

**Ritual and Subsistence:
Paleobotany at the Smith Creek Site (22wk526)**

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Abstract

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The Smith Creek Archaeological Project focuses on a mound site in Wilkinson County, Mississippi. The site (22Wk526) has three earthen mounds surrounding an open plaza dating to the Coles Creek period (AD 700 – 1200) and a probable village area at the south end of the site dating to the Anna Phase of the Plaquemine period (AD 1200 – 1350). This thesis examines paleobotanical material from the flotation and water screening samples from this village area. The discussion centers around both subsistence, with a focus on the beginnings of corn agriculture, and ritual uses of plants, with a focus on sweet gum. Additionally, other plant remains found at the site will be discussed in terms of what they illuminate about the use of plants at the Coles Creek-Plaquemine transition.

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Chapter 1

Introduction

The Lower Mississippi Valley (LMV) in the southeastern United States has a rich cultural history. The area has been occupied from at least 8,000 BC by various Native American cultures. The primary cultures examined in this thesis are today called Coles Creek (AD 750-1200) and Plaquemine (AD 1200-1730). Coles Creek, which spans the Late Woodland and Mississippi periods, is known for its ceremonial earthen mound centers. While mounds have been attested in the archaeological record well before Coles Creek, it is then that they become flat-topped mounds that could have potentially housed structures on their summits. Coles Creek people subsisted off a diet of wild plants and animals. The plants were gathered from the surrounding forest and may have been encouraged to grow close to human communities. While a few wild, local plants eventually became domesticated, the primary plant food source for this people was wild and undomesticated.

Plaquemine is very similar to Coles Creek, with patterns of settlements surrounding ceremonial mound and plaza complexes. However, major socio-political shifts took place at this transition with largely egalitarian and communally-oriented groups becoming gradually more hierarchical. Other differentiators between these cultures are the pottery, which is stylistically distinct, and the subsistence patterns employed. Plaquemine subsistence accounts for the introduction of corn agriculture, which occurs quite late in the LMV.

The Smith Creek site (22Wk526) in Wilkinson County, Mississippi, a mound and plaza site, forms the primary case study for this thesis. Excavation at the site in the summer of 2015 showed that the site's occupation spanned the Coles Creek and Plaquemine periods, hence the focus on them. Examining the paleobotanical data from Smith Creek and comparing it with the

expected cultural subsistence finds leads to several points of discussion beyond simply assuring Smith Creek fit into the typical regional and temporal patterns. Preliminary analysis of the 2015 field season was primarily geared at establishing the basic plants used at the site and to specifically search for corn, which had been noticed in the field. The presence of this corn in the South Plaza is what provided the impetus to begin analysis with these samples.

The majority of the plants recovered during the 2015 season fall into the expected suite of wild plants for Coles Creek and Plaquemine. The corn distinguishes a section of the site as a Plaquemine deposit, though further investigations will be needed to know how widespread this occupation was. Finally, a puzzling find of a charcoal pit containing copious amounts of burnt sweetgum allows for the examination of non-subsistence plant use. This could have been used for utilitarian or ritual purposes, though regardless of this Feature's purpose, sweetgum on site was almost certainly used medicinally as well. Finally, when comparing Smith Creek to other sites, current Smith Creek data indicates that it aligns well with another terminal Coles Creek site. However, for more comparisons to be made, more paleobotanical data from Smith Creek need to be collected and analyzed.

After this introduction, chapter 2 provides a summary of the cultural occupation and history of plant domestication in the LMV, comparing it to the larger American Southeast when appropriate. Chapter 3 details the survey and excavation history of the Smith Creek site. Methodologies are given for excavations and paleobotanical recovery. Chapter 4 lists the plants recovered by category, describes the location from which the plants were recovered, and provides a brief discussion of their likely uses. Chapter 5 is a discussion of the most interesting plants found at the site, corn and sweetgum. It closes with a comparison of the plant assemblage at Smith Creek to the contemporary sites of Feltus (22JE500) and Lake Providence (16EC6).

Chapter 6 is a concluding chapter that draws together the theoretical background, Smith Creek data, and botanical research of the larger Southeast.

Chapter 2

Background

It is now commonly accepted that the Eastern United States served as a primary center of domestication, where native plants, such as chenopodium, were cultivated and eventually domesticated in prehistoric times. The LMV, a subregion within the American Southeast, saw a slow and gradual transition from hunting and gathering to an agricultural system consisting of both local and imported domesticates. This history of domestication is here outlined starting with the transition to the Holocene, and proceeding through the occupation era of Smith Creek, where the primary data for this thesis was obtained. In addition to agricultural innovations, the emphasis on foraging in the LMV remained, often barely diminished. The site of Smith Creek (22Wk526), where the material for this thesis was collected during the 2015 field season, is located in Wilkinson County, Mississippi, solidly in the LMV region. The site has three mounds surrounding an open plaza. Excavations in 2013 and 2015 suggest that the mounds were constructed during the Coles Creek period (AD 750 - 1200). Signs of utilization of the site's southern plaza are thought to have been from the subsequent Plaquemine period (AD 1200 - 1730), due to the pottery recovered during excavation. As the decoration of pottery changes rapidly and dramatically through time, it is possible to match the sherds recovered with the period they were made.

Before examining the specific plant remains found at the site, and attempting to interpret them, it is necessary to review the history of human and plant interaction in the LMV. The following sections outline this history so that the Smith Creek finds can be properly contextualized, and arguments can be made for the uses and significance of the various plants recovered.

Cultural History

The Mississippi Valley, spanning the length of the Mississippi River from Minnesota to the Gulf of Mexico, is traditionally divided into Upper, Lower, and Central sections, each with slightly different cultural trajectories. Smith Creek is located in the LMV, so this background will be focused on that area, with the occasional comparison to other locations. The basic chronology of the LMV is presented in Figure 1.

The Holocene era, which many scholars believe was integral to humans beginning to experiment with plants, began just over 12,000 years ago. The Early Archaic period (8,000 - 6,000 BC) began shortly after this transition from the Pleistocene to the warmer Holocene (Fritz 2000; Rees 2010). Settlements in the Early Archaic were characterized by the beginning of a pattern of regional diversification, which is most apparent in the archaeological record through stylistic variation in projectile points. Subsistence consisted of wild plant use and hunting local small, medium, and large animals, which was a transition from the focus on hunting megafauna during earlier periods (Rees 2010).

Some of the earliest earthen mounds in the American Southeast, considered to be cultural and ritual centers for the people of the area, are attributed to Middle Archaic (6,000 - 3,000 BC) cultures. The earliest dated mounds are from 3,700 BC at the site of Watson Brake (16OU175) in Ouachita Parish, Louisiana, though there may have been mounds at other sites constructed much earlier in prehistory that have yet to be definitively dated (Saunders 2010). These early mound centers were presumably used for ceremonial purposes. It is not until later, however, that there is

Temporal Units		Cultural Units	
Period	Date	Phase	Culture
Historic	AD 1730	Natchez	Plaquemine
Mississippi 2	AD 1682	Emerald	
	AD 1500	Foster	
	AD 1350	Anna	
	AD 1200	Gordon	
Mississippi 1	AD 1100	Balmoral	Coles Creek
Late Woodland 2	AD 1000	Ballina	
	AD 850	Sundown	
	AD 750	Hamilton Ridge	
Late Woodland 1	AD 400	Issaquena	Marksville
Middle Woodland	AD 200	Grand Gulf	
Early Woodland	AD 1	Homochitto	Tchefuncte
Late Archaic 2	500 BC		Poverty Point
Late Archaic 1	1700 BC		
Middle Archaic	3000 BC		
Early Archaic	6000 BC		
Paleoindian	8000 BC		

Figure 1: Chronology in the Lower Mississippi Valley (Kassabaum 2014:Figure 1.3)

an increase in evidence for repeated ritual use, leading scholars to assume an accompanied increase in social complexity. Despite the evidence of ritual centers, these Archaic cultures are

thought to be small community groups living in egalitarian and mobile bands (Kidder and Fritz 1993).

Much of our understanding of the subsistence practices of Middle Archaic people comes from Watson Brake. The site has exceptionally well preserved middens due to the high pH of the soil. Excavations there have revealed faunal remains of deer indicating off-site butchery, small mammals, waterfowl, and turtles (Saunders et al. 2005). The plant remains found include nuts, berries, and weeds, such as goosefoot, which was eventually domesticated in the area; however, when examined for the typical suite of domestication characteristics, there is no evidence that native plants were being domesticated at this juncture. Overall, these patterns indicate an increase in localism and evidence of seasonal subsistence.

In the Late Archaic (3,000 - 500 BC), populations continue to show evidence for the exploitation of local resources. While most areas of the Southeast began to experiment with farming during this period, the LMV remains unique in that there is no evidence that these people were depending on the Eastern Agricultural Complex (Fritz 2000).

Dating to this time frame are a suite of sites classified as Poverty Point culture sites (1700 - 500 BC), after the earthenworks in West Carroll Parish, Louisiana. These sites see a resuming of mound building that seems to have ceased for about 1,000 years after the Middle Archaic. Some characteristics of Poverty Point are unusual compared to the sites that have been discussed thus far, as there is evidence of a broad trade network, indicated by the presence of non-local stone materials. However, the subsistence trends seem to hold. Subsistence at these sites is focused on local wild foods, with little evidence of storage. While there is the possibility that these populations had ovens, which would have changed the way they prepared foods, reliance on wild plants and animals remained the norm throughout the Archaic (Gibson 2010).

Despite the impressive nature of sites such as Poverty Point, most Archaic mound sites were abandoned before or as Woodland-period cultures emerged. Early Woodland (500 BC - AD 1) occupations typically show settlement patterns of residential sites surrounding mound centers and relative sedentism. The subsistence strategy continues to be locally centered, with hunting, fishing, and gathering as the modes of acquiring food. The botanical foods continued to be typical plants that had been utilized in the Southeast up to this point (Hays and Weinstein 2010).

The Middle Woodland period (AD 1 - 400) in the LMV is best known for the Marksville site in Avoyelles Parish, Louisiana, which is often used as a microcosm for the whole period. There are not many Middle Woodland habitation sites excavated, so most of the data about life in this period come from communal sites with earthen mounds. The subsistence remains from these sites show that food continued to be locally sourced via hunting, gathering, and fishing, even for large feasting events (McGimsey 2010).

