Prehistoric Subsistence on the Coast of North Carolina: An Archaeobotanical Study

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Abstract

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Prehistoric Subsistence on the Coast of North Carolina: An Archaeobotanical Study
(Under the direction of C. Margaret Scarry.)

When European settlers first arrived on the coast of North Carolina, they encountered Native Americans who they described as living in permanent villages and pursuing a mixture of hunting, fishing, and farming. Very little is known of the subsistence practices of people in the area before the arrival of Europeans, however. My dissertation seeks to help rectify this by increasing our knowledge of plant use on the coast during prehistory. I analyzed plant remains from 606 flotation samples from eight sites on the coast and synthesize data from 13 previously reported sites. These sites are found on all subregions of the coast and include material from most periods of prehistory from the Early Archaic to the Late Woodland.

Using this data, I explore several topics of interest to coastal archaeology in general: the value and use of coastal resources, seasonal mobility of coastal groups, and the nature of the adoption of agriculture on the coast. I discuss prehistoric subsistence in North Carolina within the framework of human behavioral ecology. I compile estimated handling return rates for different plant foods found on the coast and rank them in accordance with diet-breadth model building. I then explore the implications of the diet-breadth model and central place foraging models for prehistoric subsistence in coastal North Carolina. The plant resources with the highest estimated return rates correspond fairly well with the plant remains most frequently recovered from archaeological

contexts.

My results suggest that during most of prehistory people on the coast of North Carolina collected a fairly wide array of nuts, fruit, starchy and oily seeds, and weeds. Nuts, particularly hickory, seem to have been a mainstay of people's diets for most of prehistory. There is currently no evidence for farming on the coast before the Late Woodland period. During this time, some, but not all, coastal people began farming maize and, to a lesser extent, beans and squash. Over all, plant-based subsistence practices on the coast of North Carolina seem to have been fairly consistent throughout most of prehistory although the adoption of agriculture seems to have been highly localized.

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Chapter One

Introduction

When Europeans first arrived on the coast of North Carolina, they encountered a variety of Native American groups who they described as residing in permanent villages and living primarily on hunting, fishing, and farming plants such as maize. However, European explorers of the time were not trained observers and their reports were often influenced by their cultural values and perceptions (Loftfield and Jones 1995). The archaeological record indicates that this way of life may not have been universally practiced on the North Carolina coast and may have been a relatively late development in prehistory where it was practiced at all (Hutchinson 2002). Comparatively few subsistence studies have been carried out for the coast of North Carolina compared to other parts of the state and syntheses are almost entirely lacking. The small amount of prior research, however, suggests that there may have been differences in the use of maize between different areas of the coast and that maize may have only become part of coastal people's diets during the later parts of prehistory (Hutchinson 2002; Scarry and Scarry 1997).

What sorts of food other than maize people on the coast of North Carolina ate is also unclear. Coastal environments in many ways are very different from inland environments. People living in coastal regions face a different set of challenges and opportunities than their neighbors in the interior. They have different resources available to them and different choices to make about how to earn their living. The coast of North Carolina is a fairly rich coastal environment with many resources that people could choose to exploit. It is clear, therefore, that people living in the area had many subsistence options but without comprehensive subsistence studies we can not know which of those options they chose. Loftfield (1988), citing work by Glazier (1986), posited that plants may not have been an important part of the diets of prehistoric people on the coast of North Carolina. If true, this would be a highly unusual situation for foragers in a non-arctic environment. In almost all areas where plant life is abundant, plants form a significant portion of the diet of hunter-gatherers (Kelly 1983). Gathering plants is often a more predictable source of nutrients and calories than hunting, which tends to have a higher failure rate. While some animal resources on the coast of North Carolina, like fish and shellfish, might be highly productive, it seems unlikely that foragers would entirely ignore the wide diversity of plant foods available in the area.

Part of the uncertainty about the role of plants in coastal subsistence patterns is due to lack of data. In this dissertation, I will seek to help rectify this deficit by presenting plant food data for eight newly analyzed sites on the coast and by synthesizing data from 13 previously analyzed sites. This will provide a much more comprehensive view of plant use on the coast.

Using these data, I will address several key topics that are relevant to studies of coastal archaeology in general. These include the value and use of coastal resources, the seasonal mobility of coastal groups, and the nature of the adoption of agriculture on the coast and its impact on subsistence practices. I will discuss these issues in Chapter 2. I will also present information on the physical environment of the North Carolina coast and a summary of the current archaeological understanding of the prehistory of the area.

Finally, I will summarize some of the previous research that has been carried out on coastal subsistence.

In Chapter 3, I will discuss human behavioral ecology, the theoretical framework within which I will interpret the results of my analysis. Specifically from human behavioral ecology, I will use an optimal foraging model called the diet-breadth model to explore the subsistence decisions that faced the prehistoric inhabitants of the North Carolina coast. Diet-breadth models can be used to study which resources an efficient forager should choose to use out of all those available. These models also have the advantage of being applicable to the use of both wild and cultivated resources, both used by the inhabitants of the area.

I discuss the archaeobotanical datasets used in this dissertation in Chapter 4 and the sites the datasets are derived from. I also summarize the field and laboratory methods used in the analysis of these samples as well as the quantitative methods used in their interpretation.

Chapter 5 discusses the results of the archaeobotanical analysis of the eight sites I examined. First, I describe the plant taxa found at these sites including their habitats, nutritional qualities, how they are utilized by people, and their seasonality. Next, I report on the plant remains found at each site individually.

In Chapter 6, I discuss the results of the archaeobotanical analysis and what it can tell us about the subsistence activities carried out by the inhabitants of the coast. I first discuss each site individually. Then I describe temporal and regional trends in plant use for both the eight sites analyzed here and for all coastal sites with reported plant remains.

Chapter 7 discusses the implications of human behavioral ecology and diet-breadth models for coastal North Carolina subsistence. First, I compile estimated handling return rates for all of the plant food resources found on the coast. Secondly, I rank them from highest to lowest as is required to construct a diet-breadth model. Then I examine the implications of this ranking for coastal subsistence patterns and the introduction of agriculture. I also compare the predicted ranking of resources from the diet-breadth model to the distribution of plants found in coastal sites and discuss some of the implications of central place foraging theory for coastal subsistence.

In Chapter 8, I conclude by discussing some of the main issues of coastal archaeology for the North Carolina context. I also address the transition to agriculture on the coast and the use of diet-breadth models for studying North Carolina coastal subsistence patterns. Finally, I conclude with suggestions for future lines of research.

Chapter Two

North Carolina Coastal Archaeology

North Carolina contains three large physiographic regions: the mountains in the west, the piedmont in the central portion of the state, and the coast in the east. Like all coasts, the coast of North Carolina has several features that make it a much different environment for human habitation than inland areas. Besides the proximity to the ocean, there are more wetland areas on the coast, for example, and attendant differences in the faunal and floral resources available for human use. In this chapter, I turn to a description of the North Carolina coast, both physical and cultural, and the archaeological research relevant to it. First, I discuss coastal archaeology in general. Several key issues that have been explored and debated in other coastal areas of the world are relevant to North Carolina coastal archaeology and will be discussed throughout this dissertation. Second, I provide a description of the physiography and ecology of the North Carolina coast with special attention to intra-regional variation. Next, I give an overview of archaeological understanding of North Carolina coastal prehistory. Finally, I conclude with a summary of previous research on coastal subsistence practices.

Coastal Archaeology

Coastal environments, existing between sea and land, provide people opportunities and challenges different from those of inland environments. The benefits of being able to exploit both marine and terrestrial resources are often tempered by extreme weather and the lack of some resources, such as fertile agricultural land, found more readily in the interior. Whether they make a living by foraging, farming, or some combination thereof, coastal dwellers, therefore, can not be assumed to have followed the same subsistence practices as their neighbors farther inland in North Carolina or elsewhere in the world. Archaeologists throughout the world have been interested in how people interacted with and lived in these environments (see Erlandson 2001). This interest has spawned a number of debates over maritime resources and human adaptation to coastal environments. Three of those contentious issues will be addressed here: 1.) the use and value of maritime resources to prehistoric people; 2.) mobility and seasonality of coastal groups; and 3.) the impact of domesticated plants on coastal subsistence and settlement patterns.

Use and Value of Maritime Resources

Archaeologists have long debated many aspects of the use and value of coastal resources for prehistoric people. Besides debates on the timing of human occupation of coastal environments, many studies have focused on the relative wealth (or poverty) of coastal environments. Erlandson (2001) has, for heuristic purposes, dubbed the most extreme views of coastal resources the "Gates of Hell" and "Garden of Eden" models. Some archaeologists have seen coasts as marginal environments that would have been used largely when people had no other options (Bailey 1975; Osborn 1977). These "Gates of Hell" models tend to view the plants and animals of coastal regions as poorer or sparser food sources than those found farther inland, especially terrestrial game. They have suggested that people would probably have only occupied coastal areas in response to increasing population pressure from the interior. On the other extreme, some archaeologists have argued that coastal environments are usually quite rich with many highly productive and nutritious plant food and animal resources. Researchers who posit "Garden of Eden" models believe that occupation of the coast was probably not the result of population pressure but an opportunistic exploitation of a desirable environment and would have occurred early in prehistory (Erlandson 2001; Perlman 1980; Yesner 1987). Most archaeologists, however, seem to have come to the consensus that coastal environments throughout the world are highly variable and that while some might be resource poor others are very rich (Jones 1991; Reitz 1988). The coast of the southeastern United States is one of those recognized as being highly productive (Perlman 1980; Reitz 1988). Given this, it seems clear that it is not a question of whether or not prehistoric people would have been able to make a living on the southeastern coast but rather *how* they did it. Which resources, out of the many available, did prehistoric people choose to incorporate into their diet and why?

The majority of research on coastal resources has understandably focused on the highly visible and relatively well-preserved remains of animals. Shellfish, in particular, have drawn special attention and debate over their relative merit and role in subsistence. Some archaeologists have argued that shellfish require large processing times and provide fairly small amounts of meat and nutrients (Osborn 1977; Bailey 1975). They have pointed to ethnohistoric data that suggest that shellfish were considered low-status or starvation foods (Osborn 1977: 173). On the other hand, some have argued that shellfish are a nutritious and reliable food source that might have played a major role in the diet of prehistoric people. While individual shellfish provide less meat than a terrestrial mammal, they are usually available in large numbers, can be collected year-round, and can be dried or smoked for storage. Shellfish are generally easy to locate and collect and can be collected by almost all members of a group (Erlandson 2001; Jones 1991; Waselkov 1987). This means children and the elderly may have been able to provide more of their own food than they could in other situations, possibly freeing adult foragers for other pursuits. There may also be gendered differences in shellfish exploitation. Ethnographic studies show that women tended to spend more time collecting shellfish than men (Waselkov 1987). Thomas (2008) suggests this may be because women, with fewer reproductive opportunities than men, were under evolutionary pressure to ensure the survival of their offspring. Therefore they tended to pursue foraging strategies focused on resources that were stationary, abundant, close to home, and low risk. Shellfish would certainly meet these criteria. Erlandson (1988) has also suggested that coastal groups with primarily plant-based diets might have used shellfish as a vital source of protein. Recent studies have demonstrated, however, that the energetic return from shellfish collection may vary greatly with the species exploited, the method of collection, the amount of field processing carried out, and the distance the shellfish must be transported (Bettinger et al 1997; Bird and Bliege Bird 1997; Kennett 2005).

The role of plants in coastal environments has received relatively less attention. This may be in part because preservation of plant remains is often quite poor in coastal soils. As Reitz (1988:139) points out, however, lack of evidence of plant consumption should not be interpreted as evidence for a primarily carnivorous diet. While foragers living in some coastal areas of the world, like the Arctic, undoubtedly derived the majority of their nutrition from animal sources, that was certainly not the case for all coastal peoples. In many areas, plants were an important complement to shellfish and other marine resources. For example, small seeds were very important to the diet of prehistoric foragers on the coast of California. As these seeds are usually high in calories but low in protein, a diet composed of seeds and protein-rich shellfish would have been nutritious, relatively easy to procure, abundant, and low risk (Erlandson 1991). In other areas, nuts may have played a similar role. On the southeast coast, in general, acorns and hickories are often extremely productive, easy to gather in large quantities, and storable (Thomas 2008). These attributes made them extremely attractive resources and they may have been central to the seasonal round of many groups (Larson 1980).

Mobility and Seasonality of Coastal Groups

Questions about the mobility of coastal groups have accompanied the debates on the value of coastal resources. Researchers have long discussed whether coastal resources were rich enough to support sedentary groups and/or complex social systems or whether people needed to maintain seasonal mobility to meet their dietary needs. Ethnohistorical evidence indicates that at least some populations of coastal hunter-gatherers were indeed sedentary and included "some of the most complex and artistically accomplished hunter-gatherers of all time," such as those in the Pacific Northwest (Erlandson 2001). The Pacific coast of Peru also supported a notably early sedentary society characterized by political complexity and large monumental architecture (Reitz 1988).

However, not all coastal regions were productive enough to maintain large sedentary populations without the support of agriculture. The productivity of a coastal region is effected by a number of factors including wave stress, seasonal temperature, sedimentation, and topography (Perlman 1980). In general, areas with broader continental shelves, gentle slopes, and low relief are more productive than other coasts. This is in part because such topography is often associated with extensive inshore water like estuaries, marshes, and lakes, which are often very rich in resources (Perlman 1980; Reitz 1988). The exception to this trend may be rocky shorelines where large sea mammals such as seals and sea lions establish rookeries (Jones 1991).

Perlman (1980) developed an optimum diet model for coastal hunter-gatherers based on coastal productivity and concluded that groups in rich coastal environments, like the eastern United States, might have become sedentary as an opportunistic response to the wealth of resources around them. Larson (1980), however, thought that soils on the southeast coast were poor for farming and prehistoric inhabitants of this area would have maintained a seasonal round to exploit different resources throughout the year even after the adoption of horticulture. These resources would have included nuts in the autumn, shellfish in the winter, and other plant foods in the spring. In opposition to Larson, other archaeologists have suggested that the soils of the southeast coast were indeed productive enough to support sedentary agricultural populations when combined with other subsistence activities (Thomas 2008).

Impact of Domesticated Plants on Coastal Subsistence

Another important issue in the study of coastal prehistory is the nature of the adoption of domesticated plants into the subsistence regime. The pattern of agricultural adoption on coasts is almost as diverse as the different coastal environments themselves. In some areas of the world, evidence for plant domesticates appears very early in shell middens and coastal sites. In other coastal environments, like California, agriculture never developed at all (Hammett and Lawlor 2004; Waselkov 1987). In general, it seems that in very rich coastal environments, adoption of horticulture was often slow or minimal (Kennett et al 2006; Waselkov 1987). The southeastern coast of the United States may have been one of these areas. There is very little evidence for dependence on horticulture until late in prehistory (Reitz 1988). Even then, there are regional differences in the reliance on horticulture, especially maize. By examining bone chemistry, Hutchinson et al (1998) found that there was evidence for increasing maize consumption by coastal populations of Georgia after A.D. 1000 although there was continued reliance on marine resources until the Spanish arrived. In Florida, however, there was very little evidence of maize consumption until the Spanish mission period.

There is also some debate over the relationship between the use of domesticated plants and wild animals, especially shellfish, in coastal areas. In some places it seems that the use of domesticates increased as the use of wild animals decreased, perhaps replacing them in the diet (Reitz 1988; Waselkov 1987). However, unless the domesticated crops were very high in protein, it seems more likely that domesticated plants would have supplemented and perhaps eventually replaced wild plants rather than wild animals. In many areas of the world, of course, people pursued mixed strategies of foraging and farming so the use of marine animal resources may not have changed much at all with the addition of domesticates (Kennett et al 2006; Reitz 1988). In these cases, the adoption of domesticates may have had more impact on settlement patterns, seasonality, and scheduling than the overall diet (Reitz 1988). People may have chosen to place their settlements closer to arable land than to wild resources and would have faced decisions about which subsistence activities to pursue such as in the spring when anadromous fish might be running and crops would need to be planted.

The North Carolina Coastal Environment

North Carolina is usually divided into three broad physiographic regions: the Mountains, the Piedmont, and the Coastal Plain. The Coastal Plain itself can be further divided into subregions on the basis of geomorphological variation and attendant ecological differences. (See Fig. 2.1.)

The coastal region begins in the west at the fall line where streams and creeks descend from the Piedmont onto a relatively flat plain sloping gently to the ocean. The entire region is underlain by marine sediments deposited by the ocean at different periods of inundation. The inner coastal plain is a wide area dissected by rivers with broad floodplains. Oak-hickory and pine forests dominate upland areas while gum, cypress, and pond pine dominate wet areas (Phelps 1983:5; Schafale and Weakley 1990). The inner coast lies on the Talbot Terrace and is bounded in the east by the Suffolk Scarp, a relict shoreline running roughly parallel to the modern shore (Copeland et al. 1984: 8).

