven used to cook and flavor bear meat:

> A large part of the meat we gave to the Indians, to whom it was a real luxury, as they scarcely taste flesh once in a month. They immediately prepared a large fire of dried wood, on which was thrown a number of smooth stones from the river. As soon as the fire went down and the stones were heated, they laid next to each other in a level position, and covered with a quantity of branches of pine, on which were placed flitches of the bear; thus placed, the boughs and the flesh alternated for several courses, leaving a thick layer of pine on the top. On this heap was then poured a small quantity of water, and the whole was covered with earth to the depth of four inches. After remaining in this state about three hours the meat was taken off; it was really more tender than that which we had boiled or roasted, though the strong flavor of the pine rendered it disagreeable to our palates”  [Coues 1893:1011-12].

Other historians have noted the use of cooking facilities such as earth ovens, yet there are subtle differences between how these different cultures design and construct their facility. The Osage used clay-lined pits to cook a variety of resources (Sassaman 1993). Tribes using pit ovens with stone to process bulbs and roots in the Southwest have also been heavily documented (Benison 1999; Saunders 1920). Accounts from hunter-gathers in Australia expose the use of baked clay as thermal elements in the ovens built there (Beveridge 1869).

Although many accounts of the collection and utilization of vegetable and root resources exist, the ability of the archaeological record to reflect their dependence is strained due to lack of preservation. This further supports the notion that an intimate understanding of food processing methods needs to be pursued in order to tease apart the intricacies of subsistence strategy. In the Pine Hills region, cooking facilities have been interpreted as associated with the processing of nuts, tubers, seeds, and aquatic resources, yet more questions exist about the role of these features in subsistence strategy than definitive answers (Jackson 2000; Fields 2003; Reams 2006). Could the different

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*Remote Sensing Effectiveness in the Pine Hills*
possible cooking facilities reflect specific resource processing? In order to begin to address these questions, an experimental approach is needed.

EXPERIMENTS

Experimentation with the construction and use of pit cooking facilities offers one approach to begin to understand the different archaeological features of the Pine Hills. This experimentation relies on the assumption that size, shape, and construction method affects cooking properties, and if so, then an evaluation of cooking qualities may point to different resources prepared in these different facilities. Since no accounts of Pine Hills cooking technology experimentation exists to date, a close examination of experimental archaeological methods outside the Pine Hills aided in the development of a locally applicable experimental design.

We conducted our own small scale experiments in order to determine the basic construction and use of a small basin shaped earth oven feature typically found in the Pine Hills region. This serves as a pilot study for additional experimentation planned for the near future. Figures 7-11 through 7-25 illustrate the basic stages of the experiment.

In our experiment, smaller pits were used 34-65cm deep and 47-65cm wide. We chose these dimensions because they closely resembled the small basin shaped clay lined features uncovered on both 22FO1294 and 22FO1301, and as noted in the earlier section, these dimensions resemble features types uncovered across the greater Southeast. Five total test pits were excavated for this experiment. Secondly, our pits were lined with various types of clay found in close proximity to the sites 22FO1294 and 22FO1301. This was perhaps the most labor intensive part of the whole construction process. Most of the clay was recovered from the banks of Jacob’s creek at the base of site 22FO1294. Additional clay loam was removed from the subsoil of 22FO1301 at approximately 40-50cm, and the remainder was removed from an upland hill near 22FO1301. Our rationale for using different clay was to determine whether on-site B-horizon sediments were sufficient clay to become hardened during firing or would clay had to have been imported from another source.

Next, fires were started in each pit using pine straw and oak kindling as shown in the pictures below. As the fire burned, the clay walls of the pit noticeably hardened, and an appreciable color change was noticed once the fired clay oxidized. Sandstone cobbles were added to the fire as a thermal element for the oven.

As the clay lined pits were being fired, a variety of resources were prepared for baking. Greenbrier roots, fresh squirrel, and freshwater perch were chosen to replicate resources available to the Pine Hills foragers. Everything used to prepare both the pits and the food would have been available to anyone living in the Pine Hills region, and could have been gathered in a single day.
Figure 7-11. Measuring depth of experimental oven.