Due to the presence of earthwork enclosures at Marksville and similarities in the ceramic motifs, archaeologists have long considered LMV Middle Woodland sites to be associated with contemporary Hopewell sites in the Ohio River Valley. While there was certainly influence and interaction, Hopewell was a distinct culture, characterized by extensive long distance trade and elaborate earthworks in a way that the LMV Middle Woodland was not.

The Late Woodland (AD 400 - 1000) is a period of rapid change in the LMV, thus the early portion of the Late Woodland and the late portion of the Late Woodland are often discussed separately. Typically the early portion of the Late Woodland in the southern and western portions of the LMV is discussed in terms of the Troyville culture and the northern and eastern areas are discussed in terms of the Baytown culture (Lee 2010).

Both Baytown and Troyville cultures show evidence of continued mound construction and a subsistence pattern focused on the natural flora and fauna, supplemented with some cultivated foods, coupled with hunting and fishing (Fritz 2000; Lee 2010). The history of domestication is discussed in further detail in the next section, where more information will be provided about what is meant by “cultivation” in this context. Baytown cultures also show evidence for long distance trade. Overall, for both groups, there is evidence of regional differentiation during this time period, and the strategies adopted by these cultures eventually led to the emergence of more complex societies during the subsequent periods. It was during this time that some would argue the emergence of local sociopolitical organization can first be seen (Lee 2010).

The subsequent Coles Creek culture (AD 750 - 1200) is notable for its square-sided, flat-topped mounds (Kidder and Fritz 1993). Additionally, there are changes in settlement patterns, mortuary practices, and pottery style that help define the start of the period. During Coles Creek, people shift from focusing on the construction of burial mounds to constructing platform mounds that could have served as foundations for structures. Mounds were constructed in groups of two to four surrounding open plazas (Steponaitis 1986). There is evidence of increasing interaction among groups and a continuation of the political complexity that began to emerge during the earlier portion of the Late Woodland. These changes occurred during the period that Emergent Mississippian societies were present in other parts of the Mississippi Valley, which led to a scholarly convention of discussing Coles Creek primarily as a precursor to Mississippian. However, it is now commonly accepted that Coles Creek is a distinct cultural entity that developed out of the earlier, local Late Woodland groups (Roe and Schilling 2010).

The plants used during this period are particularly pertinent to the discussion in this paper because the primary occupation of Smith Creek was during Coles Creek times. Typically, there are some examples of the use of domesticated plants, all local species, although this certainly was not occurring at every site. Furthermore, there has been no evidence found that maize agriculture was occurring at this time (Fritz and Kidder 1993; Kidder 1992; Roe and Schilling 2010). All things considered, wild plants and animals still provided the primary food sources.

The following Plaquemine culture (1200 AD- 1730 AD) is generally thought to differ from its Coles Creek predecessor in subsistence strategies and socio-political organization (Roe 2006). It shows the biggest change in subsistence strategies in the prehistory of the LMV, with the introduction of maize agriculture. Other features of the period are stylistically distinct pottery and continued construction and use of platform mound and plaza centers. The mound centers identified as Plaquemine show a mixture of Coles Creek and Mississippian, a contemporaneous culture in the Central Mississippi Valley, features (Rees 2010).

In the next section, I will focus in on the history of cultivation in the LMV, using this cultural chronology as a framework in which to place these developments. Following that, the remainder of this thesis focuses on the Coles Creek and Plaquemine periods, as it was during that time that the most significant activities were taking place at Smith Creek.

Cultivation History

The history of plant use in the American Southeast centers on use and manipulation of wild plants as opposed to significant anthropogenic changes in the native or imported flora (Fritz 2000; Smith 2006; Kidder 1992). However, there are four domesticates local to the region considered to have undergone human induced genetic change. They are the sunflower,

Helianthus annuus, chenopod or goosefoot, *Chenopodium berlandieri*, marshelder, *Iva annua*, and potentially squash, *Cucurbita pepo*. The earliest evidence of domestication indicates that this process began about 7,000 years ago in Eastern North America in general, though the date was later in the American Southeast, and far later in the LMV, which is notable for its uniquely late uptake of agriculture (Fritz 1990).

Domesticates introduced to the American Southeast from Mexico, include maize, *Zea mays*, and beans, *Phaseolus vulgaris*. Mexico is also a potential source for squash, *Cucurbita pepo*. These appear in the archaeological record of the greater Southeast around 2,000 years before present, but are not particularly widespread until around 900 years ago in the LMV (Fritz 2000). These crops are merely the domesticated plants in the Southeast and by extension the LMV, and are by no means the only ones utilized or cultivated. Additionally, there may also have been plants that were domesticated, but never came to show the morphological traits associated with this. In lieu of this morphological evidence, it has been argued that plants co-occurring with domesticates, particularly outside of their natural range, can be taken to indicate intensive human interaction. Also important to the LMV subsistence are knotweed, maygrass, various nuts and berries, not to mention fauna that was exploited.

Domestication is a long process, and genetic changes can only happen over the course of several generations. Through the process of domestication, plants are selected to have characteristics that make them better food sources for humans. Examples of the most common morphological changes include thinner seed coats, larger fruits, and stronger seed attachments to the stems of a plant, making it harder for the plant to self propagate and increasing its dependence on humans (Ibara et al. 2007). In order for a plant to become domesticated, it must first undergo periods of cultivation, in which humans encourage the plant's propagation, thereby

selecting for specific genetic traits on specific plants. After a sufficient period of this, the plant will undergo genetic change, at which point it is considered to be domesticated (Asch and Green 1992). Plants may have been domesticated in all but genetics for a long period of time. If people were finally achieving these morphological changes in the last 1000 years this paper examines, they must have been cultivating these plants for a substantial amount of time before then.

Indeed, the paleobotanical evidence supports this. Towards the end of the Late Archaic period, the first domesticated plants begin to appear in the archaeological record in the Central Mississippi River Valley, in locations around the Midwest (Fritz 1992; Fritz 2000). Between 5,000 and 4,000 years ago in the Central Valley, squash, sunflower, marshelder, and chenopod all present evidence of cultivation (Smith 2006). While animals were hunted in the wild, and wild plants such as knotweed and maygrass never stopped being important food sources, plants were being brought back into communities and tended to. Furthermore, these were all local plants and it would be another 2,000 years before maize reached the American Southeast (Fritz 2000). Tobacco, albeit not a food crop, is not attested until 1,800 years ago (Fritz 1990), though the route tobacco took to domestication could be different because of its ritual status. Regardless, people had the freedom and food security from hunting and gathering to experiment with agriculture, thus modifying, in this case genetically, the plants around them and fundamentally altering their niche.

As previously mentioned, the LMV, where Smith Creek is located, is notable for having a much later trajectory into domestication. While sites in Ohio showed evidence of cultivation during the Archaic, and domestication of native seed bearing crops as early as the Middle Woodland, plants recovered from both Watson Brake and Poverty Point do not show signs of domestication. It would not be until the Coles Creek period that scholars started confidently

identifying low level cultivation of native crops, and not until Plaquemine that evidence for corn agriculture appears (Fritz 2000). This evidence suggests that the natural resources, with minimal human intervention, proved sufficient to support not only agricultural experimentation, but a monument-building culture.

Looking specifically at the cultures present at Smith Creek, Coles Creek shows heavy utilization of wild plants. However, the chenopodium from several sites, when examined with a scanning electron microscope, shows a seed coat thickness which could indicate a low level of cultivation (Fritz 2000, Kassabaum 2014), and it is reasonable to think that other native plants may have been cultivated in a similar way.

When the Coles Creek culture was first studied, it was assumed that agriculture must have played a large part in subsistence, for the practice of large-scale mound building displayed massive amounts of organized labor (Sherwood and Kidder 2011). Maize seemed the reasonable solution. As Coles Creek sites were increasingly studied, and studied with a focus on the paleobotanical remains, it became apparent that corn was not present in these contexts (Fritz and Kidder 1993). Though the earliest maize dated to the LMV seems to be about AD 800 - 900 there is no evidence it was being cultivated and utilized by people at the time, meaning that a conscious decision was being made to focus solely on local plants (Fritz 1990).

Again, this evidences the LMV substantially farther behind the rest of the Mississippi River Valley in terms of cultivation trends. Maize had been introduced in the Central River Valley around AD 100 and intensively adopted by AD 700. The Upper River Valley saw potential maize introduction around AD 500 and intensification at AD 900. The LMV, even once corn is present, does not show signs of intensification until the start of Plaquemine at AD 1200.

In Plaquemine, agriculture is well documented, and domesticated plants came to the region from several sources. Some were locally domesticated, such as chenopodium, some were imported as already domesticated plants from other regions, like beans and corn, and some were imported as undomesticated plants and then turned into crops in the Southeast when they reached the settlements there, as some varieties of squash likely were (Smith 2006). As previously mentioned, around AD 800-900 maize was introduced to the LMV from Mexico as a domesticate, and it is several hundred years later at Plaquemine sites that maize begins to appear as a food source in the LMV. Additionally, as would be expected given the abundance of the region, local wild plants continued to form the basis of food for these people as well.

While the knowledge of a plant's status as wild or domesticated can be important for drawing conclusions about the people who utilize it, it can be difficult to identify if a plant is domesticated, let alone when and where said domestication happened. Several plants are still fairly contested in this regard in the Southeast. As previously mentioned, while squash was certainly a domesticate of the Southeast, it is uncertain if it was imported this way, or domesticated later (Fritz 1990; Smith 2006).

Taken comprehensively, the patterns of plant use in the American Southeast presents several clear trends. Clearly humans were interacting with their environment in a way that fundamentally changed how it was used. Furthermore, it seems compelling that this was not driven from desperation and necessity, but rather from a security that allowed for experimentation. Although the availability of wild plants and animals at times incentivized against the effort of cultivation, the region's eventual cultivation would not have occurred without that food base.