East of the Suffolk Scarp and at a slightly lower elevation is the outer coastal plain or Tidewater situated on the Pamlico Terrace. The outer coast consists of a series of barrier islands running parallel to the shore with estuaries behind them. The barrier

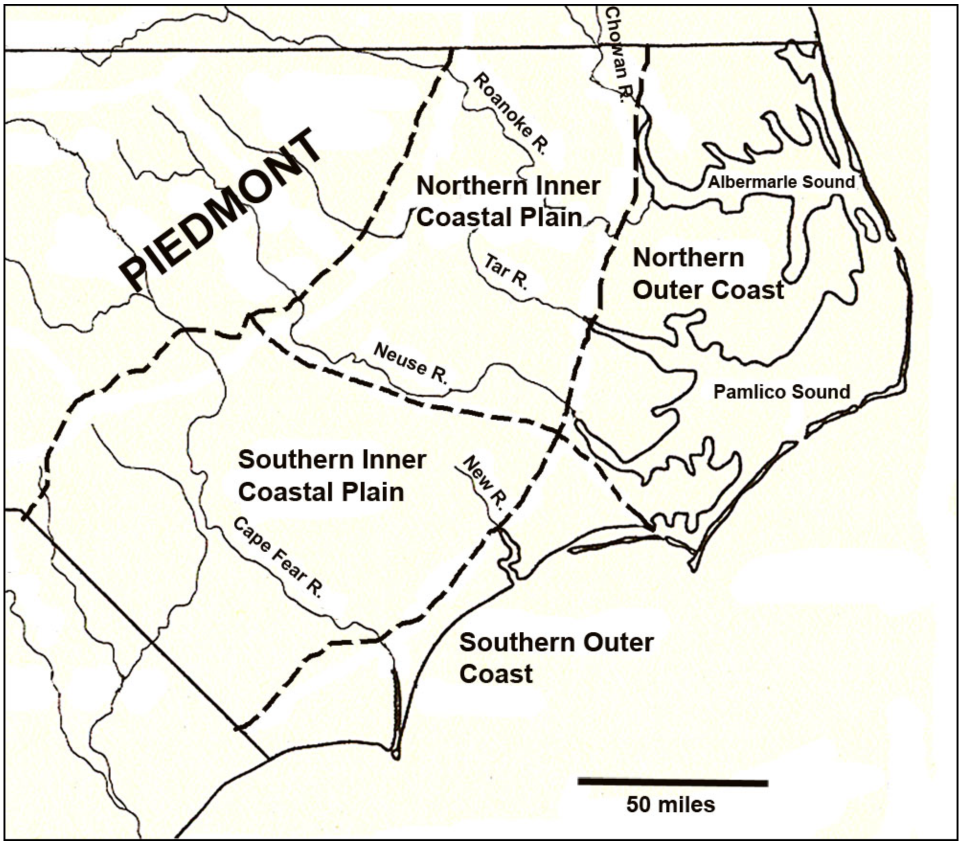

Fig. 2.1. Subregions of the North Carolina coastal plain.

islands are relatively thin and fragile strips of sandy land of fairly recent geological origin, being roughly only 5,000 years old (Godfrey and Godfrey 1976). Some of the islands are large enough to support marshes and scrubby woodlands but they are all subject to dramatic changes caused by ocean tides and hurricanes. Indeed, storm winds and high water washing over the islands have probably shifted them toward the mainland as the sea level has risen since the last glaciation (Godfrey and Godfrey 1976).

There are, however, considerable differences between the northern and southern parts of the outer coast, which directly impact the ecological communities found there and subsequently human use of the area. The boundary between the two can be found by drawing a line from Raleigh to Cape Lookout through Kinston (Pilkey et al. 1998). From

Cape Lookout and the Neuse River north, the outer coast is characterized by long barrier islands that act as buffers between sea and land. These islands, the Outer Banks, create a sheltered environment for the expansive estuary systems and sounds that dominate the remainder of the northern outer coastal plain. The conjoined Albermarle and Pamlico Sound system covers 2,900 square miles and is the second largest sound on the East Coast after the Chesapeake (Griffith 1999: 12). These estuaries are the drowned portions of rivers and their floodplains. Because there are only four inlets on the northern part of the coast, they are largely fresh or brackish water and experience minimal oceanic influence. The Pamlico Sound, which has more inlets from the ocean, is more saline than the more protected Albermarle. The waters of both sounds are home to vast quantities of shellfish, fish, marine mammals, waterfowl, and reptiles. They also serve as important nursery areas for several species of anadromous and migratory fish and crustaceans (Copeland et al 1984). Around these complex waterways lies a flat sandy/loamy mainland interspersed with marshes, swamp forests, and pocosins.

The northern outer coast also encompasses a major transition zone in marine life. The projection of the barrier island chain into the Atlantic corresponds with a natural division in marine resources between northern and southern waters. From Cape Hatteras north, marine species are those more common to northern waters like pollock and hake while to the south of Hatteras species like grouper, snapper, and billfish, which are typical of southern and Gulf Stream waters, are more common (Griffith 1999: 14).

The bedrock of the northern outer coast is overlain by an eastward thickening wedge of marine sediments up to 230 feet thick with an average slope of only 0.2 feet per mile (Pilkey et al 1998: 62). In contrast, the bedrock underlying the southern portion of the outer coast experienced a slight uplift in the past resulting in a steeper slope (3 feet per mile on average) and a thinner covering of sediment (Pilkey et al 1998: 61-62; Gunn 2002: 8). Because of these geological differences, the coastline of the southern outer coast is also very different from the north. The barrier islands here are short and consequently provide many inlets for the ocean to reach the mainland. Tides, therefore, play a much larger role in the system. Sounds are much smaller on the southern coast and the estuaries that form there are shorter, narrower, and tend to run parallel to the coast rather than perpendicular to it as on the north coast. The southern coast also has well-developed marshes and intertidal flats (Peterson and Peterson 1979).

These physiological and ecological differences along the shore line have the potential to affect human use of different areas of the coast. Estuarine resources are much more readily available in the northern part of the coast, for example, but the southern coast is more protected from extreme wind and cold in the winter (Ward and Davis 1999: 195).

It should be noted that the study of coastal archaeology is complicated by the loss of sites due to changing sea levels. Global sea levels have gone through several cycles of rising and falling in the recent geological past. However, sea levels have been rising since the last glaciation ended about 17,000 years BP (Copeland et al 1984). This was accompanied by a gradual warming of climate that eventually established the vegetation patterns seen in the state today. Sea level rise seems to have slowed down around 4,000 years ago. This means sites dating to the Late Archaic or Early Woodland or later are probably about the same distance from the coast as they were at the time of their occupation (Loftfield 1988). Sites from earlier time periods may have been covered by rising sea levels or the flooding of the river valleys which formed the estuaries.

North Carolina Coastal Prehistory

At the time of contact, European explorers and settlers encountered people on the coast of North Carolina who spoke languages belonging to three large language families. In the northern coastal region, the outer coast was occupied by Algonquian speaking groups while the inner coastal plain was dominated by the Iroquois-speaking Tuscarora. In the southern coastal region, both the narrow outer coast and the inner coastal plain were occupied by people speaking Siouan languages although there is relatively little evidence of what their languages were like (Campbell 1997: 141-142; Phelps 1983; Ward and Davis 1999). Archaeologists have generally assumed that these three languages corresponded to three major cultural areas on different parts of the coast and have attempted to project these differences back into the prehistoric past.

Chronologically, archaeologists divide the prehistoric human occupation of the coast into three major periods: the Paleo-Indian, the Archaic, and the Woodland. The Paleo-Indian Period lasts from the earliest human settlement of the region up to about 8000 BC. Little is known about coastal populations from this time. Fewer than 50 Paleo-Indian sites have been recorded on the coast (Ward and Davis 1999). This is probably partly due to the fact that during this time period sea levels were much lower than they are today and many coastal sites would have been submerged by the rising sea and expanding estuaries. The climate of North Carolina during the Paleo-Indian period was cooler and wetter than it is today. Although data on subsistence practices for this time period are practically non-existent, people living on the coast would have been supporting themselves through hunting either large or small game, fishing, shellfishing, and gathering wild plants. The inhabitants of coastal North Carolina almost certainly did not rely heavily on hunting Pleistocene mega-fauna, which may have been more common in the western United States, as the forested environment would not have supported large herds of those animals. The Pleistocene megafauna were also becoming extinct during this period and were gone by 8500 BC (Ward and Davis 1999).

The Archaic Period spans from 8000 to 1000 BC and includes the transition to a modern climate regime. As in other parts of the Southeast, people on the North Carolina coast most likely lived in small nomadic bands and practiced hunting, fishing, and gathering during this period. Bands are assumed to have been exogamous, territorial, and with status distinctions based on individual skill and achievement. People probably established base camps as fairly long-term settlements and smaller, temporary procurement camps to take advantage of seasonally available resources like deer, anadromous fish, shellfish, or nuts. Base camps were usually situated near stream confluences while procurement camps were scattered in a variety of different environments and the number of sites seems to increase through time (Phelps 1983). In the Late Archaic, fish and shellfish appear to become more important parts of subsistence practices and settlements became more sedentary.

The Woodland Period (1000 BC – AD 1600) is the best known of the prehistoric time periods for the coast. This period saw the spread of pottery making and the inhabitants of the coast also began a shift towards agriculture and living in more permanent settlements. Very little is known about Early Woodland (1000 – 300 BC) settlement patterns or subsistence practices. Almost no subsistence remains for this time period have been recovered and there is currently no indication that cultivated plants played an important role in the subsistence economy of coastal people. It is possible that the rich estuarine resources available to people on the coast encouraged a continuation of earlier hunting, fishing, and gathering practices (Ward and Davis 1999: 203). During the Middle Woodland (300 BC – AD 800), more sites were situated along major streams and estuaries than in proceeding periods. People are assumed to have been living in fairly settled, permanent villages for most of the year and possibly practicing a mix of cultivation and hunting and gathering. The expectation of cultivation, however, is partly based on the presence of maize pollen in the Dismal Swamp of southern Virginia dating to around 2,000 years ago (Whitehead 1972: 311). Seasonal camps were probably still important, especially for the exploitation of shellfish, given the number of sites with large shell middens dating to this period. None of the presumed permanent settlements have been excavated, however, and subsistence data for this period are still scarce (Ward and Davis 1999: 204).

The Late Woodland (AD 800 – 1600) is probably the best-understood prehistoric period. During this period, shell-tempered pottery was introduced to the area. Archaeologists have generally assumed that the ethnohistorically described linguistic divisions mentioned above may be first established in this period. The have sought to associate regional differences in material culture and burial practices with these linguistic groups. On the northern Outer Coast, the ancestors of the Algonquians encountered by Europeans may have been organized into chiefdoms or some other type of ranked society. They probably relied more heavily on cultivation although they also still maintained fishing and shellfishing camps (Ward and Davis 1999: 212). Ethnohistoric drawings depict the Algonquians living in at least two types of villages: one of tightly clustered longhouses surrounded by a stockade and one of more dispersed longhouses without a stockade. Both types of villages are depicted with associated agricultural fields. Stockaded villages seem to have had fields just outside the walls of the village. In the dispersed villages, however, the houses are shown nestled between fields and gardens of corn and other crops. Algonquians also often buried their dead in ossuaries. On the northern Inner Coastal Plain, the predecessors of the Tuscarora probably also had mixed subsistence patterns using agriculture, hunting, gathering, and fishing. Seasonal deer hunting camps were important to people in this area when they were first contacted by Europeans but this may have been the result of the European fur trade rather than the continuation of a prehistoric practice (Ward and Davis 1999: 224).

The people living on the southern Outer Coast during the Late Woodland period shared many cultural traits with their northern neighbors. They lived in long houses, exploited many of the same resources, and buried their dead in ossuaries (Ward and Davis 1999:217). It seems likely that at least some of the people in this area were closely related to the Algonquian people living on more northerly parts of the coast. The interior of the southern coast is virtually unstudied for this time period.

Recent archaeological research has begun to problematize the connection between the ethnohistoric linguistic groups and these regions, however. Ann Kakaliourias (2003), for example, examined some of the biological differences previously believed to exist between the different coastal groups. She found no significant biological differences between the presumed Algonquian, Iroquoian, and Siouan speakers. Instead, she suggested that the people of North Carolina probably formed a single population with extensive gene flow between local communities. She also pointed out that language is not necessarily correlated with culture and speakers of more than one language may share cultural practices. Joseph Herbert's (2009) analysis of Woodland ceramics also found that ceramic styles tended to persist over long periods of time in large regions of the coast. This suggests that there was more stability than change in ceramic technology throughout prehistory. It also lead Herbert (2009: 199) to conclude that "ceramic types, composed of independently varying traits, reflect communities of practice encompassing multiple ethnic and linguistic groups but somehow sharing common cultural histories."

Previous Research on Subsistence on the North Carolina Coast

Relatively few studies have been conducted on the subsistence practices of prehistoric North Carolina coastal people. Loftfield (1976) compiled data on plant and animal foods mentioned in ethnohistoric accounts of North Carolina and Virginia from the 16th century to the beginning of the 18th century. English settlers reported Native Americans raising several different crops. These included maize (*Zea mays*), sunflower (*Helianthus annuus*), beans (*Phaseolus* sp.), squash (*Cucurbita* sp.), gourds (*Lagenaria* sp.), and tobacco (*Nicotiana rustica*). Early settlers also noted Native Americans consuming several different wild plants. These included several roots and tubers such as tuckahoe (also called golden club, *Orontium aquaticum*), the roots of woody smilax (*Smilax* sp.), ground nut (*Apios tuberosa*), wild potato vine (*Ipomea pandurata*), and arrowroot (*Sagitarria latifolia*). Reported nuts used by Native Americans included chestnuts (*Castanea dentata*), walnuts (*Juglans nigra*), hickories (*Carya* sp.), and acorns (*Quercus* sp.). The English settlers also reported Native Americans eating a variety of fruits and herbs such as persimmon (*Diospyros virginiana*), prickly pear (*Opuntia* sp.), grapes (*Vitis* sp.), strawberries (*Fragaria* sp.), and wild rice (*Zizania aquatica*).

There have been a few bioarchaeological studies of note that addressed subsistence. The largest of these by Dale Hutchinson (2002) included the analysis of skeletal remains from two Middle Woodland and 11 Late Woodland sites. Incorporating a stable isotope analysis performed by Lynette Norr (2002) and dental enamel microwear analysis performed by Mark Teaford (2002), Hutchinson (2002) found temporal and regional differences in diet on the North Carolina coast. Middle Woodland people from most sites on both the inner and outer coasts were found to have monoisotopic diets that may indicate a diet entirely based on C3 (non-maize) plants, C4 (most likely maize) plants, or a mixture of both and terrestrial and marine protein (Norr 2002). The exception was the 31MT16 site on the inner coastal plain which had an isotopic signature indicating a diet rich in freshwater fish and a C4 plant that may have been maize. People at Late Woodland inner coastal sites seem to have been consuming freshwater fish and maize. The people at outer coastal sites during this time period, in contrast, seem to have been eating diets with more marine fish and little to no maize. There was, however, variation within these areas, especially on the outer coast, suggesting that people had very localized diets. Since early European explorers of the area reported that people living on the coast were farmers, Hutchinson (2002: 158) concludes that the inhabitants of the outer coast may have adopted maize agriculture later than the inhabitants of the inner coast, sometime after A.D. 1400. Men and women in both areas had similar stable isotope values and were therefore probably consuming the same foods. They did, however, have different patterns of dental chipping that indicates that the different sexes may have been consuming those foods in different ways, perhaps at different stages of processing (Hutchinson 2002).

Carmen Trimble (1996) conducted stable isotope analysis of remains from 20 individuals from the Late Woodland Flynt (31ON305) site on the southern outer coast. Botanical remains found at the site included hickory, maize, and acorn while faunal remains included deer, shellfish, and fish. The stable isotope analysis confirmed that people from the site had diets high in marine protein resources and C4 maize.

Elizabeth Monahan (1995) conducted a bioarchaeological analysis of the remains of 32 individuals uncovered during Mark Mathis' excavations at the Broad Reach (31CR218) site. She looked at several indicators of health and nutrition (linear enamel hypoplasias, stature, Harris' lines of arrested development, treponemal infection, and caries) with the goal of exploring possible status differences among individuals buried in different contexts. Almost all of the individuals analyzed showed signs of nutritional stress at some point in their life and most had multiple episodes. The only individuals with dental caries, however, were found in a Late Woodland ossuary called Burial 6, which was presumed to include high status individuals because it contained some unusual grave goods. Monahan (1995) interpreted these caries as signs that the individuals of Burial 6 had diets high in maize but had difficulty explaining their assumed high status combined with their poor overall health. She suggested that they may have been high status individuals buried later than most of the others at the site and that these individuals may have lived after people at Broad Reach made the transition to maize agriculture.

John Scarry and C. Margaret Scarry (1997) compiled zooarchaeological and archaeobotanical data from published sources and unpublished theses, dissertations, and site reports on file at the North Carolina Office of State Archaeology. Their data included 113 cultural components at 93 archaeological sites throughout North Carolina. On the coast, 39 cultural components had zooarchaeological data and 15 had archaeobotanical data. Due to the variation in recovery and analytical methods and reporting, only presence/absence data for animal and plant taxa were recorded.