Figure 7-12. Lining the pit with clay.
Remote Sensing Effectiveness in the Pine Hills

Figure 7-13. Firing clay pit with oak kindling.

Figure 7-14. Clay in pit starts to harden.
Greenbrier roots, fresh squirrel, and freshwater perch were wrapped in Turnip, Mustard, and Magnolia leaves (Figures 7-15 through 7-18). These “food packets” were held together by small, green privet hedge branches laced through the leaves. The final bundle is shown in Figures 7-19 and 7-20.

Figure 7-15. Greenbrier Root.

Figure 7-16. Perch.

Figure 7-17. Fresh Squirrel.

Figure 7-18. Wrapping food packets.
The bundles were then placed on top of the heated sandstone cobbles. Half of the pits did not include sandstone, in order to judge differences in cooking capability. The experiments were executed by a group of five people in order to replicate a small band activity. The total pit construction time took around 3.5 hours (which includes clay extraction and baking), and food preparation took about 30 minutes. The final step was to cover each of the pits with soil, and then start a fire on top of the surface as shown in the photos below. The fires were fed for about twenty minutes each, and then were allowed to burn down to hot coals.

Each bundle was allowed to slow cook for about 3 hours at which time they were removed from the pit. The leaves had protected the food from being spoiled by the ashes, yet surprisingly enough there was little remaining charcoal and ash inside the pit. Most of the ash had baked into the clay wall or had been removed during excavation. The sandstone cobbles were all intact, and appeared to be serviceable for another firing. Most importantly the food tasted great. The roots were well roasted, and the fish were steamed perfectly inside the mustard leaves adding a nice flavor to the fish.

As can be seen in Figures 7-24 and 7-25, little was left inside the pit. No botanicals and little charcoal remained after the pit was used, and it was ready to be re-fired at any time. One important aspect of this experiment is that it proved that although labor costs are initially high for building the cooking facility, it is a one-time cost with the potential for multiple returns over time. In fact, the more the clay gets fired in the pit the harder it becomes which makes it a semi-permanent feature for both prehistoric cooks and the archaeological record. This fact essentially makes this type of facility a low cost, high return technology if used frequently.
Figure 7-21. Covering pit with clay.

Figure 7-22. Fire started on top of pit.

Figure 7-23. Fire stoked on top of pit.
Figure 7-24. Pit after food removal.

Figure 7-25. Cleaned and cross-sectioned pit profile.
These experiments also helped explain the low occurrence of botanical remains and charcoal inside the pits as they reveal themselves in the archaeological record. This lack of concentrated charcoal and botanical remains has perplexed many archaeologists. James Bruseth notes little charcoal and ash associated with the clay lined pits on the Cedarland site:

As neither ash nor charcoal was observed with the features, they may instead have served as earth-ovens rather than hearths. Under this interpretation, the oxidized soil of the features would represent prepared clay walls that became fired from heating in the oven” [Bruseth 1991:11].

He claims this cooking technique unique, yet as this report shows it may have been widely known and practiced throughout the Southeast region. Thirty-six years later and the question is still one worth pursuing.

Other archaeologists have been conducting cooking experiments in order to better understand the subsistence technology of prehistoric populations, yet Phil Dering’s experimental work in the Southwest on prehistoric cooking technologies has garnered much attention in archaeological circles. Dering used a labor cost and caloric intake experiment to show that earth-ovens were used during the Early and Middle Archaic to exploit low ranked high cost resources such as Prickly Pear cactus and Agave Lechuguilla. The data from his experiments outlines earth-ovens as a technology developed as part of a subsistence strategy dealing with, “…a broad spectrum, low return economy” (Dering 1999:259).