The LMV transition to agriculture was characterized, even more strongly than the American Southeast in general, by the fact that the area's natural resources were abundant (Fritz 2000). For example, though the LMV was frost free for approximately 229 days out of the year, agriculture developed no earlier than areas such as the Northern Midwest, and in many cases developed later than less climactically ideal regions (Fritz 2000). On the other hand, while the climate may not have put any pressure of populations to develop agriculture, it certainly made the process of experimenting with plant cultivation and domestication lower risk so regardless of the choices being made by specific populations to cultivate or let be wild plants, climatic considerations were certainly in play.

It is because of this late entry into agriculture that this area that the Coles Creek to Plaquemine transition is so interesting. The Smith Creek Archaeological Project provides the opportunity to examine this transition in closer detail. The study of the Coles Creek-Plaquemine transition is the study of two cultures that are only separated by a few centuries, yet something as integral, important, and on some level basic as how they procure their food has changed so dramatically.

Chapter 3

Excavations at Smith Creek

Smith Creek Survey History

The Smith Creek site is located in Wilkinson County, Mississippi on the bluff edge overlooking the Mississippi River floodplain. It consists of three mounds A, B, and C, dating to the Coles Creek period surrounding an open plaza, a layout which is typical of Coles Creek sites (Figure 2). The site has a long history of survey and excavation, starting with Fred Kniffen of the Lower Mississippi Survey, who visited and surface collected the site in 1932. After this, James Ford collected the site again in 1933, 1937, and 1938 (Nelson et al. 2013). Philip Phillips, also from the Lower Mississippi Survey, mapped and surface collected the site in 1956 (Steponaitis et al. 2002). Mound B, a burial mound, was excavated J. Ashley Sibley and the Junior Archaeological Society in the 1950s, 60s, and 70s, and some of the burials excavated at that time were recently studied by the Louisiana Department of Justice (Ellis 1963, 1964; Hallings and Seidmann 2016). Later in the 1970s, Joe Collins, a local amateur archaeologist excavated a deep midden along the southern edge of the plaza, where the 2015 units were later placed (Boggess and Ensor 1993).

Recently, in 2013, Mounds A and C and the eastern edge of the plaza were investigated as part of the Mississippi Mound Trail by the University of North Carolina, Chapel Hill. These various surface collections and initial excavations indicated that the site was rich in pottery and organic materials (Kassabaum, Steponaitis, and Melton 2014). From the pottery types uncovered in these excavations and a series of radiocarbon dates from the Mississippi Mound Trail Project, the site was assumed to be primarily Coles Creek. Excavations in 2015 in Mounds A and C

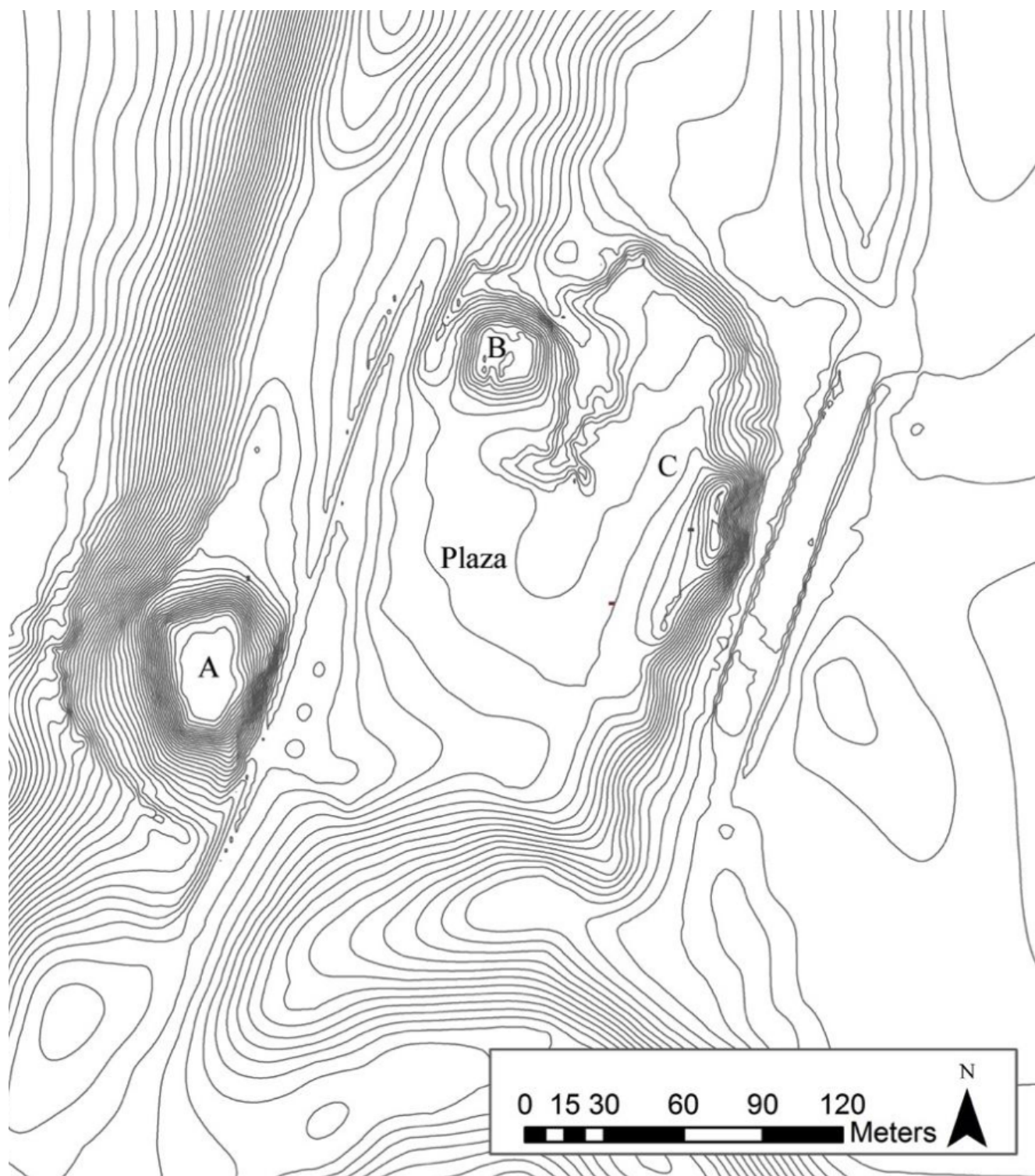


Figure 2: Map of Smith Creek (22Wk526)

further confirmed this date and 2013 and 2015 excavations in eastern and southern plaza were found to contain mixed Coles Creek and Plaquemine deposits.

2015 Field Season

2015 was the first season for the University of Pennsylvania's Smith Creek Archaeological Project. A unit was opened half way up the eastern slope of Mound A, 1046R466, and the western slope of Mound C, 1077R625. Two contiguous units, 989R546 and 991R546, were opened in the southern portion of the plaza. The goals of these excavations were to determine more about the nature of the society during the Coles Creek period, which could then be applied to answering larger questions about how social structure and subsistence changed from the periods surrounding it.

General Conclusions: Site Chronology

During the 2015 season, the mounds were confirmed to be Coles Creek, due to stylistic dating of pottery and, in the case of Mound A, Accelerator Mass Spectrometry (AMS) radiocarbon dating of plant material from the midden. AMS dating is a specific type of radiocarbon dating that targets carbon 14. It requires smaller sample sizes and gives more precise dates than other forms of carbon dating making it ideal for plant remains (Beta Analytic Radiocarbon Dating).

The chronology of the South Plaza proved to be more complicated. Over the initial weeks of 2015 excavations, sherds with clear Plaquemine designs were found in the dry screen in significant numbers suggesting the units contained deposit that dated later than previously thought. Once corn was found in a water screening sample from the same unit, this suspicion seemed confirmed. However, excavations were also recovering significant amounts of Coles

Creek ceramic material. AMS radiocarbon dates on plant material from the midden and features uncovered in the South Plaza indicated that at least part of the plaza occupation took place during the Coles Creek period, as originally suspected, while some activity undoubtedly continued into Plaquemine. Further excavations in subsequent seasons will help elucidate this.

South Plaza (989R546 and 991R546)

The South Plaza was excavated in an attempt to discern what off-mound activities were taking place at Smith Creek. Feltus (22JE500), a contemporary site 35 miles to the north, showed significant ritual activity in its southern plaza (Kassabaum 2014). Furthermore, Joe Collins' excavations in the Smith Creek South Plaza found a line of posts, significant midden, and evidence of charcoal pits (Boggess and Ensor 1993). Combined, this evidence suggested that the South Plaza had the potential to provide important information about the use of the Smith Creek landscape more broadly.

The 2015 units yielded a thick midden, rich in pottery and paleobotanical remains, with 31 possible features beneath. Some of these proved to be false features when excavated, and some could be seen extending higher into the profile and therefore had likely been missed at their tops in the previous level. Figure 3 shows a profile map of the units' walls, showing the stratigraphy and some features which were bisected by the excavation limits. The stratigraphy shows a plow zone, which contained modern and historic contamination, on top of a midden zone rich in archaeological material. The A horizon, which would have been the topsoil during prehistoric occupation, is unidentifiable, however the E horizon, which would have lain between the topsoil and sterile subsoil, and the Bt Horizon, which is the sterile subsoil, are clearly visible.