Among the zooarchaeological remains recorded at coastal sites are several types of shellfish and fish; reptiles, including turtles and alligators; birds such as turkeys, geese, and ducks; and mammals like white-tailed deer, dogs, opossums, racoons, and beavers. John Byrd (1997) found most of these taxa during his analysis of faunal remains from Jordan's Landing (31BR7), one of the sites analyzed in this dissertation. He found that the people at this Late Woodland site exploited a wide variety of animal resources and probably lived at the site year-round.

Cheryl Claasssen (1983) examined shellfish remains from 19 Woodland sites on the coast. She found that most of the levels of shell middens at these sites indicated that people were collecting shellfish from the fall to late winter or spring. This is in contrast to historic reports of Native Americans fishing during the summer during the Contact period. Claassen posits that the Europeans' frequent summer visits attracted native populations to the coast at that time and thus changed their subsistence scheduling.

Studies of coastal plant remains have so far been largely limited to unpublished site reports. Besides the 15 temporal assemblages from 10 sites compiled in Scarry and Scarry's (1997) report, eight more assemblages from three sites were also found in a brief survey of the archives at the Office of State Archaeology. These include Middle and Late Woodland remains from Hammocks Beach West (31ON665); Late Archaic and Early and Middle Woodland remains from 31CB114; and Early, Middle, and Late Woodland remains from Long Point (31JN2) (Abbott et al 1999; Crites 1999; Detwiler and Scarry 1999). Presence/absence data from these 13 sites are presented in Table 2.1 and discussed further in Chapter 6.

Current archaeological research, therefore, suggests that residents of the North Carolina coast pursued a foraging subsistence strategy for most of prehistory. People ate a variety of marine and terrestrial animal foods including fish, shellfish, and deer. The previously reported archaeobotanical data indicate that hickory is the most common plant food recovered from prehistoric sites on the coast. Other taxa found on the coast include acorns, walnuts, and a variety of tree and weed seeds. Despite the possible maize isotope signature found by Norr (2002) at the Middle Woodland 31MT16 site, domesticated plant remains, including maize and beans, have only been recovered from sites dating to the Late Woodland and historic periods.

Table 2.1 Plant Taxa Reported at Previously Analyzed Coastal Sites.

Site #	BF115[a]	DR035[a]	DR035[a]	HF020[a]	HF030[a]	HF030[a]	HF030[a]	HY043[a]
Site Name	(Bath Creek)	Tillett	Tillett	Mount Pleasant	Liberty Hill	Liberty Hill	Liberty Hill	Amity
Period	Late Woodland	Middle Woodland	Late Woodland	Late Woodland	Early Woodland	Middle Woodland	Late Woodland	Contact
Location:								
North/South	North	North	North	North	North	North	North	North
Inner/Outer	Outer	Outer	Outer	Inner	Inner	Inner	Inner	Outer
Corn								x
Bean				x				x
Chenopod								
Amaranth								
Knotweed								x
Little Barley								x
Squash							x	x
Sumpweed				x				
Bearsfoot								
Maygrass								x
Wild Rice								
Ragweed								
Acorn		x	x	x				x
Hickory	x			x	x	x	x	x
Walnut								x
Blackgum								
Grape				x				x
Haw								
Hackberry			x					
Huckleberry								
Maypops								
Sumac								x
Palmetto								
Persimmon								
Prunus								
Dogwood								
Tulip Poplar								
Wax Myrtle								
American Holly								
Bedstraw								
Vetch								
Clover								
Purslane								
Carpetweed								
Copperleaf								x
Spurge								
Spurge family								
Gromwell								
Indian Turnip								
Morninglory								
Weedy Legume								
Goosegrass								
Mustard family								
Grass family								
Cane								
Cedar		x						
Pine cone								x

[a] Scarry and Scarry 1997

Table 2.1 (continued). Plant Taxa Reported at Previously Analyzed Coastal Sites.

Site #	NH556[a]	ON031[a]	ON190[a]	ON190[a]	ON190[a]	ON195[a]	ON305[a]	ON665[b]
Site Name	Stoney Brook		Cape Island	Cape Island	Cape Island		Flynt	Hammock Beach West
Period	Middle Woodland	Late Woodland	Early Woodland	Middle Woodland	Late Woodland	Late Woodland	Late Woodland	Middle Woodland
Location:								
North/South	South	South	South	South	South	South	South	South
Inner/Outer	Outer	Outer	Outer	Outer	Outer	Outer	Outer	Outer
Corn		x			x	x	x	
Bean					x	x		
Chenopod			x		x			
Amaranth					x			
Knotweed								
Little Barley								
Squash						x		
Sumpweed								
Bearsfoot								
Maygrass								
Wild Rice			x		x			
Ragweed					x			
Acorn					x		x	x
Hickory	x		x		x	x	x	x
Walnut								
Blackgum								
Grape					x			
Haw								
Hackberry								
Huckleberry								
Maypops						x		
Sumac								
Palmetto								
Persimmon								
Prunus								
Dogwood					x			
Tulip Poplar								
Wax Myrtle								
American Holly								
Bedstraw			x		x		x	
Vetch					x			
Clover					x			
Purslane								
Carpetweed								
Copperleaf							x	
Spurge					x		x	
Spurge family								
Gromwell			x		x			
Indian Turnip			x		x			
Morninglory				x	x			
Weedy Legume								
Goosegrass								
Mustard family			x		x			
Grass family					x			
Cane								
Cedar								
Pine cone					x			

[a] Scarry and Scarry 1997

[b] Detwiler and Scarry 1999

Table 2.1 (continued). Plant Taxa Reported at Previously Analyzed Coastal Sites.

Site #	ON665[b]	CB114[c]	CB114[c]	CB114[c]	JN2[d]	JN2[d]	JN2[d]
Site Name	Hammock Beach West				Long Point	Long Point	Long Point
Period	Late Woodland	Late Archaic	Early Woodland	Middle Woodland	Early Woodland	Middle Woodland	Late Woodland
Location:							
North/South	South	South	South	South	South	South	South
Inner/Outer	Outer	Inner	Inner	Inner	Outer	Outer	Outer
Corn	x						
Bean							
Chenopod							
Amaranth	x						
Knotweed							
Little Barley							
Squash	x						
Sumpweed							
Bearsfoot	x						
Maygrass							
Wild Rice							
Ragweed							
Acorn	x						
Hickory	x	x	x	x	x	x	x
Walnut						x	
Blackgum		x					
Grape	x						
Haw							
Hackberry							
Huckleberry		x					
Maypops							
Sumac							
Palmetto							
Persimmon							
Prunus							
Dogwood							
Tulip Poplar		x					
Wax Myrtle							
American Holly							
Bedstraw		x		x			
Vetch							
Clover							
Purslane	x						
Carpetweed	x						
Copperleaf							
Spurge							
Spurge family	x						
Gromwell							
Indian Turnip							
Morninglory							
Weedy Legume							
Goosegrass							
Mustard family							
Grass family	x						
Cane							
Cedar							
Pine cone		x					

[b] Detwiler and Scarry 1999
[c] Abbott et al 1999
[d] Crites 1999

Chapter Three

Human Behavioral Ecology and Diet-Breadth

Many different theoretical approaches can be employed in the study of prehistoric subsistence. Human behavioral ecology is one that has frequently been used by archaeologists to generate hypotheses and interpret subsistence patterns in the archaeological record. Several studies of coastal areas throughout the world have successfully employed human behavioral ecology to understand coastal subsistence and settlement patterns. In this dissertation, I interpret the results of my archaeobotanical analysis within the framework of human behavioral ecology. In particular, I use the implications of diet-breadth models to discuss subsistence choices by the prehistoric people of coastal North Carolina. I will also discuss some of the implications of central place foraging for prehistoric subsistence practices. Here, I present a summary of human behavioral ecology and diet-breadth and central place foraging models.

Human Behavioral Ecology

Evolutionary ecology is the application of Darwinian principles, especially natural selection, within a specific ecological context. When applied to human behavior, it is typically referred to as human behavioral ecology (HBE) (Winterhalder and Smith 1992). HBE has been employed by anthropologists and archaeologists at least since the 1970's and has a set of well-developed, testable models that can be applied to many situations (Winterhalder and Smith 2000; Kennett 2005). HBE has been used to explore topics as diverse as the evolution of menopause, conservation biology, parental investment in offspring, and the origins of agriculture (Winterhalder and Smith 2000).

Human behavioral ecology can be applied to a wide range of topics because its basic tenets are widely applicable. HBE asserts that the forces of natural selection work on humans as they do on other animals and, since behavior is one of the most important ways in which humans adapt to their environment, natural selection should favor individuals whose behavioral tendencies increase their reproductive fitness and/or chances of survival. Human behavior is obviously very complex and has multiple causes. While genetics certainly play a role in some behavioral tendencies of individuals, behavior is also shaped by the environment, both physical and cultural, in which individuals live and their interactions with that environment. It is not necessary or feasible to attempt to determine which human behaviors have a genetic basis in order to use HBE models. Instead, behavioral ecologists focus on phenotypes, the expressed traits of individuals, and assume that "selection will favor traits with high fitness … irrespective of the particulars of inheritance" (Smith and Winterhalder 1992: 33).

Since natural selection favors different traits in different circumstances, HBE places a heavy emphasis on the interaction between humans and their specific physical and social environments. Behavioral ecologists also generally work within a framework of methodological individualism, which suggests that the properties of social groups are the results of the actions of individuals. Therefore, any adaptations to a given environment seen on a group-level are the result of natural selection acting on individuals and the choices those individuals make throughout their lives. These two factors make most HBE models very fine-grained with short time scales (Kennett 2005). The archaeological record, however, rarely provides us with a short term view of the past. Instead, we usually see the results of many individual decisions by many people over a long span of time. This has led some to argue that there is a scalar mismatch between HBE models and the archaeological record and to question if HBE models are really applicable to archaeology (Smith 2006). As Bettinger (2006) points out, however, it is still unclear if the differences in scales actually make a difference to the accuracy of the models and many archaeologists have found the implications of HBE useful in the interpretation of the archaeological record.

Optimal Foraging Theory

While HBE can be applied to a range of subjects, the majority of HBE research, especially as used in archaeology, has focused on resource acquisition and subsistence. The models produced by these studies are commonly grouped under optimal foraging theory (OFT). As the name suggests, the models were originally developed to address hunter-gatherer subsistence strategies but in recent times more anthropologists have been applying HBE models to pastoralists and agriculturalists (Barlow 2006; Gremillion 1996; Kennett and Winterhalder 2006; Smith 2006). Optimal foraging theories share several important elements.

Firstly, they all begin with an *assumption of optimization*; that is, they assume that evolutionary forces will select for individuals who “behave as if they were optimizing some fitness-related currency or set of currencies"(Kaplan and Hill 1992). Behavioral ecologists, however, do not expect human behavior to be fully optimal in most situations. There are always constraints on optimization including temporal lags in adaptation to changing circumstances and competing goals (Winterhalder and Kennett 2006). Nonetheless, even slightly more optimal behavior would have an evolutionary advantage over inefficient behavior and therefore should be selected for.

All foraging theories employ some form of *currency* to measure the costs and benefits of behaviors. Since the effect of any given action or behavior on the fitness of the actor is often difficult to assess, behavioral ecologists instead use more easily quantifiable measures, such as energy or time, as proximate currencies (Smith and Winterhalder 1992). These measures are assumed to be highly related to fitness since both can influence reproductive success. Energy, usually measured in kcal, is necessary to sustain life, successfully carry out reproduction, and support offspring. Time is an important currency because time spent on one activity cannot be used on others that may contribute more to fitness. Time spent foraging, for example, is time not spent finding a mate or caring for children. The most common currency in OFT models combines the two. The net acquisition rate (NAR) of energy can be expressed as the amount of energy in kcal produced by an activity per unit time. This is a measure of efficiency and behaviors that yield higher NARs should be favored by natural selection. Net acquisition rates are not the only possible currency for OFT models, however. The currency can actually be anything of value in a given situation. In some cases, where calories are easy to come by, some other nutritional factor, like protein or calcium, could serve as a currency (Winterhalder and Kennett 2006).

Every optimal foraging model also requires a *goal*. In some cases, this may simply be the maximization of the currency during the modeled activity. For example, the goal of many models is attaining the highest amount of energy during foraging. Other models may place emphasis on minimizing the risk of food shortfalls, maximizing reproductive opportunities, or maximizing prestige (Winterhalder and Kennett 2006).

The ways in which a goal can be achieved under a particular model are called the *alternative (or decision) set*. The alternative set includes all the possible behaviors that an individual could carry out in the situation being studied (Winterhalder and Smith 2000). In foraging models, the alternative set is usually comprised of the decisions a forager could make while foraging and would include things like whether or not to exploit a specific resource, how frequently to move between resource patches, and how long to spend in pursuit of prey.

The alternative set is the dependent variable in foraging models. The independent variable, which determines which option of the alternative set is chosen, is one of a series of *constraints* on the model. Constraints include any factor of the actor or their environment that limits their possible behaviors. They may include things like the physical or intellectual limits of the forager or the number and type of resources available in their immediate surroundings. In using the model, most of the constraints are assumed to remain stable and fixed. One constraint, however, is allowed to vary and becomes the independent variable. Researchers can change which constraint serves as the independent variable to generate predictions about how the behavior selected from the alternative set may change under different circumstances.

Diet-Breadth

One of the most commonly used optimal foraging models in archaeology is the diet-breadth model, also known as the prey choice or resource selection model. This model focuses on a very specific and limited action that has much larger consequences for the lives of foragers. The diet-breadth model poses the question of what a forager should do when they encounter an edible resource while foraging: should they stop and collect it or ignore it and continue looking for other resources. Ultimately, this model seeks to address which resources efficient foragers should choose to exploit out of all the potentially edible species in the environment. Humans rarely ever consume all of the edible plants and animals in their immediate surroundings, therefore they must have some criteria for choosing among their options.

The diet-breadth model explores what those criteria might be by creating testable hypotheses about which resources should be included in the diet to achieve the model's goal. The goal in diet-breadth models is to optimize the currency. The currency of most diet-breadth models is net acquisition rate of energy, however, as noted above, other measures can take its place. If the acquisition of calories is not a limiting factor in a given environment, other nutritional elements might be. For example, Gardner (1992) constructed diet-breadth models using Vitamins A, B, and C and calcium as currencies.

The alternative set in diet-breadth models is quite simple. When a forager encounters an edible resource, he or she decides to either pursue it or to ignore it. In order to simplify the prediction of the decision making process, diet-breadth models stipulate that there can be no partial pursuits. A forager will either always pursue a given item or will always ignore it. Partial pursuits can be addressed using patch choice or patch residence time models (see Winterhalder and Kennett 2006).

Like all optimal foraging models, diet-breadth models use a simplified version of the real world in order to better predict behavior and control the number of variables that must be considered. They do this by placing a number of constraints or assumptions on the hypothetical situation. The diet-breadth model starts with a forager setting out on a foraging trip. For the sake of the model, it is assumed that foraging has two phases: search and pursuit (Winterhalder and Goland 1997). In the first phase, the forager will search for all resources in the optimal diet simultaneously. The way foragers encounter resources in diet-breadth models is constrained in ways that may or may not match real world experiences. Firstly, the model stipulates that a forager will encounter resources one at a time, randomly, and independent of previous encounters. In other words, encountering one type of prey, like a deer, should have no effect on the chances that the next prey encountered will also be a deer. The model also assumes that the density of prey will remain the same throughout the entire time the person is foraging (Thomas 2008).

When the forager encounters an edible plant or animal, he or she must decide whether to pursue it or ignore it. Whether or not a forager should pursue a given resource is decided by calculating the optimal diet for the situation. First, all possible resources are ranked by their estimated handling return rate. The handling return rate is simply found by dividing the caloric return per unit of the resource by the handling time necessary to exploit it. Handling time can include any time spent after finding the resource to prepare it for consumption. This may include tasks such as pursuing animals, butchering them, removing inedible plant parts like husks or shells, or boiling to remove toxins. Handling return rates are expressed in kcal/hr for each type of food and those with the highest return rates are incorporated into the optimal diet first. While the caloric return of resources can be found by nutritional analysis, handling time must be estimated through ethnographic observation or experimental archaeology. Diet-breadth models assume that the rank of each resource is independent of other resources and that the costs and benefits of each resource are fixed and invariable (Thomas 2008).

To calculate how many resources should be in the optimal diet, search times must be incorporated into the model. The resource with the highest handling return rate should always be pursued no matter how rare it is. Additional resources will be added from highest to lowest handling return rate until adding another resource will decrease the average foraging return rate of the diet (Winterhalder and Goland 1997). The foraging return rate is found by dividing the caloric return rate of a resource (or resources) by the handling *and* search times. Search time is, in part, a proxy measure for abundance since a forager will have to search longer for a rare resource while abundant resources may be found with very short search times. Since all resources in the diet are searched for simultaneously, adding more resources always decreases the search time per item; in other words, it increases the frequency of encounters with edible resources (Bettinger 2009). Resources with high handling return rates will be included in the diet even if they are very rare because they will yield many calories for little effort. Resources that have very high handling times (i.e. have very low handling return rates), however, may decrease the foraging return rate even if they are very common (and have short search times) because they will yield few calories and require extensive processing.