Phil Dering’s earth-oven experiments with Sotol, Lechuguilla, and Prickly Pear cactus reveal:

In contrast to the meager calorie yield, the abundant FCR and plant refuse from these features dictates that they are highly visible components of the archaeological record. Cooking the food load for 24 to 48 hours in a 1.5-m pit requires about 224 kg of fuel wood to heat a rock element weighing about 250 kg. Plant refuse and FCR from an earth-oven firing accumulates rapidly. If one makes the stipulation that rock may be reused twice, a 1.5-m-diameter earth oven containing 30 plants will accumulate 1m³ of rock after 15 firings. Each oven firing would generate about 1,140 lechuguilla leaf bases or about 4,925 sotol leaf bases” [Dering 1999:665].

Dering’s experiments showed that an average of 7656 calories could be produced per oven firing. He calculates that this would provide enough food for a small family for one or two days at 1,500 kcal/per day. Figure 7-26 illustrates Dering’s labor cost model, and the importance of Dering’s experimental approach is that it provides tangible results when applied to prehistoric subsistence technology.
How can we use Dering’s approach to explain the feature types occurring in the Pine Hills region? According to Dering, the intensification of low ranked resources such as roots, tubers, and seeds by prehistoric populations reflect subsistence stress. One major question it begs of the Pine Hills area is one of earth-oven cost and return. In Dering’s model, the costs of collection, primary processing, and secondary processing far outweigh the caloric return rate of earth-oven use when processing low-ranked resources.

EARTH OVEN COOKERY IN THE PINE HILLS

The cooking applications posed for these four feature types require a working knowledge of the resources being cooked in order to tease apart the different construction methods and function. Current research in the field of earth-oven technology and prehistoric subsistence suggest that different features types represent facilities built for a specific resource (Wadsnider and Sodha 1998, Wadsnider 1999, Smith and Martin 2001). Wadsnider’s experimental work with pit oven technology concluded that pit design plays a vital role in the specific resource being processed. Her series of experiments in the Southwest evidenced pit-ovens built for the specific purpose of exploiting root resources (Wadsnider and Sodha 1998, Wadsnider 1999).

Potential foods exploited by prehistoric foragers certainly included “wild plants”, and the list of edible plants available within the Southeast region are extensive. Green Brier roots, Prickly Pear cactus, Arrowhead roots, and Wild Potatoes are just a few of the choices available for Pine Hill inhabitants to cook with earth-ovens as noted in Table 7-1, and given the range of resources amendable to earth-oven cookery, differences in construction/types may be related to the resource being processed.
Table 7-1. Earth-Oven Plant Resources.