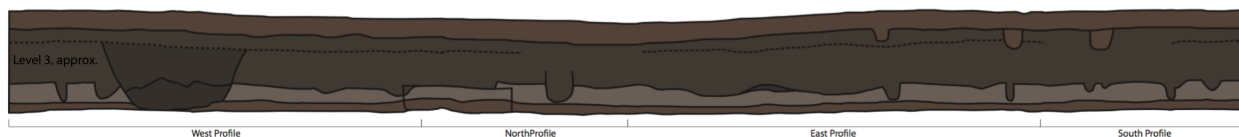


Figure 3: Stratigraphy of the South Plaza, Units 989R546 and 991R546

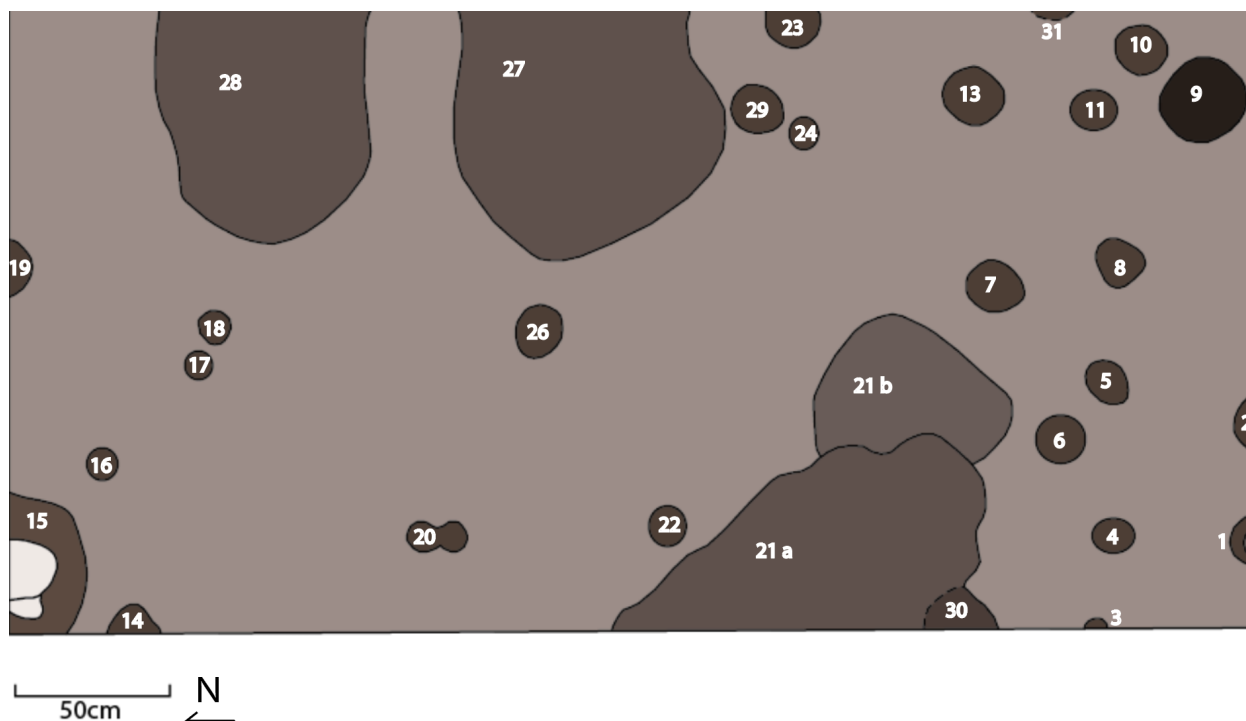


Figure 4: Floor map of the South Plaza, Units 989R546 and 991R546, with features labeled

Figure 4 shows a plan view map of the units' floor containing features. These features are a combination of 5 pits (Features 9, 15, 21A and B, 27, 28) and 24 possible post holes (Features 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 16, 17, 18, 19, 20, 22, 23, 24, 26, 29, 30, 31), some of which yielded pottery and botanical remains.

Without further excavations it is difficult to know the exactly when the features were dug and the midden was laid down. The best conclusion at the present is that the southern plaza area of the site was used, substantially, in at least two different time periods, Coles Creek and Plaquemine.

Methods

Excavation Methods

While some levels in the mounds were excavated stratigraphically, the South Plaza was done in arbitrary levels in two contiguous 2 x 2 meter trenches. Coring indicated that the first level should be 30 cm to clear the plow zone and ensure subsequent levels were free of modern and historic contamination. Levels 2-4 were dug in 20 cm intervals. Excavations were done with shovels, pointed trowels, and edging trowels. Levels 2 and 3 were entirely within the midden zone, while Level 4 reached the sterile subsoil. When the bottom of Level 4 revealed features, those were dug individually, by bisecting each feature so that profile photographs and drawings could be made. Excluding the features, and any samples taken for water screening and flotation, the dirt from these levels was dry screened through a ½” mesh and artifacts from each level were kept separated.

Paleobotanical Recovery

The material examined in this thesis was recovered during the 2015 excavations. The vast majority of the paleobotanical remains were recovered via flotation. For this study, all of the flotation samples were taken from Level 3 excavations in both units, which comprises 53 to 76 cm below the datum and falls entirely within the midden layer, and from Feature 9, a small charcoal pit in the southeastern corner of the excavation.

In a unique case, some carbonized material was found *in situ* in Feature 9 which was carefully extracted with much of the surrounding soil matrix, packaged, and brought back to the laboratory. Additionally, paleobotanical materials were recovered from both the dry and water screens when noted, though that material is not included in the formal analyses.

The methods used for in-field recovery were consistent with the standard practices for this region. Each level below the perceived plow zone was sampled for water screening and flotation. Water screening samples consisted of five five-gallon buckets, and were screened with a hose through 1/4 and 1/16th inch screens in the field. The presence of corn in the water screening sample from Level 3 in 989R546 provided the basis for this research's focus on the South Plaza.

Flotation, mentioned above, is a method by which water is agitated, either mechanically or manually, causing the now cleaned carbonized plant remains in a sample to either sink to the bottom of a tank, comprising a part of the heavy fraction along with ceramics, stone, and other artifactual materials, or float to the top to be skimmed off into the light fraction. Since the introduction of this technique much finer and more diverse sets of botanical remains have been recovered from sites (Marston, Warinner, and Guedes 2014). Flotation samples at Smith Creek were generally 10 liters and were processed in the field with a mechanized flotation machine. In the case of certain features, the entire context was floated, resulting in samples of more or less volume. In the case of large features, left over soil was either water screened or dry screened depending on the discretion of the unit supervisor.

Both recovery methods introduce an artificial bias to the sample. The deposition itself contains a limited number of the plants that would have been utilized prehistorically, a number that would be further decreased by archaeological sampling and subsequent processing. While methods were chosen in an attempt to recover the most comprehensive sample, all data are, by nature, partial.

Samples were further processed in the Center for the Analysis of Archaeological Materials at the University of Pennsylvania's Museum of Archaeology and Anthropology. In the

lab the flotation samples were processed first as they represented the most consistent method of recovering paleobotanical remains, likely to yield the most numerous and detailed results. All plant material recovered was carbonized, and anything that was not was dismissed as modern contamination. The light fraction was weighed and then put through a geological sieve, dividing it into 2mm, 1.4mm, .71mm, and bottom pan (BP) portions. The 2mm sample was sorted into the categories of wood, nutshell, seeds, archaeological material including bone, shell, lithics, and concretions, and contaminate consisting of modern botanical material and undissolved dirt. The seeds and nutshell were identified when possible. In the 1.4mm, .71mm, and bottom pan fractions, only seeds were pulled and the rest of the material was re-bagged as residue. In cases in which sweetgum, *Liquidambar styraciflua*, was present in the 2mm, 1.4mm, or .71mm fractions it was bagged and counted separately, at first because it was unidentified, and then eventually because it was present in such large quantities that it bore special attention.

Before laboratory processing, the heavy fraction had to be screened to separate artifacts that would be washed by hand and identified with the larger, dry-screened material, such as intact long bones and pottery sherds. Material that passed through the 1/4" screen was stored as bag 2/2 of the same bag number, and brought to the lab for further processing as part of this research. No plant remains were identified in the >1/4" fractions. Once in the lab, the heavy fraction was similarly weighed and sorted through the sieve, though only into 2mm and bottom pan portions. The 2mm was sorted entirely for wood, nutshell, and seeds, and then archaeological materials and contaminant, both categories consisting of the same material as for the light fraction. Similarly the bottom pan was scanned for seeds. Sweet gum was again separated from the 2mm portion, but was not present in the bottom pan.

Only one bag of water screened material was examined (Bag 41), and only the 1/16th-inch fraction was studied due to the presence of corn noted in the field. This sample was scanned for corn and the other material was replaced for further sorting at a later time. Both the remainder of this sample and the other water screening samples still contain large amounts of unsorted botanical material, which could be interesting if examined for another project.

For both the flotation and water screening, all sorting was done with either the naked eye, a low-magnification binocular head magnifier, or a low-powered light microscope. Botanical remains were identified to the species level when possible. When not possible, some were put into a category of multiple possible species, or genus or family-level designations. Samples were sorted by the author and then checked for accuracy by Megan Kassabaum. Resources used to identify plant remains include Martin and Barkley's seed identification manual (1961) and Fritz's Paleoethnobotany laboratory guide (2007). Initially the intent was to sort samples from multiple areas on the site, however the South Plaza produced unexpected information that merited the sole consideration of a thesis of this breadth.

Chapter 4

Plants Recovered

Discussed in this chapter are the plants recovered at Smith Creek during the 2015 field season. All plants recovered are listed in Table 1 and the provenience of each sample is shown in Table 2. Since wood was not identified to genus or species, it is recorded by weight only. Seeds, and other, more specifically identified plants are discussed by count and weight. In the case that a genus or species of plant could be confidently identified it is discussed in detail below. In cases where it was impossible to differentiate between multiple, equally likely identifications, the resulting composite categories are not discussed, and it should be assumed that the seeds fall into one of the two categories making up the label.

The data examined in this section are from four of the Smith Creek samples from 989R546 and 991R546, both in the southern plaza. Because all of these samples essentially come from one area on the site, no intrasite comparisons were made and the data are treated as one set. The purpose of this analysis is less for comparing concentrations of any plant, and more to discuss the plants present at Smith Creek in general. Therefore, with rare exceptions, the data are not standardized, though wood weights are presented to allow for standardization at a later time.

Data are split into the following major categories: nuts, starchy and oily seeds, fruits, and miscellaneous. The four species of nuts identified are native to the region and commonly found at Coles Creeks sites, making them an expected find. Five starchy and oily seed species, that would likely have been eaten for food, were identified. Again, all were expected local plants.