Plant resources (and, to a certain degree, shellfish), however, differ in some important ways from animal food resources which effect search times. As Gardner (1992) and others have pointed out, since plants, unlike animals, are sessile, foragers often know before setting out on a collection trip where they will find plant resources and will have some idea about the conditions of edible resources. Information about plant location, productivity, and fruit or seed ripeness can be acquired while carrying out other tasks like hunting or carrying water or acquired from other people who have seen them. Unlike hunting for deer, therefore, a forager is unlikely to be unable to find hickories when he or she sets out on a foraging trip. Travel or transportation costs may be more relevant to which plants are included in the optimal diet. While foragers may not have to search blindly for a specific plant resource, if there is very little of it in the area, they will have to travel far to collect it and carry it a long way back to their home. Central place foraging models, which I discuss in the next section, can be used to address some of these transportation issues.

As mentioned above, the constraints and assumptions of optimal foraging models can be treated as independent variables in order to produce testable hypotheses. This is true for diet breadth models as well. The constraint or constraints chosen as the independent variable will depend on the circumstances and the researchers interests. One of the most common, for example, is the assumption that the density of prey will remain constant. If, in contrast, resource abundances change over time, they will have predictable, testable impacts on the breadth of the diet. In general, if higher-ranked resources decrease in abundance, the diet will broaden to incorporate more resources with lower handling return rates. If resources with high handling return rates increase in abundance, on the other hand, the diet will narrow to include fewer resources. The assumption that the costs and benefits of resources remained fixed can be similarly tested as might be the case if a new technology allowed the easier processing of a resource, thus decreasing its handling time. It should be noted that optimization is itself never tested using the diet-breadth model (Thomas 2008: 67). However, if foragers do not seem to be behaving optimally, it should encourage us to examine the other assumptions of the model and may lead to new avenues of inquiry.

Since optimal foraging theory and models like diet-breadth were originally developed to explain the behavior of foragers, there has been some debate over its applicability to other modes of food production. Recently, however, there has been a growing consensus that, with proper adjustments, optimal foraging models may be useful in exploring agricultural and pastoral activities and the transition from foraging to food production (see Kennett and Winterhalder 2006). While it is easy to think of the development of agriculture as a revolutionary landmark in human history that radically changed subsistence patterns, in most places there was probably a continuum of activities from foraging to tending wild resources to cultivation to agriculture (Barlow 2006; Bettinger 2006). Considering horticultural activities in this way may provide a method to investigate food production with optimal foraging theory. Barlow (2006) constructed a model for predicting the adoption of agriculture among the Fremont of Utah and theorized that foragers will focus on the expected future return rate for individual farming activities, each of which is assumed to increase yields at harvest time. Therefore, they should invest time in agricultural activities when the expected return rate (after harvest) is greater than the immediate return rate of spending that time foraging. Gremillion (1996) used both deterministic and risk reduction (z-score) diet-breadth models to explore the adoption of new crops by people who were already practicing horticulture. She found that the reliability of crops and their ability to minimize the risk of food shortage may play an important role in their adoption, especially if there are no more attractive resource options. Winterhalder and Goland (1997) also used deterministic and risk reduction diet-breadth models to examine the initial domestication of plants and its relationship to sharing, exchange, and field dispersal. They concluded that the handling return rate ranking and abundance of resources may have different ecological consequences and should both be considered individually. They also theorized that domestication probably affected household organization, sharing, and land-use rights.

Central Place Foraging

Another optimal foraging model often employed by archaeologists is central place foraging. While it is beyond the scope of my dissertation to create a central place foraging model for the coast of North Carolina, I will discuss some of the implications of central place foraging theory for coastal subsistence in Chapter 7. Therefore a brief definition of central place foraging is in order.

Like diet-breadth, central place foraging models are a specific kind of optimal foraging model. Also like diet-breadth models, central place foraging attempts to determine which resources efficient foragers should select in a given ecological setting. Central place foraging models, however, place an emphasis on travel and transportation costs required to collect resources. They assume that people tend to place their habitation sites in desirable locations and then travel radially out from that site to forage during the day. They would then return to their central habitation site with the food they collected for consumption. Central place models predict that optimal foragers will try to maximize the value of food collected and minimize the time and effort required in travel, handling, and transportation (Winterhalder and Kennett 2006). These model have been used to explore how far foragers should travel from their central place to forage for different resources, where they should locate their habitation sites, and field processing (Hollenbach 2009; Winterhalder and Kennett 2006: 17). Field processing is generally used to reduce the bulk of collected resources by decreasing low value parts, such as inedible nutshells or shellfish shells. This makes resources easier to transport but increases the handling time required in the field (Winterhalder and Kennett 2006).

In Chapter 7, I will discuss the implications of optimal foraging theory for subsistence on the coast of North Carolina. I will estimate handling return rates for some of the major plant food resources found at coastal sites and rank them as they would enter the theoretical optimal diet for foragers in the area. I then compare this model to the plant remains recovered from all sites on the coast. I will also discuss how the conclusions of central place foraging theory may have impacted the use of resources here.

Chapter Four

Archaeobotanical Datasets and Methods

For this dissertation, I analyzed plant remains from eight sites on the coast of North Carolina. In selecting sites, I attempted to find material representing the widest possible geographical and temporal range in order to strengthen and complement the already existing archaeobotanical data for the coast. Half of the sites I analyzed were from current salvage archaeology projects while the other half were from previously excavated sites archived at East Carolina University. The sites are found in all subareas of the coast except the southern inner coastal plain. (See Table 4.1 and Fig. 4.1.) They also cover virtually all periods from the Early Archaic to the historic period. Only the Middle and Late Archaic are unrepresented.

Except for five samples from Jordan's Landing that were processed by water screening, all of the samples I analyzed were processed by flotation. This is a common method of isolating plant remains from soil samples taken during excavation. The soil samples are placed in a tank of water and agitated so that most of the plant material will float on the surface where it can be collected while most of the dirt and heavier material will sink. The plant remains and other material that float are called the light fraction while the material that sinks is called the heavy fraction (see Pearsall 2000 for a more detailed description). Some plant remains, such as heavy nutshell, may not float and would remain in the heavy fraction. During my analysis, however, I found that most of the recovered plant material was found in the light fractions of the samples and heavy fractions usually did not contain much other than hickory nutshell, which was also found in many light fractions.

In total, I analyzed 606 flotation samples from 337 unique contexts at these eight sites. In this chapter, I will give a description of each site along with the methods used to excavate them and the number of archaeobotanical samples analyzed from each. I also discuss the temporal associations of the samples from each site. Since most sites on the coast were occupied during more than one time period and most lack good stratigraphy, it can be very difficult to determine when features were created and used. Unless sites contain evidence of occupation during only one time period, I only assign features with diagnostic ceramic artifacts or radiocarbon dates to specific periods. In order to clarify the temporal association of Hanover style ceramics found at Broad Reach (31CR218) and 31ON1578, I submitted samples of maize from these two sites to Beta Analytic for accelerator mass spectrometry (AMS) dating. The results of this analysis are presented in Table 4.2. In this chapter, I also describe the laboratory methods used to carry out the analysis of the plant remains and the quantitative methods used to interpret them.

Table 4.1. Summary of the Sites Analyzed for this Dissertation.

Site Name	Site Number	Time Period	Location: North/South	Location: Inner/Outer	Samples
Barber Creek	31PT259	Early Archaic, Early - Middle Woodland	N	I	151
Windsor	31BR201/201**	Early Archaic, Late Archaic – Late Woodland	N	O	215
Southside	31NH802	Late Archaic – Middle Woodland	S	O	26
Brooks Island	31DR32	Middle Woodland	N	O	6
Broad Reach	31ON218	Early - Late Woodland	S	O	124
31ON1578		Early – Late Woodland	S	O	51
Jordan's Landing	31BR7	Late Woodland	N	I	7
Cape Creek	31DR1	Late Woodland – Historic	N	O	26

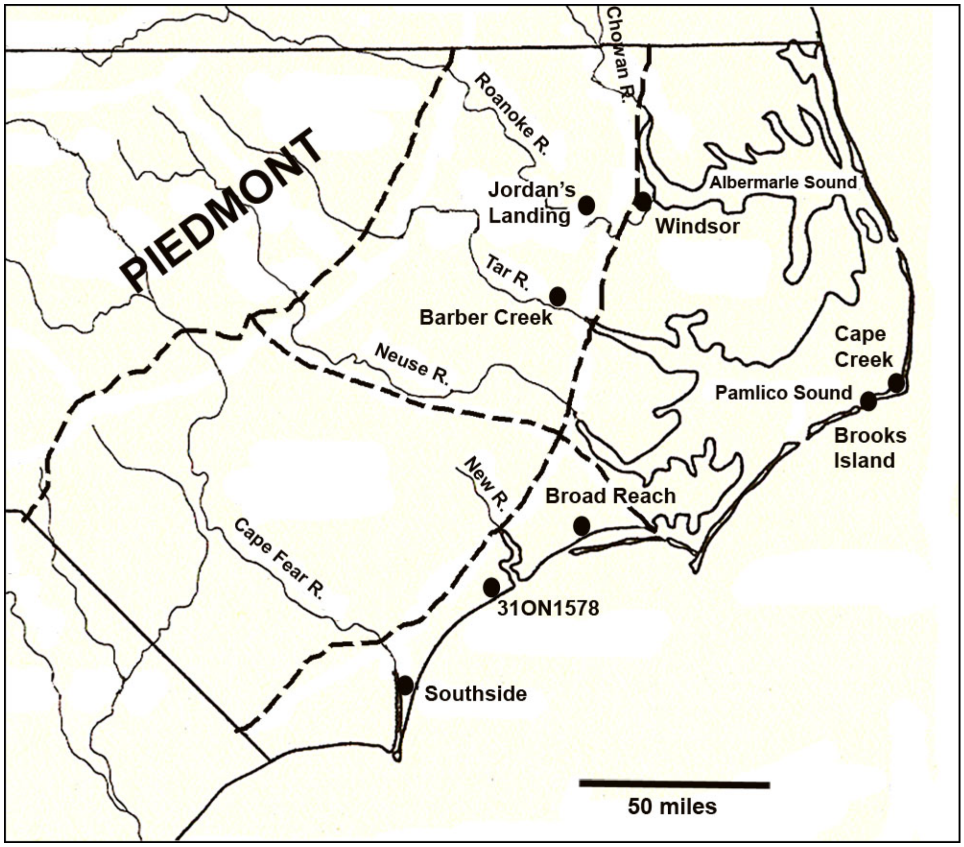

Fig. 4.1. Location of sites analyzed for this dissertation.

Table 4.2. AMS Dates from Broad Reach (31CR218) and 31ON1578.

Laboratory Number	Site	Feature	Calibrated Intercept	Conventional Radiocarbon Age	2-Sigma Calibrated Range
Beta – 299361	31CR218	Feat. 15610	AD 1310, 1360, and 1390	620 ± 30 BP	AD 1290 – 1400
Beta – 299365	31ON1578	Feat. 698	AD 1420	530 ± 30 BP	AD 1330 – 1340 and AD 1400 – 1440

Barber Creek (31PT259)

The Barber Creek site (31PT259) is situated on the northern inner coast. It sits on a relic sand dune about 1.5 m above the floodplain parallel to Barber Creek on the northern inner coastal plain near Greenville. The site spans over 100 m near the confluence of Barber Creek, just to the west of the site, with the Tar River to the south of the site. Remains were scattered over approximately one hectare of the sand ridge (Daniel 2004).

The site was first recorded by East Carolina University (ECU) archaeologists in 1976 during a survey for a proposed waste treatment plant (Daniel 2002). It was not extensively excavated, however, until 2000 when Randolph Daniel, Jr. (2002) conducted the ECU Field School at the site. At that time, the excavators dug 99 shovel tests throughout the site, working in 25 cm levels. Ten 2-m squares were also dug in the south-central area of the site which had a higher artifact density. These squares formed two parallel trenches perpendicular to the long axis of the site. The field school returned to the site in subsequent years.

Barber Creek is unusual for a coastal site in North Carolina because it contained stratified Archaic remains. Excavations at the site revealed three clear soil zones containing Woodland and Archaic artifacts. Ceramics found at the site include the Early Woodland Deep Creek type, Middle to Late Woodland Hanover ceramics, and some possible Middle Woodland Mt. Pleasant ceramics. Zone 1, from the ground surface to about 25 cm below the surface, was a dark gray-brown loamy sand with scattered Woodland artifacts. Zone 2, from 25 cm to 80 and 90 cm below the surface, was a yellow-brown very fine sand with Woodland artifacts in the upper portion and Archaic artifacts in the lower portion. An Early Archaic occupation is associated with the area 60 to 70 cm below ground surface. Zone 3, from 80 cm to 1 m below the surface, was a yellow-brown fine to medium sand. Radiocarbon dates confirm the occupation of the site during the Early Archaic and Early and Middle Woodland Periods. Flotation samples were taken during excavation but not processed at the time. I processed the samples with a Flotech flotation machine. The light fraction of each sample was caught in sheer material and heavy fractions were collected in a fine mesh screen. For this dissertation, I analyzed 151 flotation samples from 34 1 x 1 m excavation units. Fifty-seven of these samples came from the Early to Middle Woodland levels of the site and 15 were associated with the Early Archaic occupation.

Windsor (31BR201/201)**

The Windsor site (31BR201/201**) covers approximately 90,000 sq m of a terrace next to the Cashie River on the northern outer coast. Environmental Services, Inc (ESI). conducted excavations at the site in 2006 in connection with proposed highway construction. During the excavations, 106 units were excavated in six large areas (A-F) revealing 2642 features. Some of the post molds formed structure patterns in Areas A, C, E, and GT11. These patterns included 56 circular arc patterns and 21 "I," "L," and "T" patterns. A total of 634 artifacts were piece plotted and an additional 1482 artifacts were recovered during excavation.

The site consists of three major components: a Late Archaic and Woodland component in the eastern part of the site, a Woodland component in the western part of the site, and a historic component spread throughout the whole site. The artifacts found include ceramics, lithics, animal bone, and plant remains. Though some of the artifacts indicated Early Archaic and Late Woodland components, the most intensive use of the site seems to have been in the Transitional (Late Archaic to Early Woodland) and Middle

Woodland Periods. The site was most likely a field camp or short-term procurement site repeatedly occupied during the Late Archaic to Middle Woodland (Seibel and Russ 2009).

ESI collected and processed flotation samples from features encountered at the site. All of the flotation soil samples were less than or equal to a gallon (3.8 L) in volume. In total, 215 flotation samples from 157 features and one excavation unit were analyzed for this report. Only the light fraction portion of the samples was submitted and analyzed. Radiocarbon dates on selected features returned dates from the Early Archaic to the modern period (Siebel and Russ 2009). One of the analyzed samples dated to the Early Archaic, 11 to the Middle Woodland, one to the transitional period between the Middle and Late Woodland, two to the Late Woodland, and five were modern.

Southside (31NH802)

The McKean Maffitt Southside Wastewater Treatment Plant site (31NH802) is located on the southern outer coast. It sits on a low forested ridge next to the Cape Fear River in New Hanover County, NC. The site is about 30 km north of the river's mouth and only about 1000 m north of where Barnards Creek joins the river. From September to December of 2009, ESI conducted archaeological investigation on the Southside site. Overall, 164.9 square meters were excavated in nine blocks (A-I). This revealed 15,134 artifacts and 14 features. No structure patterns were present. The artifacts recovered included ceramics, lithics, shell, animal bone, and plant remains. The ceramics and lithics indicated a Late Archaic to Middle Woodland occupation. Southside was probably mostly occupied seasonally for the collection and/or processing and cooking of plants and shellfish (Russ and Seibel 2010).

Soil samples were taken from excavation units and features, processed by flotation, and presorted by ESI. Twenty-six samples from 24 contexts were then submitted for analysis. Only plant remains pulled from the light fractions by ESI archaeologists were available from the site. Of these samples, one was from a feature containing Early to Middle Woodland ceramics. Ten additional samples were from Middle Woodland features.

Brooks Island (31DR32)

The Brooks Island site (31DR32), located on Hatteras Island on the northern outer coast, was first recorded by Trawick Ward in 1975. The site consists of an oyster shell midden approximately 100 m long covered by live oak and cedar hammock. It runs from east to west on top of a relict dune ridge about three meters above sea level and parallel to the nearby shore of Pamlico Sound. David Phelps conducted test excavations there in 1996. Brooks Island and the nearby Moore site (31DR81) were excavated by the Coastal Archaeology Office (CAO) of ECU in the fall of 1999 and the spring of 2000. The archaeologists from CAO excavated two 2 x 2 m units (S-B and S-B1) in arbitrary 10 cm levels. Their work revealed three features and nine post molds. The post molds were not arranged in any particular pattern. No lithic artifacts were recovered from the site except for unmodified pebbles. Middle Woodland (Hanover and Mount Pleasant) ceramics, shell, and faunal remains were found. Two radiocarbon dates obtained for the site, both with a calibrated date of AD 655, confirm that the site was occupied during the Middle Woodland (Skinner 2002). Ten liter flotation samples were taken from each of the excavation levels. I analyzed six samples from the two excavation units for this study.