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>USE TYPE</th>
<th>HABITAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goosefoot, <em>Chenopodium bushianum</em></td>
<td>Seeds</td>
<td>Disturbed open ground</td>
</tr>
<tr>
<td>Marsh Elder, <em>Iva annua</em></td>
<td>Seeds</td>
<td>Disturbed open ground</td>
</tr>
<tr>
<td>Pigweed, <em>Amaranthus sp.</em></td>
<td>Seeds</td>
<td>Disturbed open ground</td>
</tr>
<tr>
<td>Woodland Sunflower, <em>Helianthus strumosus</em></td>
<td>Seeds</td>
<td>Open woodland</td>
</tr>
<tr>
<td>American Elderberry, <em>Sambucus nigra ssp. canadensis</em></td>
<td>Fruits</td>
<td>Dry open woodland</td>
</tr>
<tr>
<td>Pine, <em>Pinus sp.</em></td>
<td>Seeds</td>
<td>Mixed upland forest</td>
</tr>
<tr>
<td>Gromwell, <em>Lithospernum sp.</em></td>
<td>Seeds</td>
<td>Disturbed sandy soils</td>
</tr>
<tr>
<td>Ground Nut, <em>Apios tuberosa</em></td>
<td>Rhizome</td>
<td>Wet woodland soils, swamp margins</td>
</tr>
<tr>
<td>Dwarf Cattail, <em>T. minima</em></td>
<td>Rhizome</td>
<td>Wet or moist woodland soils, transitional environs from wet to moist</td>
</tr>
<tr>
<td>Wild Potatoes, <em>Ipomera pandurata</em></td>
<td>Roots</td>
<td>Open fields, stream and lake margins</td>
</tr>
<tr>
<td>Greenbrier, Chinabrier, <em>Smilax sp.</em></td>
<td>Roots</td>
<td>Wet woodlands, thickets, stream banks</td>
</tr>
<tr>
<td>Water Lotus, <em>Nelumbo lutea</em></td>
<td>Roots</td>
<td>Ponds, oxbow lakes</td>
</tr>
<tr>
<td>Swamp Mallow, <em>Malvaceae hibiscus</em></td>
<td>Roots</td>
<td>Wet woodland soils, swamp margins</td>
</tr>
<tr>
<td>Evening Primrose, <em>Onagraceae biennis</em></td>
<td>Roots</td>
<td>Wet woodland soils, swamp margins</td>
</tr>
<tr>
<td>Morning Glory, <em>Ipomoea sp.</em></td>
<td>Roots/Seeds</td>
<td>Open fields, stream and lake margins</td>
</tr>
<tr>
<td>Duck Potato, <em>Sagittaria latifolia</em></td>
<td>Tuber</td>
<td>Ponds, lakes, stream margins</td>
</tr>
<tr>
<td>Jerusalem Artichoke, <em>Helianthus tuberosus</em></td>
<td>Tubers</td>
<td>Thickets, woodland borders</td>
</tr>
<tr>
<td>Oak, several species, <em>Quercus sp.</em></td>
<td>Acorns</td>
<td>Mixed upland forests, floodplain forests</td>
</tr>
<tr>
<td>Hickory, several species, <em>Carya sp.</em></td>
<td>Nuts</td>
<td>Mixed upland forests</td>
</tr>
<tr>
<td>Pecan, <em>Carya illinoisensis</em></td>
<td>Nuts</td>
<td>Floodplain forests</td>
</tr>
<tr>
<td>Wild Garlic, <em>Allium canadense</em></td>
<td>Bulb</td>
<td>Moist woodlands, stream banks, and thickets</td>
</tr>
<tr>
<td>Nodding Onion, <em>Allium cernuum</em></td>
<td>Bulb</td>
<td>Moist woodlands, stream banks, and thickets</td>
</tr>
</tbody>
</table>

One main resource, as noted above, that would have been available for earth-oven use in the Pine Hills region would be the exploitation of roots. Alston V. Thoms notes 4 main factors for root (geophyte) exploitation common throughout sites studied:

The potential of these particular geophytes to be exploited intensively and to serve as staples results from several factors: (1) they tend to grow densely in large tracts; (2) they are easily dug, typically growing in sandy or silty soils; (3) productive root grounds often are found in proximity to raw materials required to build long-baking earth ovens, notably cook stone, fuel, green-plant packing material, and water; and (4) gently sloping or elevated landforms adjacent to productive root grounds afford dry, well-drained places to build and use earth ovens and carry out related tasks” [Thoms 2004:177-178].
All four of these factors are present at 22FO1294 and 22FO1301, and can further be evidenced in other nearby sites such as 22FO1234 and 22FO1235.

Another interesting component of earth-oven technology involves the transformative aspect the strategy provides to the exploitation of occulted resources. For instance, there is substantial data to support certain toxic plants can be transformed into edible resources using moderate or high temperature cooking over an extended period of time. One commonly known Pine Hills example that would qualify is the Prickly Pear cactus as noted by Phil Dering in his Southwest experiments, “Sotol, lechuguilla, and Prickly Pear store carbohydrates in their stems and pads, but they contain poisonous or indigestible compounds that require exposure to heat for at least 36-48 hours in order to render them edible” (Dering 1999:661).

The method of dry heat cooking has been proven to actually change the chemical composition of some plant resources into healthier and more easily digestible foods. Much like cooking a sweet potato, baking can hydrolyse complex polysaccharides into easily digestible simple sugars such as disaccharides and monosaccharides (C.S. Smith et al. 2001). Ethnographic accounts highlight the ability of earth-oven long term cooking methods transforming otherwise unavailable foodstuffs into highly prized meals. This would allow prehistoric foragers to exploit resources with a new transformative technology, and it further illuminates the need for a thermal element within the oven such as sandstone or rock in order to increase cooking time.