	Common Name	Usages	Taxonomic Name
Nuts	Acorn	Nut (Starchy)	<i>Quercus</i> spp.
	Hickory	Nut (Oily)	<i>Carya</i> spp.
	Pecan	Nut (Oily)	<i>Carya illinoensis</i>
	Walnut	Nut (Oily)	<i>Juglans nigra</i>
Starchy and Oily Seeds	Amaranth	Seeds (Starchy)/Greens	<i>Amaranthus</i> sp.
	Chenopod	Seeds (Starchy)/Greens	<i>Chenopodium</i> sp.
	Cheno-am	Seeds (Starchy)/Greens	<i>Chenopodium/Amaranthus</i> spp.
	Maygrass	Seeds (Starchy)/Greens	<i>Phalaris caroliniana</i>
	Smartweed/Knotweed	Seeds (Starchy)/Greens	<i>Polygonum</i> spp.
	Squash	Seeds (Oily)	<i>Cucurbita</i> sp.
Fruits	Grape	Fruit	<i>Vitis</i> sp.
Other	Corn	Vegetable	<i>Zea mays</i>
	Crabgrass	Weed	<i>Digitaria</i> sp.
	Galium	Medicinal	<i>Galium</i> sp.
	Purslane	Medicinal	<i>Portulaca</i> sp.
	Sweet Gum	Medicinal/Ritual	<i>Liquidambar styraciflua</i>

Table 1: Species identified as Smith Creek

	Catalog Nos.		Analysis Unit	Volume (L)	Plant Weight (g)	Wood Weight (g)	Other Weight (g)
	Heavy	Light					
South Plaza, Midden							
	43	42	989R546	10	1.29	0.69	67.28
	39	38	991R546	10	0.86	0.41	51.45
	67	68	989R546	9	3.20	0.47	13.33
South Plaza, Feature 9							
	108	109	989R546	16	16.30	0.96	6.23

Table 2: Provenience of samples at Smith Creek

Only one sample of a fruit seed was identified, making it a very rare find on the site thus far. The miscellaneous category includes two species likely used medicinally, one weed for which there is no recorded use, corn, a crop that entered the LMV very late, and sweetgum, which has potential medicinal and ritual uses. Overall the samples show an expected assemblage of plants given the region and time period, with sweetgum being the major outlier, due partially to the amount recovered and partially to its scarce identification on other sites in the region.

Nuts

Acorn (*Quercus* spp. Sample: 12 fragments, .14g)

Acorn was predominantly found in the heavy fraction of excavation Level 3 for both units. One very small fragment (<.01g) was collected from the light fraction of the flotation sample from Feature 9. Acorn is a well attested food source of Coles Creek and Plaquemine populations, so its presence could fit with either context (Fritz 2000; Roe and Schilling 2010;

Rees 2010). Acorns trees can be managed, making their nuts an ideal candidate to be gathered and stored for long periods of time. That coupled with their high starch content make them ideal food sources (Kassabaum 2014).

Hickory (*Carya* spp. Sample: 49 fragments, .55 g)

Hickory nutshell, another well attested wild food, was found in every flotation sample analyzed, though typically in the heavy fraction. It was the most prevalent nut found. The presence of hickory could indicate its use as a fuel source, or as a food, and likely both. Hickory trees are found in mixed hardwood forests, where they can be the dominant tree. Many nuts can be harvested at once, if done at the right point in the trees seasonal cycle and the nuts are good sources of protein and fat (Scarry 2003). There are several ethnographic recipes for using hickory nut meat, including soups which involve both nutmeat and nutshell (Fritz et al. 2001)

Pecan (*Carya illinoensis*. Sample: 4 fragments, .02g)

Pecans were found in the heavy fractions of two flotation samples, neither of which were from a feature. Pecan and hickory come from the same family of trees, and share many characteristics, though pecan shell is noticeably thinner. This difference, along the with differences in the internal arrangement of the nut means that the meat was extracted by hand and not crushed (Scarry 2003; Kassabaum 2014). It is worth noting that the comparative ease of processing pecan may have resulted in processing near collection sites, as opposed to consumption sites, and may negatively influence the amount recovered during excavation. (Smith 1996; Kassabaum 2014).

Walnut (*Juglans nigra*. Sample: 17 fragments, .29g)

While walnuts were found in more contexts than pecans, it is again possible that this was due to deposition processes, as pecans are relatively easy to process and may have therefore been processed near the collection site, as opposed to back at Smith Creek. Walnuts are the most calorically dense nut available in the LMV, however they cannot be collected in large quantities in the way that hickory can. (Scarry 2003; Kassabaum 2014). That being said, they are clearly present in the contexts studied and therefore formed at least a part of the diet of these people.

Starchy and Oily Seeds

Amaranth (*Amaranthus* sp. Sample: 3 seeds, <.01g)

Amaranth was found in the light fraction of a flotation sample from Level 3 of unit 989R546. The greens of amaranth were likely eaten when gathered, and the seeds were either consumed then as well, or stored for a later source of carbohydrates (Scarry 2003; Kassabaum 2014). Two seeds from the same context were identified as Cheno-am, because they could not be identified with certainty as either chenopod or amaranth.

Chenopod (*Chenopodium* sp. Sample: 10 seeds, .01g)

The majority of the chenopod was found in Feature 9 (90%) and the remaining seed was recovered from Level 3 of unit 989R546. Chenopod was another good source of supplementary carbohydrates in the LMV (Kassabaum 2014). Additionally, it is one of the few plants native to the Eastern Agricultural Complex that was domesticated pre-corn agriculture (Smith 2006). The chenopodium seeds from Smith Creek were not examined for evidence of domestication, so it is not certain how cultivated they are, though it is likely that people had been working with the plant for some time at this point, due to what is known about Coles Creek sites in general (Fritz

2000). A future project of interest would be examining seed coat thickness on the chenopodium seeds in the Smith Creek samples to investigate the rate of domestication as influenced by corn agriculture. As mentioned above, two seeds of cheno-am were also identified in the sample.

Maygrass (*Phalaris caroliniana* Sample: 6 seeds, .01g)

Maygrass was recovered in both light and heavy fractions from unit 989R546, with no recovery from features. As it is here, maygrass is often found in conjunction with other cultivated foods (Kassabaum 2014). Another source of carbohydrates, is assumed to have been cultivated, though not domesticated by the population at the time (Smith 2006). It is easily transportable and storable, making it a logical addition to the diet (Kassabaum 2014).

Smartweed/knotweed (*Polygonum* spp. Sample: 1 seed, <.01g)

The smartweed/knotweed seed was recovered from Level 3 of excavations in unit 991R546. Another source of carbohydrates, knotweed is an attested wild plant in the LMV (Kassabaum 2014), and another one of the local domesticates in the Eastern Agricultural Complex (Smith 2006). This sample was not examined for evidence of domestication, and due to only having one sample that cannot be identified to species it is unlikely there would be much success if attempted.

Squash (*Cucurbita* sp. Sample: 2 rind fragments, .01g)

The cultivation history of squash is still somewhat in question. While there is evidence of squash being domesticated in Mexico and then entering North America through the Southwest, following the same path as corn, there is also evidence that squash may have been an eastern

North American domesticate (Smith 2006). Means of introduction aside, the plant was definitely cultivated. Squash rind was found in two of the Level 3 samples. In addition to the flesh of a squash, the oily seeds would have provided a good source of calories (Kassabaum 2014). It is probably that these were being consumed on site as well, given what is known about squash use at other sites, though none were recovered.

Two additional fragments were counted as potential squash rind. They share the same internal texture at the other three, but appear to be inverted, and while it is quite possible that the rind shrunk, flipping the structure, it is not known for certain.

Fruits

Grape (*Vitis* sp. Sample: 1 potential seed coat fragment, <.01g)

The fragmentary grape seed was recovered from unit 991R546 and is the only fruit recovered from these samples. As is the case today, this fruit could have been eaten fresh or dried providing additional nutrients to the diet. Additionally, there are medicinal uses for the sap, including the treatment of digestive issues (Kassabaum 2014).

Miscellaneous

Bedstraw (*Galium* sp. Sample: 2 seeds, .01g)

Bedstraw was found in the heavy fraction of two samples. It is a local plant, though was never domesticated (Smith 2006). While there is some debate as to bedstraw seeds being deposited accidentally, the plant also had medicinal purposes. It was used as a laxative and to treat kidney ailments, so it is quite possible that caches of this seed evidence intentional gathering for these purposes (Williams 2000).

Corn (*Zea mays*, Sample: 21 kernels, .15g, 2 probable kernel fragments, .02g)

Corn was found at Smith Creek in both 1/16" water screen samples, see Figure 5, and flotation samples from level 3 of both units 989R546 and 991R546 but was not present in any features.

Corn is a nonlocal domesticate imported to the LMV around 900 AD, but not adopted agriculturally until around 1200 AD (Kidder 1992). Corn was not farmed and consumed by the Coles Creek people, and only began to appear and intensify in the archaeological record towards the transition to Plaquemine, when it became a major subsistence crop (Kidder 1992). The presence of corn in these samples indicates that at least part of the South Plaza, likely feature 21A or 21B based on the *in situ* discovery of Plaquemine pottery, is from a Plaquemine context, though further excavations will be necessary to confirm which other parts may also date to Plaquemine.

Crabgrass (*Digitaria* sp. Sample: 1 seed, <.01g)

One example of crabgrass was found from Level 3 in unit 991R546. Crabgrass is typically a weedy, annual grass that would have been pervasive at the site. The most likely species of *Digitaria* to be native to the American Southeast is *D. ciliaris*. There is no evidence of crabgrass as either food or medicine. Some information suggests it could be used as fodder, but since Coles Creek people were not keeping animals, this is unlikely (Invasive Species Compendium). Perhaps it was a weed that became accidentally carbonized.

There are accounts of crabgrass in Oklahoma being used to make daub. A lumber procter in the mid 19th century reports that members of the Creek Nation would mix the crabgrass with river mud, and use that to plaster their houses (Richards 1993). It is not unreasonable to assume



Figure 5: Corn kernels recovered from Smith Creek water screening

that this use of crabgrass happened at Smith Creek as well, however there is no direct evidence for crabgrass as a construction medium.

Purslane (*Portulaca* sp. Sample: 7 seeds, .01g)

Purslane was found in the Level 3 contexts and not in any features. The seeds and flowers were edible and it was likely used for greens (Kassabaum 2014). Purslane has medicinal purposes, primarily for gastrointestinal ailments and skin lesions (Williams 2000).