Broad Reach (31CR218)

The Broad Reach site (31CR218) covers approximately 50 acres along Bogue Sound in Carteret County just east of Swansboro on the southern outer coast. It extends south to the current, rapidly eroding shoreline of Bogue Sound. It is entirely possible, however, that the site originally extended further south and has been lost to erosion. The site was first identified in 1987 by Carolina Archaeological Services. The first major excavations at the site were conducted by Mark Mathis of the Office of State Archaeology in 1991 and 1992. During these excavations, 3 ha (7.5 acres) were mechanically stripped within the area of a proposed marina and an access channel between the marina and Bogue Sound. An additional acre was stripped adjacent to the marina in 1992 (Mathis 1994). While the proposed marina and access channel were built after Mathis' excavations, the housing development it was expected to accompany never materialized. A second subdivision planned for the area prompted a new round of study in 2006 when archaeologists from TRC Garrow Associates, Inc. conducted excavations at the site for five months. Large areas east and west of the marina were scraped by machine to expose features. In total almost nine acres of soil were stripped to reveal thousands of features. Soil samples were taken from a selection of the features and processed by flotation.

The site is dominated by a large shell midden up to 25 cm thick in places. Features were found both underneath the midden and to the north of it where they were capped in areas by substantial soil overburden. The site currently extends south of the marina built after Mathis' excavations to both the east and west. The area around the marina access channel, however, is lower and wetter than the rest of the site and contained very few artifacts or features. In total, excavations exposed “25 human burials, 16 dog burials, 30 pot busts, 744 shell pits, 1,585 soil filled pits, 5 lithic caches, 53 charcoal pits, and 22,265 post molds” (Millis 2008). The largest concentration of features was found under the shell midden and especially in the southwestern corner of the study area. Some of the post molds were arranged in structure patterns. The 2006 excavations revealed one circular, ten square, and almost 100 rectangular structures. The rectangular structures ranged in size from 3 x 5 m to 15 x 6 m and were most likely houses for families of varying sizes. The smaller circular and square structures may have been special use structures. Artifacts recovered include ceramics, lithics, shell and copper beads, shellfish, animal bones, and charcoal. Diagnostic ceramics were of the Hanover, White Oak, Hamps Landing, Mockley, Cape Fear, New River, Stallings Island, and Mount Pleasant types. About half of the analyzed ceramics were Hanover and about a third were White Oak with small amounts of the other types. This suggests a substantial Late Woodland occupation but the site was clearly used repeatedly throughout the Woodland period (Millis 2008).

In total, I analyzed 124 samples from 75 features at Broad Reach. Heavy fractions were analyzed for some but not all of the samples. In general, the heavy fractions contained very little non-wood material and yielded mostly hickory shell with a few maize cupules and acorn shell fragments. Since hickory shell is often over represented in botanical samples relative to other taxa, the omission of heavy fractions here probably does not significantly alter the view of plant use at Broad Reach. Unfortunately, the most common diagnostic ceramics found in the Broad Reach features belong to the Hanover style, which has been the subject of some confusion in recent ceramic studies. Hanover ceramics are found on many parts of the coast and radiocarbon dates associated with them cover an extremely long time period spanning the Middle and Late Woodland (Herbert 2003 and 2009). This makes assigning features with Hanover ceramics to a time period difficult. Nine of the Broad Reach features contained Hanover ceramics along with another ceramic style and 33 features contained only Hanover ceramics. In order to address this problem, I submitted a sample of maize from one of the features (Feature 15610) at the site that included Hanover ceramics to Beta Analytic for accelerator mass spectrometry (AMS) dating. This sample returned a 2-sigma calibrated date of AD 1290 to 1400 (Beta - 299361, see Table 4.2). This date would place the feature at the end of the Late Woodland period therefore I will tentatively assume other features with Hanover ceramics at Broad Reach belong to the same period. Two features contained only Early Woodland diagnostic ceramics and two more features contained only Middle Woodland ceramics. An additional ten features contained only Late Woodland ceramic styles.

31ON1578

Site 31ON1578 is generally oriented northeast to southwest, parallel and very close to the shore of Everett Bay on the southern outer coast. It sits on a slightly elevated area between the bay and a lower marsh to the north. The site was first identified by Bobby Southerlin of Archaeological Consultants of the Carolinas, Inc. in 2006 during a survey of a housing development tract. The survey revealed a total of 16 sites; two of which (31ON1578 and a historic site, 31ON1582) were ultimately chosen for excavation. Excavations at 31ON1578 were conducted in the fall of 2006 and the winter of 2007 (Southerlin et al 2008). The site covers approximately 4.85 ha (12 acres) and contains both prehistoric and historic era components. Eight blocks totaling 2,324 sq m were scraped by a trackhoe to remove the plowzone and expose cultural features. Most of the exposed features were excavated by hand. Three hundred forty-four features were excavated from five of the eight machine scraped blocks. The features were classified into ten types: large shell pit, small shell pit, small non-shell pit, large non-shell pit, charcoal pit, post holes, artifact concentrations, dog burial, human burial, and other. Large non-shell pits were further divided by function (hearths, fire pits, storage pits, and trash pits) while post holes were divided by size (small or large) and other features were divided by whether they were believed to be caused by natural (e.g. root stains) or cultural processes. Some of the posts were arranged in small circular (1.5 m diameter) or linear patterns but no complete habitations were identified.

The central portion of the site is slightly lower and wetter than the eastern and western extremes and contained relatively few artifacts. Historic artifacts were restricted to the western portion of the site and included two pieces of ceramics, brick, mortar, and metal indicating the possible existence of a structure. Prehistoric artifacts were plentiful throughout the site and included ceramics, lithics, shell, animal bone, and plant remains.

Diagnostic ceramics include types from the Early, Middle, and Late Woodland (Southerlin et al 2008).

Flotation samples were taken from a selection of features. If available, ten liters of soil were taken from the southern half of the bisected feature. If the feature was smaller than 10 L, however, all of the soil was retained for flotation. The soil was air dried before being processed by a Piyush One-type flotation system with a 0.8 mm screen heavy fraction insert. Light fractions were caught in fine mesh cloth bags (Southerlin et al 2008). In total, Archaeological Consultants of the Carolinas, Inc. submitted 64 flotation samples for analysis. At their request, I first scanned all of the samples to determine whether or not they contained plant remains. From these, I selected 51 samples from 33 features for complete analysis. Because of the general paucity of non-wood botanicals, priority was given to any samples that had maize, nutshell, or seeds.
As with Broad Reach, the most common diagnostic ceramic type at 31ON1578 was the Hanover style. Also as with Broad Reach, I submitted a sample of maize from a feature with Hanover ceramics for AMS dating (see Table 4.2). The results from this sample corresponded fairly well with the date from Broad Reach yielding a 2-sigma calibrated date of AD 1330 to 1340 and AD 1400 to 1440 (Beta - 299365). Therefore, I will consider the Hanover ceramics at 31ON1578 to belong to the Late Woodland. One feature at the site contained only Early Woodland ceramics while the majority of features with diagnostic ceramics (n= 17) contained only Late Woodland types.

Jordan's Landing (31BR7)

Jordan's Landing (31BR7) covers three acres on a sandy loam ridge on the bank of the Roanoke River about 30 miles from where the river meets Albermarle Sound on the northern inner coastal plain (Phelps 1983). There is a small creek to the north of the site and oak-hickory forest on the higher land to the north and west of the site. Near the river and creek are wet gum-cypress forests (Byrd 1997). The site was excavated intermittently for several years starting in 1971 under the direction of David Phelps of East Carolina University (Byrd 1997). Jordan's Landing is considered to be an important example of the Late Woodland Cashie phase on the coast of North Carolina. It was probably a small, roughly oval village bounded on the north and west side by a ditch. The ditch seems to have been a borrow pit for dirt to bank along the base of a palisade and was eventually filled with refuse (Phelps 1983). Features found at the site include burials, hearths, pits, and post molds, however no structure patterns were found. Hearths and pits were found in the the western and northern sides of the site while burials were more common in the southeastern portion (Phelps 1983). Byrd (1997) analyzed faunal remains from the site and found evidence for year-round occupation.

Unfortunately, only a few samples from Jordan's Landing were analyzed. Two flotation samples from Features 81 and 82 were examined as well as five water screened samples from Feature 77. All of these samples date to the Late Woodland period.

Cape Creek (31DR1)

Located on Hatteras Island on the northern outer coast near the town of Buxton, Cape Creek (31DR1) is a prehistoric and historic site associated with the Croatan/Hatteras Indians, an Algonquian society that had extensive contact with early

English colonists. The site is on the landward side of the island near Cape Creek which is a remnant of an inlet that existed there in the late 15th and early-to-mid 16th centuries (Heath 2009). Cape Creek is one of eight Late Woodland Colington Phase (A.D. 800 – 1650) sites on the island and was first identified by William Haag of Louisiana State University in 1954. David Phelps conducted limited excavations at the site in 1983 and 1994, after a 1993 hurricane exposed more archaeological deposits. More extensive excavations were conducted over 21 weeks between July 1995 and May 2000.

Excavations at Cape Creek revealed intact midden and features under sand ranging from 30 cm to 5 m deep. Midden deposits ranged from 20 to 40 cm deep and overlaid other features such as cooking and roasting pits and post molds. Some of the post molds formed structure patterns including one which may have been the end of a longhouse. The best studied midden had two clear zones. The upper zone (III A) was created in the Colonial Period (ca. AD 1665–1725) and contained food remains as well as artifacts of both Native American and European production. These artifacts included native pottery, pipes, shell beads, iron tools, gun parts, glass beads, and metal buttons. The older midden zone (III B) contained no European artifacts and has been dated to the Late Woodland (ca. AD 870 to AD 1445). It was comprised of dark organic soil densely packed with marine shell and animal bone. This zone also contained pottery and lithics (Heath 2009).

Soil samples for flotation were collected from both midden zones but not processed at the time of excavation. Instead, I processed the samples with the assistance of Amanda Tickner during the summer of 2010 using a Flotech machine. Light fractions were caught in sheer fabric and the heavy fraction was retained in the fine mesh insert.

For this dissertation, I analyzed 26 samples from nine contexts. Five of these samples came from Colonial period contexts and 16 came from Late Woodland contexts.

Laboratory Methods

Laboratory analysis of the samples followed standard archaeobotanical procedures. The heavy and light fractions were weighed and then passed through nested geological sieves with openings of 2, 1.4, and 0.71 mm. All size fractions were examined under a stereoscopic microscope (10-20x). Material larger than 2 mm was fully sorted into groups of plant taxa and other material such as ceramics and contaminants (stone and uncarbonized plants). Acorn shell and seeds were pulled from material between 2 and 1.4 mm while only seeds were pulled from material smaller than 1.4mm. All non-wood plant remains were identified to the lowest possible taxonomic level. Identifications were made by reference to seed manuals (e.g., Martin and Barkley 1961) and the comparative collection of the Research Laboratories of Archaeology at the University of North Carolina - Chapel Hill. All plant material except wood and small seeds were both counted and weighed. Wood was weighed but not counted and seeds were counted but not weighed. Where available, the heavy and light fractions from each sample were sorted separately but are combined here for quantitative analysis.

Analytical Methods

After laboratory analysis was complete, I entered the raw count and weight data into a database. To explore patterning in the data, I used both qualitative and quantitative methods. Qualitative approaches include examining taxa present in assemblages and comparisons between assemblages. These methods can provide a good, basic understanding of the contents of the sites' plant assemblages but in order to discover less immediately obvious patterns, I employed several quantitative methods.

Ubiquity is a relatively simple way to measure the number of contexts (samples, features, assemblages, sites) in which a given taxa was found. Ubiquity is equal to the number of samples (or contexts) that contain a given taxa divided by the number of all of the samples (or contexts) expressed as a percent. The absolute count of the taxa found in each sample has no bearing on its ubiquity. For example, one seed found in one sample will have the same impact on that taxon's ubiquity in a given set of samples as 100 seeds found in one sample. In other words, ubiquity is a measure of frequency of occurrence rather than overall abundance. This is not a direct measure of the importance of a plant taxon in a site assemblage or in the diet of the site's inhabitants but it can give an idea of the relative importance of the taxa. There are a few important restrictions on the use of ubiquity. First, ubiquity is only calculated for samples or contexts that contain at least two taxa, though wood may serve as one of those taxa (Popper 1988). Secondly, it is assumed that all of the samples in a group are independent of each other. That is, the contents of any sample should not be directly related to the contents of another. For this analysis, therefore, I have grouped samples from the same feature or excavation unit together unless there was clear reason to assume they were deposited independently, such as with the different midden zones at Cape Creek. Preservation and sample volume also have an impact on ubiquity (Kadane 1988). It is generally assumed that better preservation and larger volumes of samples increase the probability of rare taxa being recovered in samples. Ideally, therefore, ubiquity would only be used for samples that all have the same volume and preservation conditions. Unfortunately, preservation conditions may vary greatly from site to site on the coast and even within sites because of the action of moisture, soil chemistry, proximity to abrasive shell remains, aeolian sand dune production, and site disturbance. Volume information is also not available for most of the samples analyzed in this dissertation. My use of ubiquity, therefore, must be somewhat tentative but I believe it may still be useful in exploring general patterns.

Since volume information is only available for the 31ON1578 samples, it is impossible to calculate densities of plant taxa for most of the sites. Instead, I use relative densities to compare plant taxa. Relative density of a taxon is equal to the count of that taxon divided by the weight of all plant material (wood, nutshells, nut meat, etc.) found in that sample (Scarry 1986). This has the advantage of compensating somewhat for differential preservation of various taxa within a sample since all taxa are included in the denominator (plant weight). Relative densities can also be used to examine different preservation or use between contexts (Miller 1988). If the use of a specific taxon increased through time, we would expect it to become more common relative to other plants.

I also use boxplots to illustrate quantitative differences through time. Boxplots are a simple way to look at a batch of data and compare batches to each other. The narrowest part of a notched boxplot (the “waist”) marks the median of a range of data. The box itself contains the middle 50% of the distribution with the edges falling at the first (upper hinge) and third (lower hinge) quartile of the data. In other words, 25% of the data will fall above the top edge of the box and 25% will fall below the bottom edge. The difference between the upper hinge and lower hinge (that is, between the 1st and 3rd quartile) is called the hinge spread. Solid lines called whiskers extend from the box to the data point closest to but still within 1.5 times of the hinge spread both above the upper hinge and below the lower hinge. Data points that are more than 1.5 times the hinge spread from the upper or lower hinge are called outliers and represented on boxplots by asterisks. Extreme outliers are more than 3 times the hinge spread above the upper hinge or below the lower hinge and are marked by open circles (Shennan 1997; Velleman and Hoaglin 1981). The notches in the central part of the box around the median delineate the 95% confidence interval. If the notches of two different boxplots do not overlap, the difference between them is known to be statistically significant at the 95% confidence level. If the 95% confidence interval extends beyond either the upper or lower hinge, this will be illustrated by triangular appendages to the box.

In order to explore patterns in the data that may not be immediately apparent by simple measurements, I also conducted correspondence analysis of both the eight sites analyzed in this dissertation and a larger database of reported coastal sites. Correspondence analysis is similar to principal components analysis but is more suitable for discrete data like counts and presence/absence data (Shennan 1997). Correspondence analysis is based on a chi-squared analysis of a data matrix testing its deviation from the results expected if all of the observations were evenly distributed across the matrix.

I used SYSTAT 9 to carry out the correspondence analysis. One of the data matrices I used had site assemblages (separated by time) as the rows and the presence or absence of taxa in those assemblages as the columns. The chi-squared test in this case, tested how much each assemblage differed from what would be expected if the taxa were evenly distributed across all assemblages. This difference or distance is then weighted by the mass (the impact a row or column of the matrix has on the average of the variables and the overall correspondence analysis). Adding up these weighted differences gives us the total inertia or the total variation from the average (Shennan 1997). SYSTAT can then graph the assemblages and attempt to create axes (also called factors) that attempt to describe as much of the variation (inertia) in the data as possible. SYSTAT produces coordinates for all of the taxa and assemblages in relationship to the first two factors which can be plotted as two-dimensional scattergraphs. It should be noted, however, that the distances between assemblages and the taxa on these graphs cannot be interpreted literally since the two are being graphed from different spaces (Shennan 1997). They can, however, be interpreted relative to each other and correspondence analysis plots can be a useful way to study the relationship among a large number of variables and the similarities and differences between samples.

Chapter Five

Results of the Archaeobotanical Analysis

In this chapter, I present the results of the archaeobotanical analysis for all eight sites. In the first section, I describe the taxa recovered from these sites. I discuss their ecological distribution, physical and nutritional characteristics, how they were gathered and used by people, and their seasonal availability. In the second half of this chapter, I discuss the plant remains found at each site specifically including their temporal and spatial distribution.