Yet, why do Pine Hills region hearths use clay-lined pits? One explanation for the use of clay-lined pits was evidenced by our own experiments. The baked clay linings made the cooking pits more durable and the transfer of heat became better with each subsequent firing. Experiments conducted by Craig S. Smith et al. (2001) showed that, “The single layer of rock and the pit walls served as an adequate heat reservoir to heat the oven to a maximum temperature of 73º C” (Smith et al. 2001:177). Adding clay to the walls further insulates the oven which could feasibly increase the maximum heat reservoir temperature.

One more mundane answer lies in the simple logistics of having to dig a new hole every day. Imagine how burdensome a residential site littered with holes would be especially in the sandy soils of the Pine Hills. The pits with fired clay walls become semi-permanent fixtures of the site that only need to be constructed once. This allows labor to be invested in other activities such as secondary processing, storage, collecting other resources, and scouting.

Why use sandstone as a thermal element instead of other materials such as local chert or other types of stone? Some of the nearest sandstone deposits were miles from the site, and any sandstone brought in to the site would be done at a high labor cost. Why not use clay balls as thermal elements? The raw material would be close at hand, and it would need to be collected regardless in order to line the pits. There are certainly cases of clay balls being used in earth-ovens. “Clay cooking balls are generally considered to have been a substitute for cooking stones in areas that had little rock, especially in the
Mississippi Valley and the outer Coastal Plain” (Bense 1994:88). Fields (2005) has excavated objects in the Pine Hills region she has classified as PHO’s (Pine Hills Objects) that are interpreted to be used as clay cooking balls. Perhaps the answer lies in the utility of using sandstone instead of clay cooking balls. Kenneth Sassaman provides insight into this utility by pointedly showing the ability of certain materials such as soapstone to weather thermal shock better than untempered clay cooking balls (Sassaman 1993). Although he admits this might not make much difference during typical earth-oven cooking, he suggests that the low surface area of a baked clay cooking ball versus the high surface area of soapstone would transfer heat more efficiently. I would offer sandstone as another viable option for thermal shock resistant and increased surface area. Due to the porous nature of sandstone, it has increased resistance to thermal shock, and the nature of its formation allows for greater surface area. This would make the labor spent on sandstone collection and transport a wise investment, and the sandstone cobbles could be repeatedly used.

Another aspect of thermal material choice is one of toxicity as mentioned by K.C. Reid (1984) in regards to limestone cobbles, “…use of limestone cobbles as boiling stones would have introduced calcium hydroxides—a potentially deadly toxin—into prehistoric foods” (Benison 1999:291). While limestone is not available in the Pine Hills negating this particular problem, nonetheless, this highlights the importance of material choice during heat transfer especially when steam or water is involved in the cooking facility.

**DISCUSSION**

This theoretical perspective would add credence to the notion of possible subsistence strategies that could support larger populations. Despite the tendency to write off the Pine Hills region as an unpopulated area due to work such as Larsen (1980) and Keller (1982), it has been shown that there has been a prejudice against the Pine Hill region due to “…insufficient attention to adequate sampling and recovery” (Jackson et al. 1999:2). Furthermore, the use of earth-oven technology would prove that a subsistence strategy existed in the region that could exploit available resources for larger populations contrary to Larsen’s argument that the Pine Hills, “…was too impoverished both in terms of wild faunal and floral resources as well as soil fertility, to support Mississippi populations” (Jackson et al. 1999:2). The harsh reality of Pine Hills archaeology remains that recovery rates of cultural material, specifically faunal and botanical, remain low due to aggressive soils and large amounts of precipitation, thus clay and sandstone features play and even greater role in uncovering the truth of prehistoric subsistence.