Sweetgum (*Liquidambar styraciflua*, Sample: 535 fruit fragments, 3.86g, 344 aborted seeds, .05g, 114 probable fruit/seeds, .54g)

Large amounts of sweetgum were found in units 989R546 and 991R546, particularly concentrated in Feature 9, a charcoal-filled pit, see Figure 6. The sweetgum recovered ranged

from whole and easily identifiable to extremely fragmented portions of both fruit and aborted seeds. The remains were sorted into fruit fragments, aborted seeds and clearly identifiable fragments, and material that was possibly those things but could not be confidently identified. The number of seeds produced in each pod varies based on growth conditions (Kormanik 1990). Non aborted seeds are scarce compared to aborted seeds per fruit, and none were recovered in these samples.

Sweetgum is a common tree in the American South and grows particularly well in the LMV. Trees begin producing fruit, also called seed pods, after a few decades and can continue doing so for upwards of 150 years. Sweetgum is not a subsistence plant, however the sap could be hardened and used as a chewing gum (Chapman 1897, Native American Ethnobotany Database). Additionally, the plant was known to have medical uses to many Native American communities, including uses as an antibacterial salve, or a tea made from the bark to lower fevers (USDA Plant Guide, Lingbeck et al 2015, Native American Ethnobotany Database, Virginia Tech Sweetgum Fact Sheet, Dr. Duke's Phytochemical and Ethnobotanical Database).

Conclusion

Overall, the nuts and starchy and oily seed categories are what is expected from a Coles Creek or Plaquemine site. They are all local foods that could have easily been gathered. There is only one example of fruit, though this is likely due to sampling and recovery and not to a limited utilization of fruits at this site. Like the other food categories at this site, local fruits would have been easily collectable and a viable source of nutrients. Corn, the only food source in the miscellaneous category, dates the site to Plaquemine. With the exception of this corn, it is



Figure 6: Sweetgum as found in Feature 9

difficult to say if the other plants date to Coles Creek or Plaquemine, as the features themselves have not been dated exactly, either. The medicinal plants in the miscellaneous category are attested for ethnographically in these periods and this region. Crabgrass, which was only identified once, was likely present in the environment, and made its way into the archaeological record. Sweetgum, by far the most prevalent plant at Smith Creek, is the one that has been least recorded and discussed in this area thus far. In the next chapter, this thesis will spend more time investigating the reasons for this, and potential uses of the plant.

Chapter 5

Discussion

This chapter will focus on two of the more unexpected finds at Smith Creek, corn and sweetgum. Corn will be discussed primarily because its presence denotes Smith Creek as a Coles Creek-Plaquemine transition site. As mentioned in Chapter 2, maize agriculture was adopted quite late in the LMV when compared to the Southeast in general, only appearing at the beginning of Plaquemine. Sweetgum, also discussed in this chapter, has not been frequently identified in the archaeological record of the American Southeast. The first half of the sweetgum discussion focuses on identification strategies for future research. In the second half, sweetgum is considered in terms of its ethnographic uses, and the potential reasons why the fruit would be buried in a charcoal pit, like Feature 9.

Finally, the plant assemblage at Smith Creek is compared to another Coles Creek site, Feltus (22JE500), and a Coles Creek-Plaquemine transition site, Lake Providence (16EC6), with the goal of examining the Smith Creek evidence as compared to other data on Coles Creek to Plaquemine changes in subsistence.

Corn

Until the 1980s and 1990s it was generally assumed by archaeologists that corn agriculture was responsible for supporting any population that built monumental earthworks. With the advent of flotation and more stringent paleobotanical collection, it quickly became apparent that in the LMV, mound-building populations relied on wild and locally domesticated plants, without a focus on corn, for hundreds of years longer than the surrounding area (Kidder 1992).

This pattern is clearly demonstrated at Smith Creek, where corn was only found in the plaza and not from either of the mound excavations. The plaza yielded Plaquemine pottery and the mounds were dominated by Coles Creek pottery, supporting this pattern. Corn in the plaza but not in the mounds thus confirms dates suggested by the stylistic analysis of the pottery from various contexts, which was further confirmed by radiocarbon dating. AMS radiocarbon dates from a midden within Mound A (Cal AD 780 to 785 / 880 to 990) and from a flank midden in Mound C (Cal AD 780 to 790 / 870 to 985) both fell solidly within the Coles Creek period. An AMS date on a corn kernel from Bag 41, however came back firmly within the Plaquemine period (Cal AD 1300 to 1370 / 1380 to 1415). This fits with the period of maize intensification in the LMV, that started around AD 1200 (Smith 2000).

These dates imply that Smith Creek was constructed and used as a mound complex during the Coles Creek period. While it is possible the site was occupied earlier, and some mound construction may have taken place before Coles Creek, the presence of plant material definitively from that period between layers of mound fill implies that Coles Creek people played a primary role in the site's history. The dates from the corn indicate that the site was later reused by Plaquemine people, at least in the southern end of the plaza. Whether this range of dates represents a continuous occupation or a punctuated history of use and disuse remains to be seen.

Based on notes from the excavators, it is possible that all of the Plaquemine pottery and the corn were recovered from Features 21A and 21B (see Figure 4). These pits appeared higher in the stratigraphy and can be seen in the west profile (see Figure 3). They extend significantly higher than any of the other features, meaning those other features were likely formed quite early in the site's history, that sufficient time passed that significant midden formed on top of them,

and then these two pits were dug later in time. Due to the excavation strategy of arbitrary levels and the similarity between the fill within the pits and the surrounding midden, it was difficult to tell at exactly what depth the features appeared, therefore if the area was to be excavated in future seasons, a series of smaller levels should be used to allow for more careful examination and more effort should be made to identify subtle features closer to the surface.

Understanding the provenience of the corn in this way will help to determine when the main midden layer in the South Plaza dates. If the corn can be identified as originating from a single feature that is clearly from a later period than the rest of the midden, such as Feature 21A and/or 21B, then the midden is likely a purely Coles Creek deposit. However, if the corn seems to come from throughout the midden, then the majority of the paleobotanical remains from these units are Plaquemine, and potentially only Feature 9, containing the carbon-dated sweetgum (and potentially the other features that are stratigraphically shown to be contemporaneous) are Coles Creek.

Sweetgum Identification

Sweetgum was a difficult plant to identify in the laboratory. Figure 7 shows the fragments of the pod that first indicated a set of botanical remains that did not clearly fit into the category of “wood” or “seed”. Several of these had been found, both samples with the central hole present, and some that appeared to be smaller fragments of this structure. At first this plant was thought to be corn cob (see Figure 8) due to the corn kernels that had been identified in the sample. However, it quickly became apparent that the sections where the corn kernels would have set were at the wrong angle. Another early contender was chinaberry (see Figure 9).



Figure 7: Fractured, carbonized sweetgum fruit recovered via flotation



Figure 8: Carbonized corn cob (From the Jamestowne Rediscovery Project)



Figure 9: Chinaberry fruits and seed, uncarbonized (From Bomblies and Vectors 2011)

This was based solely off of the puckered shape of the plant's seed. Chinaberry, *Melia azedarach*, is not indigenous to North America, so its presence would have meant that the samples were contaminated by modern carbonized material (Gilman and Watson 1994).

Finally, when other suggestions were eliminated because they were not close enough morphologically to be a match, sweetgum was brought up as a possibility, given that identifiable whole sweet gum balls had been found in a pit in the same unit, just below this midden (See Figure 6). Modern sweet gum pods were obtained, and the seeds within them were examined microscopically. Sweetgum pods produce around two viable seeds each, and dozens of infertile seeds, called aborted seeds (Lingbeck et al 2015). These aborted seeds are smaller than the viable seeds, and have a distinct seed coat texture. It was at this point that the uniquely bubbly texture of the aborted sweet gum seed coat was noticed, and compared to a texture seen on various plant remains in the samples that had, at that time, only been classified as "unidentifiable plant remains". A comparison of the modern seeds and these ancient, carbonized ones confirmed that it was the same texture on the same shaped seeds (see Figure 10). Due to the extremely high number of aborted seeds in the samples, this provided confidence in the identification as sweetgum.

To further confirm this hypothesis, modern sweet gum pods were experimentally carbonized and then crushed. Several pieces looked very similar to to the hypothesized pods in the sample. Figure 11 is the most convincing side by side comparison of a modern and archaeological sample, clearly showing a center hole of the same size and shape on both. While the archaeological specimen is smoother around the edges, this likely has to do with damage from turbulence during excavation and processing.



Figure 10: Seed coat texture on aborted sweet gum seed from Smith Creek

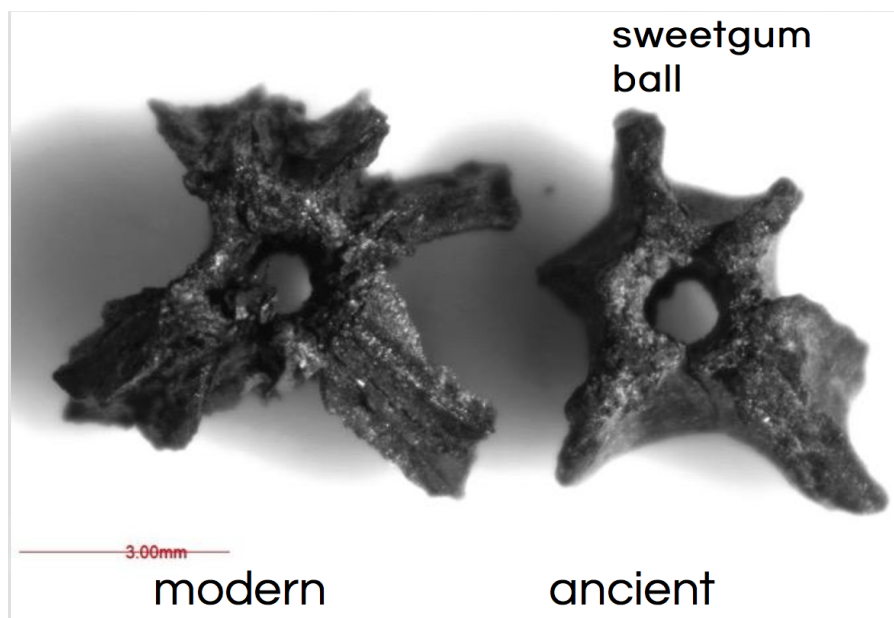


Figure 11: Comparison of modern and ancient carbonized sweetgum ball fragments

A fragment of sweetgum fruit from Bag 41, the water-screening bag in which the corn was found, was submitted for AMS radiocarbon dating, and returned a date of Cal AD 780 to 785 / 880 to 990, almost identical to the Coles Creek period middens from Mounds A and C. Two samples from the same bag returning dates separated by 500 years does not necessarily indicate contamination, however. It is quite possible that within this water-screening sample two distinct contexts were mixed. The most probable explanation is that Feature 9 was noticed after the first few centimeters had been scraped off with the previous layer, thus leading to this context being processed with general midden fill.