Plant Taxa Recovered at the Coastal Sites

The common and scientific names of all taxa recovered from the eight sites analyzed for this dissertation are presented in Table 5.1. They can be divided into seven basic categories: nuts, introduced crops, starchy and oily seeds, fruit, tree seeds, weed seeds, and other.

Nuts

Nuts were one of the most important food sources in the Southeast throughout much of prehistory. In many places, they served as the staple plant food before the adoption of agriculture and often continued to play an important part in the diet even after domesticated crops were introduced. Different nuts have different characteristics that effect their use by people.

The only plant found at all of the sites was hickory (*Carya* sp.) and this is fairly indicative of its importance in the prehistoric Southeast. Hickory trees are common in southeastern forests and found in most forest types in North Carolina except on the very poorest of soils or in extremely wet areas. There are hickory species, however, like *Carya aquatica*, that will even grown in swamps. Hickories are not always the most abundant species in these forests but they are consistently present and they tend to grow in groves (Weakley 2010). This clumping of hickory trees means the nuts are easily collected in large quantities with little time spent traveling between or searching for productive trees. Hickory trees produce nuts with smooth, thick shells covered in thick, fibrous husks that dry and fall off when the nuts are ripe. The nutmeats are tightly packed in a convoluted interior and are therefore very time consuming to separate by hand (Scarry 2003). Hickory nuts are high in fat and provide moderate amounts of protein (USDA NDL 2010). They ripen in the fall and are generally available from September to November, depending on the species and the local climatic conditions. The nuts are highly attractive to wildlife, however, so they have to be collected as soon as possible after they start to ripen. Collection is a fairly simple process usually restricted to picking fallen nuts up from the ground. This means that almost all group members could participate in hickory nut collection. The most difficult part of hickory collection is transporting them back to a place where they can be processed since the nuts are bulky

Table 5.1. Plant Taxa Recovered from the Sites.

Common Name	Scientific Name	Barber Creek	Windsor	Southside	Brooks Island	Broad Reach	31ON1578	Jordan's Landing	Cape Creek
Nuts									
Hickory	*Carya* sp.	x	x	x	x	x	x	x	x
Acorn	*Quercus* sp.	x	x			x	x		x
Walnut	*Juglans* sp.					x			
Introduced Crops									
Maize	*Zea mays*					x	x		
Bean	*Phaseolus vulgaris*					x			x
Starchy and Oily Seeds									
Chenopod	*Chenopodium* sp.					x	x		x
Amaranth	*Amaranthus* sp.						x		
Cheno-am	*Chenopodium* sp.or *Amaranthus* sp.					x			x
Knotweed	*Polygonum* sp.					x			
Squash	*Cucurbita* sp.						x		
Sumpweed	*Iva annua*	x							
Bearsfoot	*Polymnia* sp.	x				x	x		
cf. Maygrass	*Phalaris caroliniana*					x			
Fruit									
Grape	*Vitis* sp.	x							
Maypop	*Passiflora incarnata*						x		
Prickly Pear	*Opuntia* sp.						x		
cf. bramble	cf. *Rubus* sp.					x			
Persimmon	*Diospyros virginiana*		x						
Hackberry	*Celtis* sp.					x			x
Blackgum	*Nyssa* sp.	x	x						
Haw	*Viburnum* sp.	x							
Palmetto	*Sabal* sp.		x			x			
cf.wild plum/cherry	cf. *Prunus* sp.								x
Tree Seeds									
Dogwood	*Cornus* sp.		x			x			
American Holly	*Ilex opaca*		x						
Wax Myrtle	*Myrica* sp.		x	x		x	x		x
Weed Seeds									
Purslane	*Portulaca* sp.								x
Bedstraw	*Galium* sp.					x			
Morning Glory	*Ipomoea* sp.								x
Goosegrass	*Eleusine indica*		x						
Weedy Legume	Fabaceae	x	x						
cf. Legume	cf. Fabaceae								
Sedge	Cyperaceae						x		
cf. Sedge	cf.Cyperaceae						x		
Spurge	Euphorbiaceae					x	x		
Grass	Poaceae					x			
Other									
Pinecone	*Pinus* sp.	x	x	x		x	x		

and heavy. The productivity of hickories is cyclical both within and between years. The amount of nuts produced varies annually with heavy crops being produced every two to three years and fewer nuts in the years in between (Scarry 2003). While manually separating hickory nutmeats is difficult, whole nuts can be crushed and thrown in boiling water to separate the shell (which sinks) from the nutmeat (which floats). Further boiling can also be used to extract oil from the nuts (Scarry 2003). Another method of consuming hickory, still practiced by some of the Cherokee today, is to form hickory nuts into balls that are used to make a soup called ku-nu-che. To make these balls, hickory nuts are cracked one at a time, sifted to remove the larger chunks of nutshell, and then pounded to make a sticky paste of nutmeat and fine shell pieces that can be molded by hand into balls. To use the ku-nu-che balls, they are placed in hot liquid to dissolve them and then usually strained to remove any remaining shell fragments before being added to more liquid and other ingredients such as rice or maize to make a soup (Fritz et al 2001). One of the benefits of exploiting hickory nuts is that they can easily be stored for later use. The unshelled nuts simply have to be kept away from moisture and pests. The oil extracted from hickories and ku-nu-che balls can also be stored for shorter periods of time (Fritz et al 2001; Scarry 2003). The thick shells of hickory nuts preserve very well in archaeological sites and may therefore be over-represented in flotation samples relative to more perishable plant taxa.

The second most common type of nut found in this analysis was acorn (*Quercus* sp.). Oaks share many characteristics with hickories. They grow in many different habitats and are very common components of forests in the Southeast. Oaks dominate many of the plant communities of coastal North Carolina (Schafale and Weakley 1990).

They also grow in patches that facilitate collection. Collection techniques are similar to hickories although Bettinger et al. (1997) observed that native foragers of California sometimes also used poles to knock acorns down from trees to collect more ripe nuts at the same time. Like hickories, the productivity of oaks is high roughly every two or three years. The two major types of oaks, red and white, produce acorns on different cycles, however, so exploiting a range of species decreases the variability in harvest (Gardner 1997; Scarry 2003). Acorns ripen at approximately the same time as hickories, from September to November, and are also important food sources for wildlife so rapid collection is vital. Ripe acorns also have a tendency to sprout quickly if left on the ground. Acorns are, however, much different from hickories in their structure and nutritional composition. Acorns have a thin, easily-removed shell over a dense, cohesive nutmeat. Acorns are also relatively low in oil and fat but much higher in carbohydrates than hickory. They were rarely used for oil extraction, therefore, and more commonly used as a source of starch. They could be pounded into a paste used to thicken broth, made into a gruel, or ground into flour (Scarry 2003). While acorns from white oaks do not need any special preparation before consumption, acorns from red oaks are high in bitter tannic acid that has to be leached out before they are palatable. There are several possible leaching methods but most involve boiling or soaking the nuts in water. Like hickories, acorns also make excellent stored food reserves. Acorns do, however, require some processing before storage. They must be parched before being placed into storage in order to prevent them from sprouting and to kill any pests or mold that may infect them (Scarry 2003). Acorns were an important food source in prehistory but tend to be underrepresented in the archaeological record because their thin shells do not preserve well.

The last nut type found in the analyzed sites is walnut (*Juglans* sp.). Walnuts are found throughout the forests of the Southeast but are much less common than hickories and oaks. Only two species are found in North Carolina: butternut (*Juglans cinerea*) and black walnut (*Juglans nigra*). Weakley (2010) notes that black walnut is uncommon in the Coastal Plain of North Carolina and butternut is largely restricted to the mountains and Piedmont. Unlike hickory trees, walnuts do not grow in groves but widely scattered and solitary. This increases the time required to collect walnuts in bulk. The nuts ripen in the fall from October to November. Walnuts have a hard, ridged shell that is difficult to crack covered by a bitter husk that does not fall off of the nut when ripe. This means they cannot be processed for oil by boiling like hickory. However, walnut nutmeat is fairly easy to remove from the shell once cracked. Walnuts are higher in protein than hickories and fairly high in fat but low in carbohydrates (Scarry 2003). Like hickories, unshelled walnuts can be stored for extended periods.

Introduced Crops

Two crops domesticated in other parts of the New World were found in the analyzed samples. Maize (*Zea mays* ssp. *mays*) is a tropical grass originally domesticated in Mexico from a wild grass called teosinte (*Zea mays* ssp. *parviglumis*) and was most likely introduced to the eastern United States by diffusion from the Southwest (Fritz 1993). Maize was widely distributed in the East by AD 200 but did not become a major crop until after AD 800 - 900 (Smith and Cowan 2003) Maize produces large multi-rowed cobs with many kernels that do not disperse upon ripening. Maize plants, therefore, are entirely dependent on humans for seed dispersal and reproduction. Maize kernels are good sources of carbohydrates but low in fat and protein (Gardner 1997). Both maize cob parts (cupules and glumes) and kernels are regularly found in archaeological sites. The inedible cob parts, however, are more common perhaps because they were more likely to be burned intentionally to dispose of them as waste or as fuel. There are many different ways to farm maize that vary greatly in the effort and time required to produce a harvest. At the lowest level of commitment, maize may be planted in the spring in areas that have not been cleared, plowed, or prepared beforehand and then simply harvested in the fall with no effort to maintain or improve the conditions in between (Barlow 2006; Thomas 2008). Except in very fertile areas with little other vegetation, this approach is likely to produce low yields but the low cost may make it worthwhile. Maize yields can be increased by preforming other tasks to improve the growing conditions for the plants and to protect them. These activities could include preparing the soil by removing existing vegetation, amending the soil with fertilizers, removing weeds, watering, keeping watch over the field to drive away animals that would eat ripening maize, etc. Farmers could perform as many or as few of these tasks as they chose. Only planting and harvesting are absolutely required to produce a maize crop. Maize ripens in the late summer to fall but depending on the variety and intended use may be left to dry in the field until late fall.

Common beans (*Phaseolus vulgaris*) are another crop species originally domesticated in Mesoamerica. It too entered the eastern United States by diffusion from the Southwest (Hammett 1997). There is little evidence for widespread usage of beans until after AD 1300 (Hart and Scarry 1999). Like other legumes, beans are high in starch, protein, and fiber. Beans must be planted in the spring and can be harvested through the summer and fall.

Starchy and Oily Seeds

Several taxa that produce edible starchy or oily seeds were also recovered from the eight analyzed sites. Some of these taxa were cultivated and eventually domesticated in the eastern United States. Their wild counterparts, however, still existed in the area and distinguishing seeds collected from wild plants from those harvested from deliberately cultivated plants can be difficult. Even if some of these species were cultivated, wild plants of the same taxon may have also been collected (Scarry 2003).

The starchy seeded species most commonly found in the analyzed sites was chenopod (*Chenopodium* sp.), also called goosefoot or lambsquarters. The domesticated chenopod, *Chenopodium berlandieri*, was distinguished by a thin seed coat and changes in the shape of the seed's margins (Smith 1989). Chenopod is a weedy herb that grows easily in disturbed areas and along the edges of woods, fields, and streams. The leaves can be eaten as greens in the spring and summer and the seeds can be eaten as a grain. Chenopod greens are good sources of vitamins and minerals while the seeds are rich in carbohydrates. The seeds ripen in July through November and could be eaten raw, cooked, or parched and ground into flour to make porridge or bread (Moerman 1998). The seeds also could be stored for extended periods of time.

Amaranth (*Amaranthus* sp.) shares many characteristics with chenopod. The young leaves and shoots can be eaten as greens in the spring and the seeds, which ripen in

July through October, can be eaten as a grain (Scarry 2003; Weakley 2010). The greens can be eaten raw or boiled with meat and the seeds can be eaten raw, cooked and eaten whole, or ground into a flour (Moerman 1998). The seeds are good sources of carbohydrates.

Amaranth seeds also physically resemble chenopod seeds so distinguishing the two is sometimes difficult, especially if the seed coat is missing or broken. Paleoethnobotanists, therefore, often group ambiguous specimens into a category called "cheno-am" indicating that they may be either chenopod or amaranth seeds. I found seeds that could only be identified as cheno-am in the samples from Broad Reach and Cape Creek.

Knotweed (*Polygonum* sp.), also known as smartweed, is another taxon cultivated in the prehistoric Southeast. While there is fairly clear evidence of cultivation of erect knotweed (P*olygonum erectum*), evidence of the genetic changes accompanying domestication is less clear. There does, however, seem to have been some morphological changes consistent with domestication in knotweed after about A.D. 500 (Smith and Cowan 2003). Knotweed is fairly similar in habit to chenopod. It grows readily in disturbed areas and field and forest edges (Weakley 2010). Like chenopod, knotweed can be eaten as a green when the leaves are young in the spring and the seeds can be eaten as a grain. Knotweed seeds, technically achenes, ripen in the fall, from June to November, and are high in carbohydrates (Smith 1989).

Squash (*Cucurbita* sp.) and the closely related gourds (*Lagenaria* sp.) were among the first species cultivated in eastern North America (Smith and Cowan 2003). Squash plants are weedy vines that grow well in disturbed habitats. Squash fruit comes in a wide variety of shapes and sizes, some with very thick edible rinds and some with thinner ones. Squash seeds are oily and a good source of fat (King 1985). The fruit ripens from August to October.

Another oily-seeded taxon found in these samples was sumpweed (*Iva annua*). Sumpweed, also called marsh elder, is most likely not native to North Carolina but has become naturalized throughout much of the Southeast and there are a few closely related species (e.g. *Iva frutescens*) that are native to North Carolina (Weakley 2010). Sumpweed grows well in moist soils near streams or lakes but also does well in better-drained disturbed habitats and gardens. Like sunflowers, sumpweed produces achenes that ripen in September through November (Heiser 1985). The size of the achenes increased through domestication.

Bearsfoot (*Polymnia* sp.) produces oily seeds low in carbohydrates but relatively high in fat. They were probably used in ways similar to sunflowers and sumpweed (Scarry 2003).

One possible maygrass (*Phalaris caroliniana*) seed was recovered from the Broad Reach site. Maygrass, like the other starchy and oily seeded taxa, is a weedy species that grows readily in disturbed areas. Unlike the others, though, there is no clear evidence of the domestication of maygrass. Intensive cultivation of maygrass is suggested by its presence in the archaeological record in large numbers, in association with other crops, and outside of its natural range (Smith and Cowan 2003). Maygrass is high in carbohydrates and has the advantage of ripening earlier in the year than the other starchy and oily seeds. Maygrass seeds ripen in the late spring, from May to June, when few other plant resources are available and people may have used up the majority of their stored food (Scarry 2003). The seeds could be parched and stored.

Fruit

While fruit were usually not a major part of the diets of people in the prehistoric Southeast, they were usually a consistent part of the diet when available. Fruit provide variety, flavor, and vitamins. They are also easy to collect, require little to no processing before consumption, and can be dried and stored for later use. While there is no evidence for domestication or cultivation of any of the fruit taxa, foragers may have encouraged their growth intentionally or unintentionally through their impact on the environment (Scarry 2003; Wagner 2003).

Grape (*Vitis* sp.) vines grow in a wide variety of habitats from upland woods to river bottoms and swamps. They produce fruit from August to October (Weakley 2010). Besides its use as a food, grapes can be used for a variety of medical purposes and the vines and roots have been used as cordage or basket-making material (King 1984; Moerman 1998).

Maypop (*Passiflora incarnata*) is a climbing vine that produces a large fleshy fruit with a sweet interior pulp. It grows most often in disturbed areas and produces fruit from July through October (Weakley 2010). After the seeds are removed, the pulp from maypop fruits can be formed into loaves and dried to make bread (Scarry 2003).

Prickly pear (*Opuntia* sp.) is actually the fruit of a cactus. It grows in disturbed areas, dry open places, and in sandy areas along the coast. It produces fruit from August through October (Weakley 2010).

A possible bramble (cf. *Rubus* sp.) seed was recovered from Broad Reach. The genus *Rubus* includes raspberries, blackberries, and other berry varieties. Brambles grow in disturbed and wooded areas and occasionally in wet areas. The thorny canes grow for two years producing fruit only during the second year. The fruit ripens in late summer and early fall, June through September (Weakley 2010). Besides eating the fruit, the roots of brambles have sometimes been used medically to treat a variety of complaints (King 1984: 155-158).

Persimmon (*Diospyros virginiana*) trees grow in open areas, dry woods, and forest edges. The large fleshy fruit ripen in the fall, from September to November, and are very bitter until completely ripe (Weakley 2010). Like maypop, persimmon fruit could be mashed into a pulp and made into bread (Scarry 2003).

Hackberry (*Celtis* sp.) trees prefer to grow on calcareous soils in bottomlands and woodlands. The berry-like drupes are extremely attractive to wildlife when they ripen in August through October (Weakley 2010). The fruit can be eaten raw or mashed and used to flavor meat (King 1984: 169).