Although Larsen was concerned specifically with the nature of Mississippian period land and resource use, his work has been extrapolated to imply that the southern longleaf pine forest was only a sporadically used hinterland during earlier prehistoric periods as well” (Jackson et al. 1999:2). Yet, current research has revealed an abundance of resources in the Pine Hills the importance of which has been previously overlooked,
and would help explain the possibility of technological innovation. One clear example of this is the recent revision of the Pine Hills subsistence model:

…the local environment, although characterized by extensive pine forests, was not particularly desolate or barren and offered much of value to prehistoric populations. The attractiveness of the pine forests to birds, particularly bobwhite and turkey, and to some mammals was noted. Additionally, the pine forests themselves were shown to be part of a highly diversified environment that included floodplain forests in lower areas and scrub oaks and other hardwoods in more xeric areas” [Anderson and Smith 2003:141].

If the Pine Hills region was rich in resources, why innovate at all? The most interesting question at the heart of this technological shift in cooking technology involves causation. What was the catalyst for creating this transformative cooking technology? Some archaeologists attribute this technology with the exploitation of lower ranked resources due to a drier environment as mentioned by Jason Weston (2003):

The Late Archaic represents a further development of Middle Archaic patterns with firmly established group territories and certain groups concentrating in the use of specific types of food sources found within their territory (Black and McGraw 1985). Burned rock middens (earth-ovens) used in cooking plant foods became much more frequent in this period. The spread in earth-oven technology may have been due to an increased reliance on plant species resistant to drier conditions (i.e. sotol, lechuguilla, yucca, prickly pear) (Johnson and Goode 1994)” [Weston 2003:12].

This model fits nicely with our own Pine Hills region, where subsistence stress during the Hypsithermal period has been posited (McMakin 1998; Keith 1995; Jackson 2000). It also helps explain the procurement strategy of “lower ranked resources” (Smith et al. 2001). It has been further postulated that these “lower ranked resources”, namely plant, would be more predictable with less associated risk. For example, one tool available to help manage and exploit root resources would have been fire (Smith et al. 2001:173).

The negative aspect of procuring these resources would be increased handling costs (Smith et al. 2001:170). This could account for the increase in specialized cooking technologies during the Middle and Late Archaic periods, yet a reorganization of subsistence strategies would be required in order to harness the available foods during subsistence stress. This strategy reorganization has implications for the internal social organization of the both the minimum band and maximum band groupings (Wobst 1974).

FOCUSED EXRACTIVE TECHNOLOGY

The types of cooking technology seen in the Pine Hills suggest the possibility of a focused extractive system which Tom Dillehay defines as “a system that revolved
seasonally around a subsistence economy oriented toward the exploitation of a specific resource zone rather than a broader environmental setting” (Dillehay 1975:89-90). This is not to suggest that the total subsistence requirements are met by one extracted resource, but rather that a subsistence strategy could be developed seasonally around certain resources (Dillehay 1975).

This type of system would affect site choice, group organization, and seasonality of occupation. Site choice would entail knowledge of the production capability of the resource to be extracted. A site would be preferred near the resource in order to reduce labor costs and increased intensification of extraction. Available materials for resource processing would also need to in close proximity. These requirements would potentially eliminate certain areas devoid of these characteristics. Group organization would need to be based upon the type of residence established at the site. Anderson notes that a collecting strategy would best describe the focused extractive system and argues:

Collectors, by contrast, provision consumers with very few residential moves, which implies an incongruence between critical resources that necessitates the deployment of logistical strategies…In the case of spatial incongruence, hunter-gatherers will generally locate a residence near the critical resource with greatest bulk demand and will procure the other resources through specially composed logistical task groups that bring resources back to the base camp” [Anderson and Sassaman 1996:115].

These factors of focused extractive system procurement hint at a reduction in possible base camp areas during subsistence stress. Sites would have to be chosen carefully in order to provide the bulk resources needed for survival. The basic infrastructure of the site would need high labor investment in order to efficiently process incoming resources (Walthall 1990).