Additionally, perhaps sweetgum is prevalent in the midden due to some taphonomic process that had caused the dirt to shift around after deposition, meaning that the contexts may not be the primary deposition of archaeological materials. The waterscreening sample is from Unit 989R546, where Feature 9 is located, meaning that this sweetgum could have come from right above the feature. The flotation samples for Level 3 of the midden in this same unit also returned substantial amounts of sweetgum fragments, which could be explained by either of the two occurrences proposed.

Sweetgum Interpretation

The sweetgum tree is prevalent in the LMV, where it flowers in the late spring and fruits in the early summer. When sweetgum fruits mature, they dry out and the pods left behind release seeds (Maloof 2005). Sweetgum is unique among other trees in the forests of these areas, as it requires full sun to grow, meaning it does not make a good candidate to be close by other trees. Some scholars even suggest that modern concentrations of sweetgum could only have only begun when Native Americans abandoned clearings sufficiently free of other trees (Scharf 2010).

Sweetgum has no known subsistence uses on its own. The only account of sweetgum being consumed for non-medicinal purposes is in a mixture of steeped sweetgum bark and wild grapes to make a tea. Additionally, while the resin from the tree can be hardened and chewed as a chewing gum or candy approximant, it does not contain any nutritional value (Native American Ethnobotany Database). The most likely uses for sweetgum by prehistoric peoples were medicinal. Multiple parts of the tree can be utilized, though most accounts of its use focus on the leaves, bark, and sap.

The sap contains storax, sometimes called stryax, which has a host of beneficial properties, from anti-inflammatory to antibacterial (Lingbeck et al. 2015). It has also proved effective as a pesticide in clinical trials, though there are no ethnographic or historic accounts of this usage. Additionally, the seeds within the fruit that are not fully formed, referred to as aborted seeds, bark, and leaves of the tree have shikimic acid in them. This acid is the precursor to oseltamivir phosphate, one of the main ingredients in common flu medicines, such as Tamiflu (Lingbeck et al 2015). The tree also has many ethnomedicinal attestations, treating fevers, aches, colds and congestions, and more than one sexually transmitted disease (Dr. Duke's Phytochemical and Ethnobotanical Database). Reading through the descriptions of its many uses on the USDA's Germplasm Resource Information Network, it seems an almost wonderdrug, a tree that would be worth exploiting if present and propagating if required.

Ethnographically, sweetgum is recorded in the New World when European explorers began to recount their experiences. During the Spanish exploration of Mexico it was noted that Aztec tribute systems often included large quantities of dried sweetgum resin, presumably for the purposes mentioned above (Peterson and Peterson 1992). In fact, the first written account of sweetgum use was by an explorer observing an exchange between Montezuma and Cortez in the

early 1500s. A large amount of “highly ornamented” resin mixed with tobacco was exchanged. Upon inhalation of this mixture, the partaker would fall profoundly asleep (Díaz del Castillo 1586). In 1775, Bernard Romas attested that sweetgum, leaves in this case, were dried and mixed with tobacco for smoking by the Choctaw. It has also been suggested that the dried resin could have been formed into figurines, and that the Maya made sweetgum resin into perfume (Batres and Batres 2011).

In his 1709 surveyor’s report of the state of North Carolina, John Lawson also notes Native use of sweetgum. In addition to discussing its ecological importance, as beavers utilize the bark among other things, he notes that it is used as medicine against several viral infections. Antonie-Simone le Page du Pratz, in his 1775 survey of Louisiana touts the medical uses of sweetgum, talking about it as a medicine “prescribed” by native doctors to members of their community for the same purposes discussed by Lingbeck et al (2015). Le Page du Pratz goes so far as to attest that sweetgum would “save the life of many a person” if it were more widely used (1775). Aunt Clara Walker, a slave from Arkansas, recounts foraging among wild trees for added subsistence. She reports that they “chewed the sweetgum” presumably referring to the sap, though this particular detail is unspecified in this account (Covey and Eisnach 2009). Later, Alvin Wentworth Chapman, in another natural report, described the morphology of the sweetgum tree and commented on the sap hardening into a gum (1897). In 1914, the Country Gentleman listed sweetgum as one of the trees ideal for tanning leather, suggesting that utilizing it as such would help turn a profit from a tree that is otherwise a “nuisance” (Carter 1914.)

All of these properties, coupled with the native presence of sweetgum trees in the LMV, help to explain the presence of the plant at Smith Creek and may even explain the quantity that was recovered. However, this does not explain its concentration in a single pit that is only 25.5

cm in diameter and 13.5 cm deep. While it is true that nutshell and starchy seeds were found in Feature 9 as well, sweetgum was the most prevalent category of plant remains by weight (making up 14.0% of the total plant weight), even more so than wood charcoal (making up 11.5% of the total plant weight) in the pit. Several modern gardening and yard work sites suggest that the fruit of the sweet gum tree is worth burning, as it goes up in flames quickly, gives off a less smoke than the wood of the tree, and burns at such a high temperature the flame is blue, however this has yet to be confirmed in scholarly sources (Coles County Yard and Garden). Perhaps this color, or another property of the smoke could have been the Smith Creek occupants' motivation to burn this plant in such a concentrated deposit.

There are other possible explanations for this unusual feature that are attested in the archaeological record, though they are based on the characteristics of the features and not the sweetgum. One is that Feature 9 could have been a smudge pit. Smudge pits are small pits filled with combustible organic material burned for the purpose of tanning hides or finishing pottery (Skibo, Butts, and Schiffer 1997). In his 1967 article on smudge pits, Binford profiles many ethnographic accounts including their use by Natchez Indians, which was a geographically and temporally close culture to Coles Creek and Plaquemine. Binford reports that dung, corn cobs, and other organic material was ignited in a pit that was sealed with hides to be treated (Binford 1967). Smudge pits could also have been used to finish pottery, as smudging a pot would have made it considerably more resistant to abrasion (Skibo, Butts, and Schiffer 1997). While there is no evidence that sweetgum would have been used in lieu of corn in a pre Plaquemine society, it is reasonable to consider this alternative in a pre-corn subsistence economy.

There is evidence, both broadly and in the LMV specifically, of postholes, or posthole sized pits that serve not a structural, but a ritualized purpose (Kassabaum 2014). Often times on

mound sites they are thought of as dedicatory, final touches on mound constructions. This pit, being on the southern end of the plaza, does not seem to be a perfect fit for this description, however. While it is clear that the plazas in mound and plaza centers were also constructed with massive amounts of engineered labor, more of the plaza will need to be excavated before the natures of its construction is known. However, the pit could serve any number of votive purposes. It is not hard to imagine wanting to pay special attention to a tree that grew in isolation and could cure any number of ailments.

As previously mentioned, very little has been written on sweetgum in archaeological contexts. In fact, most site reports in North America mention sweetgum as a part of the background ecology, but not as a part of the archaeological findings (Lentz 1986; White, Knetsch, and Jones 1999; Delcourt et al. 1998; Perttula, Crane Bruseth 1982). Little analysis has been done on the few North American sites where it has been identified. Both Vanceville (16BO7), a Caddo Site west of the LMV region, and Feltus, previously mentioned, report finding sweetgum in small pits similar to Feature 9 (Girard 2012; Kassabaum 2014).

The Shawnee-Minisink site (36MR43), a Paleoindian-period Clovis site in Pennsylvania, reports finding carbonized sweetgum in a hearth feature, but offers no interpretation of its presence (Gingerich 2011). The Bilbo site (9CH4), a late Archaic site at the mouth of the Savannah River, reports un-carbonized sweetgum balls. This is found under layers of shell midden was therefore likely natural debris that was preserved (Cook Jr. 2007).

At the present time, it is impossible to say with certainty what the sweetgum pit at Smith Creek was being used for. There are many possibilities, given ethnographic evidence, and with more archaeological evidence a conclusion could potentially be reached. Given that sweetgum was also found at the nearby and contemporaneous Feltus site, its use may be part of a broader

Cole Creek pattern that can be explicated by future research at Coles Creek sites. Hopefully this discussion will lead to easier identification by archaeologists, both in the Southeast and other areas, in the future and a broader data set for which to study intersite use of the plant.

Other plant use at Smith Creek

The broader assemblage of plants recovered at Smith Creek fit nicely with the expected wild and Eastern Agricultural Complex assemblage as it appears in the LMV during late prehistory. Nuts, such as acorn, hickory, pecan, and walnut were almost certainly regular high caloric food sources. Acorn is one of the most ubiquitous paleobotanical finds and has been called the “most important plant food” in the Southeast until maize agriculture took over (Yarnell and Black 1985; Weinstein 2005). It certainly would have been of tantamount importance before Plaquemine, and likely would have remained a pervasive food source even then as well. Acorns could be gathered en masse in the local area and while some required intensive processing, the nutritious benefits were clearly thought to be worth it, perhaps because their caloric return was far greater than that of seed plants (Kassabaum 2014).

Starchy and oily seeds, though not as nutritious as nuts, served as an important base for carbohydrates, and additionally, many could be used as greens, providing vitamins, such as Vitamin C, to the diet (Scarry 2003). It is with some these plants that people began domestication, and while the seeds from Smith Creek have not been examined for evidence of domestication, this would be a fruitful avenue for future research (Smith 2006).