Most blackgum (*Nyssa* sp.) trees, also called tupelo, grow in wet areas such as river bottoms and swamps. It is the dominant tree in bottomland forests and an important part of several other coastal plant communities like pocosins (Schafale and Weakley 1990; Snyder 1980). The fruit ripens in August through October (Weakley 2010). While blackgum fruit is edible and highly attractive to wildlife, this taxon may have been more commonly used for medical purposes or as wood for tool making (King 1984: 135; Moerman 1998).

Haws (*Viburnum* sp.) are shrubs or small trees that often grow in moist areas.

They produce blue berry-like drupes that ripen in August through October (Weakley 2010). The fruit can be eaten raw or made into jellies or juice (Moerman 1998).

Palmetto (*Sabal* sp.) is a palm tree or shrub found mostly in maritime forests and swamps along the coast. The berries ripen in September to November (Weakley 2010). The fruit is edible and fresh slices of the roots of at least one species (*Sabal minor*) can be baked and eaten as bread (Moerman 1998). The terminal bud from these trees may also be eaten as "heart of palm."

A possible wild plum/cherry (cf. *Prunus* sp.) seed was found at the Cape Creek site. The genus *Prunus* includes a number of trees and shrubs native to the Southeast identified as plums or cherries. They grow in a wide variety of habitats from sandhills to bottomlands to woodlands. The edible fruit ripen from July to September and can be eaten fresh or dried (Weakley 2010).

Tree Seeds

Seeds of three tree taxa not eaten as fruit were recovered from the eight sites analyzed here. While these taxa do have medical uses, it is also entirely possible that their seeds were accidental inclusions in cultural features. Their presence, therefore, might be a better indicator of the local plant communities than human activities.

Dogwood (*Cornus* sp.) trees favor moist areas and calcareous soils. The berry-like drupes ripen in August through October (Weakley 2010). While the fruits of at least some species are edible, they do not seem to have been widely exploited. The two dogwood species that are ethnographically known to have been eaten by humans (*C.*

canadensis and *C. stolonifera*) do not grow on the coast of North Carolina. The fruit are highly attractive to birds and the roots and bark have been used as medicine (King 1984: 105-106).

American holly (*Ilex opaca*) is an evergreen that grows in a wide variety of woodlands from dry to wet. The bright red berry-like drupes ripen from September to October and are attractive to birds (Weakley 2010). The fruit have been eaten as a treatment for colic and a tea brewed from the leaves has been used as a remedy for sores and measles (Moerman 1998).

Wax myrtle (also called bayberry, *Myrica* sp. or *Morella* sp.) is a shrubby tree that tends to grow in wet areas, dunes, and sandhills. It is an important part of many coastal plant communities and tends to be one of the first woody plants to reclaim disturbed ground (Godfrey and Godfrey 1976; Snyder 1980). The seeds found here do not belong to Sweet Gale (*Myrica gale*), which is restricted to the mountains of North Carolina, but to one of the other species in the genus *Myrica* which are now sometimes classified as the genus *Morella*. The fruit ripen from August through October (Weakley 2010). The fruit are covered by an aromatic wax that can be boiled off and used to make candles, however, this is presumably a practice started in the historic period. Roots, bark, and leaves have also been boiled and used to treat ailments like headaches and stomachaches (Moerman 1998).

Weed Seeds

A fairly wide array of weedy taxa were represented in the samples analyzed here.

Unless otherwise noted, these taxa tend to grow in open and disturbed habitats such as forest edges and clearings, stream banks, old fields, roadsides, and garbage dumps. Most of these taxa are edible, largely as greens, and were certainly exploited by people at various times and places but they may also simply be accidental inclusions in archaeological features.

Purslane (*Portulaca* sp.) is a prostrate herb that can be eaten as a green in the spring and summer. They can be eaten raw, boiled, and even dried for use as winter greens (Moerman 1998).

Bedstraw (*Galium* sp.), also sometimes referred to as cleavers, can also be eaten as greens in the spring. Many medical uses for bedstraw have also been ethnographically observed. It has been used to treat a variety of ailments including kidney and bladder problems, respiratory problems, and aches and pains (King 1984: 159; Moerman 1998).

Morning glory (*Ipomoea* sp.) is a climbing vine with showy flowers. Some species in the genus have large edible tubers. Sweet potatoes (*I. batatas*) belong to this genus. The roots of many species have also been used for medical purposes (King 1984: 104; Moerman 1998).

Goosegrass (*Eleusine indica*) is a small grass native to the Old World but naturalized through much of the United States (Weakley 2010). Its presence at the Windsor site is presumably a modern intrusion.

Several seeds could not be identified more specifically than to the family level. Weedy legumes and possible legumes were found at Barber Creek, Windsor, and 31ON1578. Legumes belong to the Fabaceae family and include a large range of trees, shrubs, vines, and herbs. Prominent members of this family include beans, peas, and peanuts. Unfortunately, the different species in this family often have very similar looking seeds with few distinguishing characteristics (like the hilum) that are often lost if the seeds are damaged or degraded. The seeds identified here as weedy legumes do not appear to be any of the domesticated or cultivated species of the family but probably belong to wild herbs and trees. These species are often edible and were consumed by prehistoric foragers (Scarry 2003).

Seeds identified as sedges or possible sedges were identified in the samples from 31ON1578. Sedges are members of the Cyperaceae family. The sedges are mostly herbs and often associated with wet areas. They include species like bulrush. The roots and seeds of some species are edible and the stems can be woven into mats or bags (King 1984).

Spurge seeds were found at Broad Reach and 31ON1578. Spurges are part of the Euphorbiaceae family. This family includes a wide range of trees, shrubs, vines, and herbs that grow in a variety of environments. It includes species like cassava (*Manihot esculenta*) and castor bean (*Ricinus communis*), both from the tropics. Different species can be used for food and medicine.

Grasses belong to the Poaceae family. This family contains some 10,000 species of mostly herbs. The seeds identified as grasses here are small weedy species that were probably not used as a food source.

Fragments of pinecone, though not pine seeds, were also recovered in the analyzed samples. Pine trees (*Pinus* sp.) are a widespread and common part of southeastern forests. While some pine trees produce edible pine nuts, none of the species native to North Carolina do so.

Plant Remains by Site

In the remainder of this chapter, I will discuss the plant remains recovered from each site analyzed for this dissertation. I will discuss which taxon were found at each site as well as their spatial distribution within the sites. Additionally, I discuss which plant remains were found in features or contexts that could be assigned to a specific time period, either through radiocarbon dating or through associated ceramics. In the following tables of plant remains from each site, plant weight is equal to the weight in grams of all plant material including wood. Wood weight is equal to the weight in grams of all wood charcoal larger than 2mm. Weight is abbreviated “wt.” and count is abbreviated as “ct.”.

Barber Creek (31PT259)

I analyzed 151 samples from Barber Creek, a site with Early Archaic and Woodland occupations found on the northern inner coast. A summary of plant materials recovered from Barber Creek is presented in Table 5.2 and more detailed information is presented in Table A.1 in the appendix.

The majority of samples from Barber Creek contained no non-wood plant remains. Even wood was not very abundant in the samples, however. There was an average of a scant 0.39 g of wood per sample with the average sample size being 65.01 g.

This means there was on average only 0.01 g of wood per 1 g of the samples analyzed. Hickory was the most abundant and ubiquitous non-wood taxa found in 44 contexts from 19 excavation units with an ubiquity of 86%. Acorn was found in three samples from a single excavation square (N 445 E 426) in modest amounts in two levels (3 and 5) which also contained hickory. A single piece of acorn was also recovered from level 6 of this unit. The only other taxon found in more than one sample from Barber Creek was haw. Single haw seeds were found in two levels of one excavation unit (N 445 E 426, levels 1 and 3) and three seeds were found in one level from another unit (N 450 E 432, level 1). Grape, sumpweed, bearsfoot, blackgum, and a weedy legume were each represented by single seeds. The grape and blackgum were found in levels 1 and 2 respectively of the same unit (N 454 E 470). Additional material found in the samples included four fragments of pinecone, two leaf buds, and three round insect galls. Hickory was the only taxon found consistently throughout the occupation of Barber Creek. It was recovered in almost every level less than a meter below the surface. If a depth of 50 cm is taken as the approximate dividing line between the Woodland and Archaic occupations, 173 hickory shell fragments were found in the Woodland occupation levels and 238 were found in the Archaic occupation levels (Daniel 2002). Figure 5.1 shows standardized counts of hickory (hickory count/plant weight) per level at Barber Creek. In this figure, levels 1-5 correspond to the Woodland occupation and levels 6-10 to the Archaic. All of the acorn found in the samples was associated with the Woodland occupation of the site with the possible exception of the single piece in level 6 of N 445 E 426. This level seems to correspond to the transition between the Woodland and Archaic occupations. However, given that a large number of acorn shell fragments were found in the level above this

Table 5.2. Plant Remains from Barber Creek (31PT259).

FS	Provenience: N	E	Feature	Level	Quad	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory Ct.	Acorn Ct.	Other
737	439	437		8	D	216.49		0.37	205.65	9.19	0.48	10		
752	441	432		6	A	114.39		0.2	109.68	4.29	0.28	5		
818	441	432		10	A	128.64		0.01	123.96	4.55	0.01			
346	442	442		3	D	125.07		0.92	119.57	4.1	0.99	4		
386	442	442		4	D	140.15		0.81	134.37	4.55	0.93	7		
403	442	442		5	D	79.94		0.32	75.16	4.31	0.35	3		
464	442	442		7	D	133.41		0.53	129.53	3.15	0.53			
539	442	442		9	C	88.14		0.26	83.96	3.82	0.26			
539	442	442		10	B	84.47		0.03	80.95	3.41	0.03			
426	443	432	4	1		171.68		0.53	167.15	3.68	0.53			
357	443	432		4		94.41		0.3	90.15	3.76	0.35	2		
373	443	432		5	C	99.65		0.37	95.55	3.65	0.37			1 Sumpweed
451	443	432		7	B	131.14		0.09	128.44	2.44	0.09			
471	443	432		8	C	121.26		0.29	117.23	3.54	0.29			
521	443	432		9		150.4		0.02	144.29	5.9	0.02			
541	443	432		10	B	89.47		0	86.05	3.35	0			
550	443	432		11		82.01		0	80.07	1.86	0			
632	444	442		4		113.19		0.29	109.88	2.85	0.35	3		
.	444	442		8		61.45		0	58.17	3.13	0.07	7		
1710	445	426		1		64.63	33.11	0.06	28.68	4.28	0.06			1 Haw, 1 Bearsfoot
1719	445	426		2		27.12		0.07	22.44	4.55	0.07			
1727	445	426		3		33.06		0.31	26.2	2.85	0.41	2	10	1 Haw
1734	445	426		4		39.64		0.66	31.99	3.43	0.76	4		
1769	445	426		5		78.4		0.61	74.11	2.9	0.76	22	26	
1771	445	426		6	D	46.8		0.36	43.88	2.49	0.36		1	
1816	445	426		7	D	29.74		0.09	26.86	2.58	0.25	10		
1852	445	426		8	D	26.79		0.21	23.21	3.34	0.21			
598	445	432		2	C	74.3		0.37	72.3	1.53	0.37			
728	445	432		7	C	119.8		0.13	115.84	3.41	0.13			
792	445	432		9	D	86.47		0.05	81.65	4.66	0.05			
816	445	432		10	D	113.62		0	110.87	2.66	0			
823	445	432		11	D	149.01		0	145.74	3.11	0			
1379	445	434		7	A	46.62		0.08	44.21	1.98	0.35	16		
1402	445	434		8	A	31.26		0.24	29.26	1.33	0.55	14		
1436	445	434		9	A	36.54		0.04	34.57	1.53	0.37	18		
1521	445	434		11	A	58.18		0	56.19	1.93	0			
1518	445	434		12	A	37.39		0	36.54	0.8	0			
1562	445	434		14	A	69.29		0.01	68.26	0.99	0.01			
1610	445	434		17	A	220.47		0	209.94	10.45	0			
1669	445	434		19	A	274.62		0	258.8	15.75	0			

Table 5.2 (continued). Plant Remains from Barber Creek (31PT259).

FS	Provenience: N	E	Feature	Level	Quad	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory Ct.	Acorn Ct.	Other
1555	445	443		14	A	56.2		0.01	55.41	0.76	0.01			
1446	445	459		7	A	27.3		0.19	24.43	2.64	0.19			
313	446	442		2	B	75.97		0.27	74.1	1.48	0.27			
330	446	442		3	C	100.8		0.15	94.79	2.74	0.15			
348	446	442		4		81.52		0.23	75.99	2.3	0.23			
387	446	442		5	D	83.65		0.23	80.93	2.45	0.23			
839/432	446	442		6		113.01		0.33	108.03	3.42	0.33			
440	446	442		7		54.89		0.03	53.47	1.38	0.03			
467	446	442		8	D	58.97		0.01	56.6	2.28	0.01			
486	446	442		9		55.39		0.01	52.6	2.7	0.01			
838/513	446	442		11	C	59.83		0	58.23	1.52	0			
1709	447	426		1		29.72		0.61	21.9	7.14	0.61			
1718	447	426		2		50.1		0.01	43.1	6.69	0.01			
1722	447	426		3		28.16		0.28	21.59	5.36	0.28			
1735	447	426		4		24.1		0.15	18.87	5.04	0.15			
1743	447	426		5		36.45		0.29	32.98	3.1	0.29			
1753	447	426		6	D	27.87		0.23	25.15	2.39	0.25	1		
1775	447	426		7	C	2.87		0.12	2.33	0.4	0.12			
[illegible]	447	426		8	D	23.65		0.06	21.1	3.36	0.11	2		
1814	447	426		9	C	20.1		0.06	16.96	3.04	0.06			
1723	447	428		1		225.68	66.91	0.21	54.11	12.08	0.21	2		
1730	447	428		2		44.7		0.29	36.35	7.92	0.29			
1742	447	428		3		37.16		0.34	33.88	2.74	0.34			
1750	447	428		4		31.68		0.4	28.09	3.11	0.4			
1757	447	428		5		19.39		0.1	16.91	2.36	0.1			
1781	447	428		6	D	37.79		0.19	34.22	3.28	0.19			
1809	447	428		7	D	27.99		0.1	24.83	2.99	0.1			
1840	447	428		8	D	51.26		0.11	39.3	11.78	0.11			
1711	447	430		1		59.14	34.78	0.12	29.49	5.13	0.12			
1712	447	430		2		28.15		0.16	21.64	6.28	0.16			
1724	447	430		3		29.32		0.52	23.9	4.8	0.52			
1732	447	430		4		36.44		0.35	30.78	5.21	0.35			
1749	447	430		5		30.06		0.31	24.51	5.04	0.42	8		
1770	447	430		6	D	49.24		0.05	43.35	5.79	0.05			
1791	447	430		7		42.57		0.08	36.2	5.25	0.08			
1825	447	430		8	D	29.5		0.02	23.89	5.56	0.02			
1848	447	430		9	D	28.82		0.03	24.45	4.28	0.03			
357	447	432		3	D	104.48		0.5	100.59	3.26	0.5			
316	447	432		3	D	83.4		0.71	79.61	1.87	0.71			
338	447	432		4		77.55		0.51	74.13	2.35	0.76	14		

Table 5.2 (continued). Plant Remains from Barber Creek (31PT259).

FS	Provenience: N	E	Feature	Level	Quad	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory Ct.	Acorn Ct.	Other
358	447	432		5	D	77.51		0.61	73.7	2.63	0.94	21		
385	447	432		6	D	95.88		0.63	88.98	5.39	1.36	54		
421	447	432		7	D	67.08		0.41	63.89	2.29	0.85	23		
429	447	432		8	D	103.59		0.83	98.15	4.11	1.16	14		
446	447	432		9	D	64.45		0.14	61.87	2.27	0.24	9		
482	447	432		10	D	63.52		0.04	61.4	1.97	0.05	1		
1412	447	436		11	A	78.23		0.01	77.25	0.89	0.01			
1443	447	436		12	A	92.46		0	91.94	0.44	0			
1484	447	436		13	A	175.82		0.01	173.76	1.86	0.01			
1397	447	436	13	10	C	423.5	242.2	16.49	216.48	6.93	16.54	3		
1403	447	440		8	B	44.31		0.06	42.79	1.43	0.06			
1445	447	440		9	A	33.2		0.01	31.67	1.48	0.01			
1472	447	440		10	A	26.98		0.01	25.71	1.23	0.01			
1504	447	440		13	A	73.49		0	71.77	1.71	0			
1553	447	440		14		76.4		0.02	75.02	1.29	0.02			
1707	450	432		1		34.53		0.77	24.58	9	0.77			3 Haw, 4 Pinecone
1386	450	470		3	D	28.77		0.28	26.96	0.96	0.79	32		
1400	450	470		4	D	27.05		0.52	25.45	0.69	0.52			
[illegible]	450	470		5	D	36.12		0.56	32.81	1.89	1.27	43		
[illegible]	453	461		7	C	29.63		0.39	27.48	1.32	0.39			
1549	453	461		8	C	19.69		0.23	18.49	0.64	0.51	15		
1661	453	461		12	D	48.89		0.01	47.03	1.79	0.01			
1674	453	461		13	A	24.52		0.01	22.93	1.54	0.01			
380	454	432	3	1		91.04		0.36	88.56	2.02	0.36			
481	454	432	1	1		259.93		10.22	237.77	7.19	10.22			
524	454	432		7	D	23.75		0.1	22.86	0.74	0.1			1 Weedy Legume
552	454	432		8	D	63.21		0.07	61.85	1.21	0.07			
566	454	432		9	D	72.93		0.05	70.99	1.75	0.05			
592	454	432		10	D	50.18		0.04	48.87	1.22	0.04			
630	454	432		11		57.57		0	56.37	1.14	0			
1708	454	434		1		42.38		0.67	27.73	13.56	0.67			
1716	454	434		2		20.55		0.56	16.2	3.71	0.56			
1720	454	434		3		13.52		0.62	10.13	2.69	0.62			
1733	454	434		5		30.88		0.35	24.76	5.71	0.35			
1761	454	434		7		23.3		0.02	20.96	2.28	0.02			
1794	454	434		8	A	12.16		0.21	9.73	2.17	0.21			
1833	454	434		9		13.25		0.02	10.86	2.34	0.02			
1853	454	434		10	A	13.46		0.01	11.28	2.13	0.01			
1725	454	434				16.7		0.42	13.48	2.69	0.44	1		
1399	454	470		1	D	174.45		0.08	171.06	2.87	0.08			1 Grape

Table 5.2 (continued). Plant Remains from Barber Creek (31PT259).