Another important question raised by using a focused extractive system during a time of subsistence stress is one of conflict and competition. Dillehay mentions the fact that:

…it seems likely that an exchange system between various zones would have reduced conflict by restricting exposure for competition of goods within a particular zone. Such a concept exemplifies another important point—could it be that a focused extractive system was employed for the purpose of reducing conflict between social units as well as to minimize labor expended extracting food products” [Dillehay 1975:98].

This is in line with other theories of resource instability and cooperation. “Robert Kelley (1991:143) suggests that in regions where resource fluctuations are spatially heterogeneous, social relationships often serve as useful risk-reducing strategies” (Jefferies 2004:71). My argument would be that cooperation would have to be rooted, no pun intended, in some type of successful mode of production (i.e. clay-lined earth-ovens).
“A culture harnesses and delivers energy; it extracts energy from nature and transforms it into people, material goods, and work, into political systems and the generation of ideas, into social customs and into adherence to them” (Sahlins and Service 1973:35). Any investment in trade or technology could possibly lead to changes in the social organization of the group, and using the premise of a focused extractive system, areas containing highly sought resources would create zones of competition. This could theoretically increase the importance of minimum bands forming more socially circumscribed maximum band groups in order to delineate and exploit these zones. Environmental stress during the Hypsithermal forced new technologies to be pursued. This combined with larger populations and increased competition for resources could have potentially forced interaction between maximum bands. It could have also laid the framework, delineated by territorial maximum-sized bands, for long-distance trade networks to be developed. Non-local materials in the Pine Hills region such as Tallahatta Quartzite and Coastal Plain Agate potentially evidence a heavier reliance on trade networks during the Archaic periods. This would further emphasize the increased levels of group interaction and possible interdependence.

Prior to the Archaic period, hunter-gather strategies failed to change the social organization of the band into a territorial unit. So why did this new change occur? Relationship building evidenced by trade networks also indicates some level of information exchange between groups. This could be seen as the ignition toward a sedentary lifeway and the creation of interconnected production units. Investment in a network of relationships is costly especially during a time of subsistence stress. It takes resources to travel and communicate over distances, thus investment in relationship building would need to be anchored in a successful mode of production. The pursuit of relations and technological advances also depict the Archaic peoples as proactive in dealing with a series of economic problems.
CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS
H. Edwin Jackson

REMOTE SENSING IN THE PINE HILLS

The results of the remote sensing project demonstrates the potential of at least two methods of data collection, magnetic susceptibility and conductivity, for identifying prehistoric features typical of archaeological sites in the Pine Hills of southeast Mississippi. Some fine tuning will also be required to improve the segregation of cultural features from non-cultural natural events such as the effects of forest fires. The results of this project serve as a useful starting point for continued development of appropriate field methodologies and data interpretation. Remote sensing clearly has a place in both archaeological research and in cultural resource management by providing cost-effective pre-excavation information.

The excavations of 22FO1294 and 22FO1301, though limited in scale have added new information for the growing database of the Pine Hills region. Data recovered from 22FO1294 corroborates the Late Archaic affiliation indicated by the Phase I survey with the collection of another point of this time range (a Gary), but that there are also represented Woodland (undecorated pottery, Duval point) and possibly Early Archaic (fragment of what appears to be a Lost Lake point) components. A Cypress Creek point collected during the initial survey adds a Middle Archaic component for the site. 22FO1301 produced greater evidence for a Middle-to-Late Woodland occupation of the site in the form of both plain and cordmarked grog tempered pottery, as well as two Maybon points and a single Edwards point. This corresponds with the initial Phase I temporal assessment based on a Collins point and grog tempered plain ceramic sherds. Both sites produced evidence of stone tool manufacture in the form of cores, unfinished bifaces, and chipping debris (debitage). Differences in the composition of these byproducts of tool manufacture suggest slightly different emphases at the two sites, possibly reflecting differences in activities or somewhat different technological organization at the different times the sites were occupied.