Uncultivated fruits would have provided nutritional supplementation to a Coles Creek or Plaquemine diet, by providing vitamins and minerals (Kassabaum 2014). Though only one type of fruit has been identified at Smith Creek so far, this does not indicate a lack of use by Coles

Creek or Plaquemine people. It could be the case that the seeds simply did not end up in any of the samples we studied for a variety of reasons. Fruit is typically not cooked, and the seeds may have not had the exposure to fire necessary to carbonize. Given the natural edibility of fruit and the lack of processing required, it is far more likely that the seeds are not being recovered than it is that people at Smith Creek were not eating these plants.

Comparison of Smith Creek with Other Sites

Perhaps when more samples from the site are analyzed clearer patterns will present themselves, but this study will limit itself to a comparison of the taxa found between Smith Creek and other sites.

The site of Feltus is a Coles Creek site in Jefferson County Mississippi. A substantially larger number of flotation samples were processed over the five seasons of excavation, which may account for some of the differences in recovered assemblages (Kassabaum 2014). However, going forward, it would be reasonable to expect Smith Creek to produce some of the plants found at Feltus currently missing from the assemblage. Such plants include little barley, sumpweed, sunflower, bramble, cabbage palm, catchfly, sumac, and other plants typically of Coles Creek assemblages (see Kassabaum 2014 for a complete list). The largest disparity between the sites was in the fruit category, with Smith Creek only containing one example of a fruit seed, though the discussion on other plants use goes into some details as to why this might be.

Feltus assemblages contained both spurge and vetch/wild pea. Some of the samples from Smith Creek contained currently unidentified plant remains that could very likely be both of those plants, however identification is not positive enough to list them as such.

It is useful to compare Feltus to Smith Creek as it covers overlap between Coles Creek and preceding cultures. It is also important to look at sites which can provide comparative material for Plaquemine plants. Lake Providence, a terminal Coles Creek site, is aptly suited for this. Lake Providence has relatively similar assemblages to Smith Creek. The site produced nuts; acorn, hickory, and pecan, though no walnut. Like Smith Creek, Lake Providence reported squash, although it was the rind that preserved and not the seeds. Lake Providence also had rinds of bottle gourds, *Lagenaria siceraria*. Another similarity between Smith Creek and Lake Providence is the presence of corn, which is absent from Feltus due to the sites earlier occupation period (Kassabaum 2014; Weinstein 2005).

Lake Providence reported more seeded plants than Smith Creek, though Smith Creek is still at the early stages of site wide recovery and analysis. There are a few seeds which were reported at Smith Creek which were absent from Lake Providence, namely crabgrass, smartweed, and sweetgum (Weinstein 2005). As discussed in Chapter 4, crabgrass could have been introduced to the assemblage through non anthropogenic means, so this does not necessarily indicate a behavioral difference. In the Smith Creek assemblage smartweed is included in a composite category with knotweed, so it is possible that Smith Creek also does not have smartweed, but difficult to know for sure. The only truly significant absence then, is the presence of sweetgum in large quantities at Smith Creek.

Lake Providence reports beans, and though they are only identified to the family, Fabaceae. This is significant when compared with the absence of beans at Smith Creek. Lake Providence also reported wild vetch and peas, both of which were present at Feltus and not Smith Creek (Kassabaum 2014; Weinstein 2005).

At the moment is it only prudent to do presence/absence comparisons with other sites, but in the future when more data from Smith Creek have been collected and analyzed, significance can be gleaned from comparing the quantities and locations of paleobotanical finds.

Chapter 6

Conclusion

This thesis has presented some of the paleobotanical finds from the 2015 field season at Smith Creek, with the intent of aiding in the interpretation of Smith Creek's place in the larger cultural patterns of the Coles Creek to Plaquemine transition. With the exception of corn, all of the food plants found at Smith Creek would fit in with any typical Coles Creek or Plaquemine assemblage. The nuts, seeds, and fruits are all well attested plants in the archaeological record in the Southeast, and would have been native to the LMV. While cultivation may have begun with people encouraging these plants to yield more plentiful food in more convenient locations, very few species were cultivated to point of genetic and morphological change, marking domestication (Smith 2006).

None of the plants at Smith Creek were studied explicitly for markers of domestication, such as a change in seed coat thickness. In the future, this sort of information would provide a way to place Smith Creek in the larger trajectory of the Eastern Agricultural Complex. Provided other Coles Creek, Plaquemine, and transitional sites also begin to report this data, domestication markers could be plotted against temporal data such as radiocarbon dating and pottery stylistic characteristics.

The first indicator that site occupation likely extended beyond Coles Creek was the abundance of Plaquemine pottery that turned up in the dry screens from the South Plaza units. This was later confirmed by the presence of corn in a water-screening sample and upon further investigation, flotation samples from these units as well. AMS radiocarbon dates confirmed that these kernels were indeed Plaquemine, thus firmly indicating that at least part of the South Plaza deposits postdates Coles Creek. At the present time, the South Plaza is the only site area believed

to show significant Plaquemine occupation, as both the pottery and radiocarbon dates from Mound C and Mound A suggest Coles Creek construction dates for the mounds.

The corn is a significant indicator of Plaquemine occupation because, though corn was present in small amounts in the LMV around AD 900, it was not adopted as a subsistence crop until around AD 1200. This is remarkably late when compared to the broader American Southeast and Midwest, where some had adopted maize agriculture as early as AD 700 (Fritz 2000). The late uptake of corn in parts of the Southeast has sparked much scholarly debate. It makes sense that corn was present in the LMV in low levels before it was adopted as agriculture; however, it is less expected that the period during which it was present but rarely utilized coincides with a period of intensive mound building. Before flotation became systematically implemented at archaeological sites, many scholars assumed that it was the introduction of agriculture that had lead to the transformation in monument building that marks the Coles Creek (Kidder 1992).

The radiocarbon dates on the plant material Smith Creek is yet another piece of evidence that adds to the curious regional pattern of a monumental culture supported by local, non-agrarian food sources. Perhaps this says something about the abundant landscape in which this culture was situated, however it does not explain the shift to Plaquemine subsistence patterns, especially considering the transition to Coles Creek is more stark than the transition out of it. During Coles Creek, mound building, which had existed on and off for several thousand years, changed substantially. Mounds became square and flat topped, potentially holding structures, and were, for the first time, not exclusively burial monuments (Kidder and Fritz 1993). Settlement patterns become more centralized, making it easy to imagine a life for villagers in which the ceremonial mound and plaza structure was the social center of their world. The Plaquemine did

go through significant changes as well, mostly socio-political ones. Perhaps corn agriculture was adopted as a reaction to these changes, but it seems somewhat arbitrary, as clearly it was not needed to fuel massive monumental projects that literally reshaped the settlement patterns of the societies in which they lived.

While the subsistence data from Smith Creek helps to fit the site into broader discussions of subsistence in the late prehistoric LMV, sweetgum is an interesting find for different reasons. Very little has been written about sweetgum in the archaeological record. While it is widely acknowledged as background vegetation on sites, both in modern and ancient times, it is rarely reported *in situ* or even in the collected assemblages from prehistoric sites. In fact, very few reference materials exist to assist archaeologists in identifying it in the field or lab. On the few sites where it has been identified, little interpretation has been offered due again to a lack of an existing knowledge base.

Ethnographic and chemical research shows that the sweetgum tree has a host of medicinal properties (Lingbeck et al. 2015, Native American Ethnobotany Database). Various parts of the tree, including leaves, bark, and sap contain chemicals that can act as antibiotics, pesticides, and pain relievers, among other things. It is well attested in various Native American groups that such herbal remedies were common. Sweetgum additionally had ritually and socially significant purposes, possibly connected to its medicinal benefit. The Aztec and Maya used it as part of a complex tribute system, and would smoke it with tobacco for a powerful and immediate soporific effect (Peterson and Peterson 1992; Batres and Batres 2011; Díaz del Castillo 1568).

The use of sweetgum in such a ritual context is not attested in North America, let alone specifically the LMV. However it is possible that such a usage would have left no archaeological evidence. Indeed, even the medicinal uses of sweetgum, that were likely occurring at Smith

Creek, do not explain the deposit in Feature 9. It then follows that sweetgum could have had any significance invisible to the archaeological record and that while explaining the presence of this Feature would be within the scope of this thesis, it is also prudent to hypothesize other uses sweetgum might have undergone on the same site.

How, then, should Feature 9 be interpreted? A possibility that must be considered with any small pit is a votive deposit, though it would be nearly impossible to say what the significance of the choice of sweetgum was without further ethnographic evidence from the LMV. Perhaps the pit indicates a more utilitarian purpose, such as a pit for smudging pottery or for tanning hides.

The sweetgum found in Feature 9 dates confidently to Coles Creek, though it would be worth investigating if any deposits of the sort found at Smith Creek present Plaquemine dates. More information about the temporal and geographic range of these sweetgum-filled charcoal pits will make it easier to hypothesize their use. Until such a time, however, the pit poses interesting questions about any of the aforementioned interpretations. If it represents a ritual deposit, it would allow for the opportunity to examine a pattern of overlap between medicinal and ritual patterns. Ritual deposits would also provide a comparison for cross regional significance of certain plants, in this case from Central America through North America. Finally, a practical use of sweetgum would allow for suppositions about craft production and again provide data for regional and temporal comparisons about smudging and tanning technologies. It would be especially prudent to see if sweetgum is only used in potential smudge pits until corn agriculture, as corn cobs are frequently cited as the fuel of choice for these features.

The paleobotanical assemblage from the 2015 excavation season at Smith Creek has thus provided a wealth of information. There remain more questions to be answered, however. First

and foremost is elucidating the exact chronology of South Plaza use and reuse. Thanks to the paleobotanical remains and the radiocarbon dating done on them, it is apparent that both Coles Creek and Plaquemine assemblages are represented, however knowing which features belong to which period will require further excavation. Secondly, as discussed above, the sweetgum has raised many questions, most of which cannot be solved without more data. Hopefully, the identification methods presented in this thesis can encourage region-wide identification of sweetgum which, when coupled with the ethnographic evidence, will allow archaeologists to better understand the various use of the plant.

This thesis has attempted to discuss the palaeobotanical finds at Smith Creek, their significance, and the questions they raise about the site. In light of the finds outlined in this thesis, it becomes clear the paleobotany at Smith Creek has provided invaluable information about the history of the site, making the current interpretation possible and providing avenues of future research.

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