BAKED CLAY FEATURES AND ADAPTATION TO THE PINE HILLS
Feature excavation was at the very core of the project. While careful recording and excavation of features is not something new for the Pine Hills (e.g. Fields 2005; Jackson and Fields 2000), our near total focus on the features at these two sites brought into focus some of the nuanced differences that exist and may potentially be very important for understanding a range of issues related to adaptation to this particular physiographic province and how adaptive strategies employing different subsistence targets and different cooking technologies may have evolved over time. It is clear that concentrations of baked clay or sandstone cannot simply be regarded as evidence of a hearth. Differences in size and shape, the materials used to construct them, whether in situ or a dump location, all point to sometimes subtle but important clues for cooking practices that may be site or season or period-specific. As Fedoroff’s discussion in Chapter 7 clearly shows, the distinctions have implications for the length of time a cooking facility was used, what may have been effectively cooked in a specifically configured oven or cooking surface, and the size of the group for whom the food was prepared. The research on this particular range of food preparation technologies, drawn from ethnographic accounts as well as archaeological studies, also appear to have important implications for understanding how prehistoric populations may have survived and thrived in the Long Leaf forest ecosystem that was established by the Middle Holocene. We may finally be getting closer to answering a fundamental question about the area, namely why are there so many archaeological sites in an environmental setting described as a “barren” (cf. Keller 1982; Larsen 1980)? An effective cooking technology that emphasized roots and tubers, rather than deciduous forest mast, may have been part of the solution to the particular configuration and relative abundances of resources in the Pine Hills. If reliance of this form of cooking technology, dictated by the persistence of the Long Leaf ecosystem, continued to be important after the introduction of pottery into the area sometime after 1000 B.C. this might help to answer a second curious aspect of the Pine Hills’ later prehistory, specifically, why don’t Woodland sites produce ceramic artifacts in densities comparable to other areas? In the Pine Hills, sites often produce single “pot breaks” or else the very low densities of sherds exhibited by 22FO1294 and 22FO1301. Comparable excavation of any site in the Lower Mississippi Valley would produce sherds numbering in the hundreds, compared to these two sites, which produced 9 and 31 sherds, respectively. We know that ceramics are in use by the Middle Gulf Formational represented by many collections of Alexander style ceramics from sites locally. However, if, even as ceramic containers became prevalent for storage, mixing and serving, the primary cooking technology continued to rely on some form of earth oven, then it’s at least conceivable that the rate of pottery breakage and discard was significantly lower here than for populations that relied on ceramic vessels for cooking over fires. Admittedly, this gets us far beyond our nascent understanding of the roles of different cooking technologies at different times in prehistory, but the foregoing brings into focus how future research might be structured to make significant inroads into the interpretation of prehistoric cultures in the Pine Hills.

THE QUESTION OF NATIONAL REGISTER ELIGIBILITY
Although it was not the purpose of this project to specifically address the National Register eligibility of 22FO1294 and 22FO1301, the data resulting from the excavation certainly are pertinent to the question. Both sites were classified as “potentially eligible” during the post Katrina survey by Fields (2007). Consideration of eligibility would be within the context of Criterion D, the potential for producing significant new information about the past at a local state or national scale. Given the important new information produced by very limited excavations, additional excavation has a very high potential for significantly contributing to our understanding of prehistory. At 22FO1294, only a sample of remote-sensed anomalies was excavated, and no excavation beyond identified anomalies was undertaken. At 22FO1301, fewer features were identified by remote sensing and on the eastern half of the site, no anomalies were recorded. One obvious question that could be answered by additional excavation is whether remote sensing actually identified all the features present at the site. What categories of features may be systematically underrepresented by remote-sensed data? Alternatively, feature-free areas must have been devoted to other activities. With additional excavation it would be possible to examine the spatial structure of activities anchored by feature locations, possible allowing the detection of specific kinds of activity areas. Additional excavation could delineate the vertical and horizontal distribution of chronological different occupations, possibly permitting the segregation of different feature types and their associations with specific occupations. Despite the limited nature of the present investigation, the potential of these sites for producing significant new information is clearly present. Therefore for management purposes it would be fair to recommend that these sites be considered as eligible for inclusion on the NRHP.
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