FS	Provenience: N	E	Feature	Level	Quad	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory Ct.	Acorn Ct.	Other
1423	454	470		2	D	67.43		0.18	65.68	1.3	0.18			
1442	454	470		3	D	33.1		0.28	31.4	1.25	0.28			
1434	454	470		3		87.31		0.48	83.42	2.9	0.48			1 Blackgum
1453	454	470		4	D	39.18		0.56	36.99	1.5	0.59	1		
1539	454	470		6	D	46.03		0.44	44.24	1.15	0.56	7		
1651	454	470		8	D	80.85		0.31	78.19	2.19	0.36	5		
1673	454	470		9	D	54.68		0.11	53.12	1.35	0.11	2		
1649	455	434		18	A	139.93		0	131.17	8.75	0			
1401	455	459		6	A	26.23		0.22	24.45	1.47	0.22			
1468	455	459		8	A	32.24		0.23	30.37	1.52	0.27	4		
1479	455	459		9	B	17.8		0	17.09	0.66	0	1		
1648	455	459		15	D	5.69		0	5.39	0.3	0			
1655	455	459		17	B	18.24		0	17.25	0.94	0			
1671	455	459		18		5.25		0	5.02	0.19	0			
1545	455	461		14	B	2.33		0	0.57	1.76	0			
1630	455	461		18	B	8.66		0	8.19	0.47	0			
1652	455	489		16	B	22.62		0	20.11	2.45	0			
3	456	432		2		18.09		0.79	13.8	3.46	0.79			
1717	456	432		3		19.19		0.55	14.97	3.59	0.55			
1721	456	432		4		13.3		0.35	8.64	3.98	0.35			
1728	456	432		5		28.17		0.32	24.99	2.69	0.42	4		
1736	456	432		6		20.23		0.33	16.24	3.53	0.39	3		
1765	456	432		7	A	16.91		0.31	15.09	1.46	0.31			
1801	456	432		8		8		0.04	6.77	0.98	0.18	5		
18296	456	432		9		8.31		0.05	6.87	1.38	0.05			
727	456	434		3	D	44.95		0.35	43.05	1.44	0.38	1		
739	456	434		4		62.96		0.37	59.71	2.63	0.37			
795	456	434		6	D	68.25		0.11	66.33	1.63	0.11	2		
805	456	434		7	D	43.58		0.18	41.56	1.68	0.26	4		
821	456	434		8		60.26		0.04	58.76	1.3	0.06	3		
820	456	434		9		33.81		0.06	31.9	1.81	0.06			
828	456	434		10		49.5		0	48.24	1.2	0			

single fragment, it is entirely possible that it was intrusive from level 5. All of the seeds found at Barber Creek came from the Woodland occupation levels except for the weedy legume seed. The weedy legume came from level 7 at a depth of about 60-70 cm below surface in N 454 E 432, which corresponds to the Early Archaic occupation.

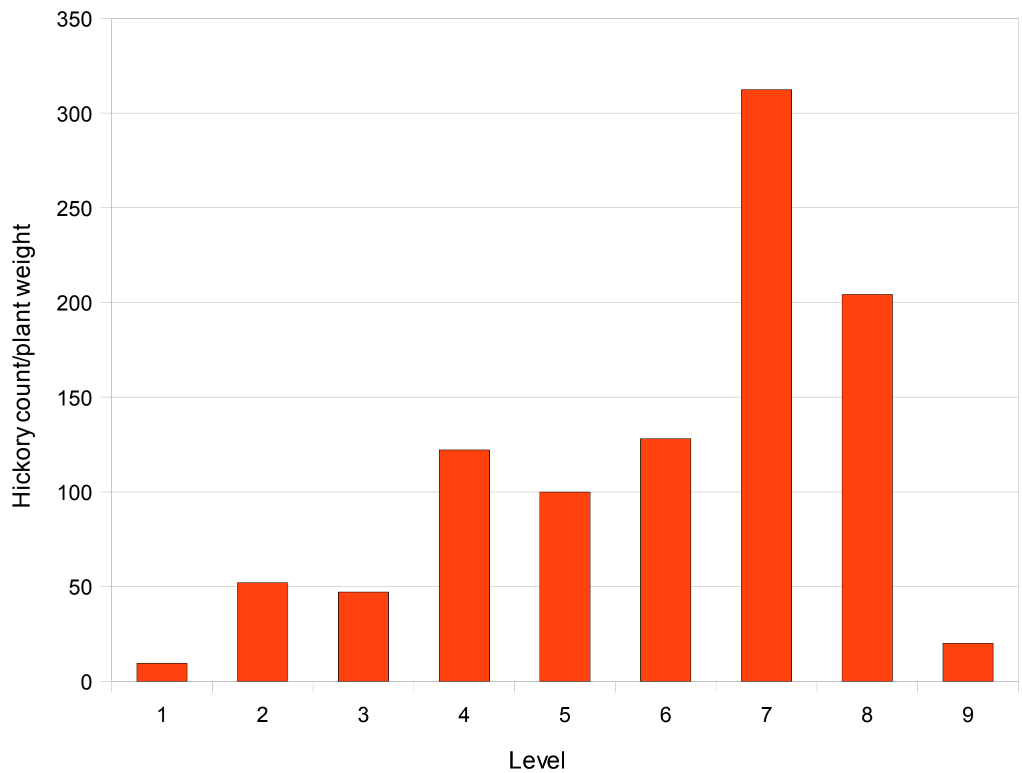

Fig. 5.1. Standardized counts of hickory by level at Barber Creek.

*Windsor (31BR201/201**)*

I analyzed 215 samples from Windsor, a site with Early Archaic and Late Archaic to Late Woodland occupations on the northern outer coast. Table 5.3 provides summary data for the features analyzed from the Windsor site for this study. More detailed information is presented in Table A.2 in the appendix. In almost all of the samples from

Windsor, wood charcoal makes up the majority of plant remains. The presence of large quantities of organic pitch and pinecone fragments indicates that much of the wood may have come from conifers.

Hickory is the most numerous and ubiquitous taxon recovered from the samples. It outnumbers all other taxa combined. Hickory nut fragments were recovered from 55 features. The majority of the samples, however, have low to moderate amounts of hickory. There are six features (Features 158, 220, 1797, 1798, 1818, 1973) and one sample from EU 4 Level 1 in which hickory outweighs wood. All of these samples are quite small, however, about 2 g or less.

All other identified plant taxa were found in just 12 features of the 157 examined and one excavation unit. Three fragments of what may be insect-infested acorn meat were recovered from Feature 344. However, no acorn shell was recovered in the Windsor features.

Seeds from three fruit species were found in the samples. A single persimmon seed was found in Feature 344. The most numerous seeds are from blackgum. Blackgum was recovered in small amounts from five features (Features 344, 543, 771, 974, 1000). Palmetto was represented by only one seed from Feature 131.

Two tree species were each found in only one feature at the site while a third was found in five features. American holly was represented by only two seeds from Feature 1000. One possible wax myrtle seed was recovered from Feature 344. While this seed was too degraded to make a definite identification, it would be perfectly reasonable to find in this situation. Dogwood was also recovered in small amounts from five features (Features C, 216, 344, 1000, 1251).

Table 5.3. Plant Remains from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory Ct.	Other
1029	C	EU 54 Lv. 1	B	12.43		3.38	6.25	2.72	3.38		
1031		EU 57	C	14.48		3.8	6.29	4.24	3.8		2 Dogwood, 1 Weedy Legume
697			EU 4 Lv. 1	0.27		0	0	0	0.27	7	
224		4	10	2.47		0.4	1.27	0.75	0.43	5	
			14	1.98		0.47	0.95	0.57	0.47		
			19	36.07		7.49	19.41	9.04	7.49		
106		4	21	0.8		0.41	0.11	0.28	0.41		
			92	6.07		1.02	1.55	3.32	1.12	7	
			93	3.1		0.37	0.24	2.41	0.41	3	
183		1	101	1.57		0.55	0.44	0.58	0.55		
			131	6.67		0.7	3.92	1.92	0.7	1	1 Palmetto
			132/133	18.24		1.84	8.33	8.01	1.84		
137		5	139	0.4		0.05	0.22	0.14	0.05		
			140	6.19		0.77	1.38	4.01	0.77		
61		5	145	5.49		1.02	0.37	3.56	1.52	19	
			146	2.75		0.28	1.94	0.52	0.28		
			153	130.64		0.37	6.91	122.94	0.37		
70		5	157	0.37		0.1	0.03	0.24	0.1		
			158	0.69		0.02	0.33	0.27	0.08	8	
			171	8.76		0.58	4.32	2.21	0.93	31	
260		3	174	6.45		0.74	3.27	2.41	0.77	2	
			176	6.9		0.97	4.18	1.67	1.02	4	
			181	0.84		0.11	0.21	0.48	0.11		
86		6	194	1.3		0.1	0.39	0.8	0.1		
117		6	213	78.01		70.5	6.22	0.03	70.5		
			216	787.17	556.47	410.09	59.42	22.81	410.09		1 Dogwood
			217	444	109.64	83.48	12.21	6.79	83.81	11	
			220	3.51		0.37	0.45	1.64	1.4	54	
			240	16.79		3.73	6.13	6.91	3.73		
			248	2.96		0.4	1.23	1.31	0.4		
			249	11.24		1.09	4.39	5.79	1.09		
79			257	4.43		0.85	0.25	3.06	0.85		
			258	20.69		2.16	4.32	14.14	2.16		
			267	1.85		0.28	0.64	0.93	0.28		
			308	5.75		1.53	2.43	1.74	1.55	1	
585	A		312	2.99		1.39	0.08	1.48	1.41	1	
619			330	4.88		0.42	4.1	0.33	0.42		
618			335	6.45		0.79	4.49	1.01	0.79		
			338	4.23		0.94	1.35	1.94	0.94		

Table 5.3 (continued). Plant Remains from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory Ct.	Other
			339/340	11.28		2.63	6.06	2.54	2.63		
			344	1588.98	350.37	241.06	50.78	41.81	241.32	5	3 cf. Acorn Meat, 5 Blackgum, 5 Dogwood, 1 cf. Wax Myrtle, 1 Persimmon
602	A		345	5.28		0.33	2.46	2.46	0.33		
515	A		347	0.11		0.1	0.01	0	0.1		
			350	9.5		3.66	4.49	1.3	3.66		
561			353	0.28		0.27	0.02	0	0.27		
471	A		354	0.32		0.21	0.1	0	0.21		
459	A		355	3.98		0.31	2.52	1.12	0.31		
448	A		360	2.51		0.94	0.84	0.73	0.94		
			366	2.54		1.08	0.94	0.55	1.08		
483	A		370	0.41		0.39	0.02	0	0.39		
600	A		371	272		0.3	1.81	0.59	0.3		
622	A		374	1.34		0.4	0.46	0.48	0.4		
			382/383	1.37		0.27	0.62	0.49	0.27		
			416	6.92		1.79	1.16	3.94	1.79		
541			433	2.14		0.73	0.08	1.29	0.76	1	
			439	6.89		0.85	3.41	2.58	0.85		
423			440	0.73		0.15	0.28	0.3	0.15		
427			445	1.7		0.53	0.24	0.95	0.53		
429			447	1.34		0.29	0.57	0.47	0.29		
430			448	1.23		0.26	0.48	0.5	0.26		
520	A		460	4.17		0.57	0.27	3.33	0.57		
510	A		462	0.72		0.31	0.05	0.37	0.31		
531	A		463	0.86		0.18	0.04	0.62	0.18		
543	A		481	0.43		0.41	0	0	0.41		
617	A		482	1.02		0.09	0.71	0.2	0.09		
647	A		484	2.39		0.38	1.36	0.63	0.38		
			487	5.13		1.6	2.37	1.11	1.6		
621	A		494	1.8		0.2	0.77	0.83	0.2		
			522	2.04		0.39	0.58	1.07	0.39		
603	A		527	1.78		0.2	1.19	0.4	0.2		
626	A		543	75.93		61.52	10.49	0.28	61.52		1 Blackgum
614	A		545	2.31		0.36	1.26	0.66	0.36		
607	A		578	6.65		0.24	0.69	0.71	0.24		
615	A		587	3.14		0.28	1.71	0.83	0.59	19	
654	A		613	8.45		0.19	7.32	0.88	0.19		
			641	7.01		2.36	2.42	2.17	2.36		

Table 5.3 (continued). Plant Remains from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory Ct.	Other
			644	4.87		1.28	1.89	1.57	1.39	6	
			657	1.97		0.91	0.37	0.68	0.91		
			664	4.02		0.92	1.26	1.78	0.92		
653	A		690	6.61		0.72	5.17	0.39	1	29	
779	A		714	5.29		0.31	3.64	1.32	0.31		
646			754	14.84		4.3	8.51	1.83	4.3		1 Pinecone
650	A		770	1.3		0.51	0.5	0.3	0.51		
			771	142.47	104.53	60.63	32.82	9.01	60.78	2	4 Blackgum
757	A		890	0.04		0.02	0.01	0	0.02		
608	A		896	4.5		0.69	2.07	1.71	0.69		
804	B		932	9.89		0.11	8.67	1.09	0.11		
			972	130.03		96.97	20.67	6.74	100.34	133	
659	B		979	4.3		0.38	2.94	0.95	0.38		
794	C		1000	13.89		2.95	7.43	3.38	2.95		5 Blackgum, 1 Dogwood, 2 American Holly, 1 Weedy Legume
802	C		1061	7.31		0.23	4.05	2.99	0.23		
816	C		1139	10.33		0.7	7.08	2.44	0.7		
813	C		1140	5.27		0.77	2.46	2.02	0.77		
815	C		1141	5.68		0.83	2.56	2.27	0.83		
810			1233	10.72		0.75	8.56	1.38	0.75		
			1237	25.68		7.07	12.41	6.05	7.07		
800	C		1251	182.12		52.71	46.74	80.33	52.71		1 Dogwood
798	C		1307	13.42		5.74	6.73	0.87	5.74		
795	C		1324	7.05		0.49	3.26	3.26	0.49		
796	C		1351	5.86		0.2	4.14	1.49	0.2		
910	C		1390B	14.2		0.59	10.87	2.41	0.8	13	
927	C		1397	6.38		0.1	5.44	0.73	0.1	1	
922	C		1431	6.4		0.22	4.95	1.21	0.22		
913	C		1435	3.55		0.77	2.08	0.64	0.82	2	
918	C		1444	4.04		0.39	2.09	1.55	0.39		
817	C		1462	5.94		0.59	3.61	1.71	0.59		
1022	C		1478	4.53		0.19	2.33	2	0.19		
			1492	881.22	296.48	143.09	32.43	20.51	143.09		
944	C		1520	7.78		0.55	5.51	1.65	0.55		
933	C		1524	7.49		0.6	4.11	2.75	0.6		
939	C		1542	4.38		0.5	2	1.5	0.71	15	1 Weedy Legume
920	C		1635	2.45		0.16	1.27	1	0.16		
929	C		1651	7.39		0.38	3.28	3.69	0.38		

Table 5.3 (continued). Plant Remains from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory Ct.	Other
923	C		1752	6.91		0.12	4.08	2.67	0.12		
942	C		1780	5.52		1.18	2.9	1.31	1.25	6	
935	C		1790	27.91		14.22	10.01	3.44	14.22		
1026	C		1793	25.76		11.69	10.64	2.82	11.69		1 Weedy Legume, 1 Pinecone
992	D		1797	11.77		0.28	7.67	2.97	1.07	30	
996	D		1798	12.21		0.35	4.6	5.46	1.89	67	
			1806	46.62		30.86	11.63	3.22	30.95	6	
1000	D		1815	3.71		0.56	1.85	1.28	0.56		
1015	D		1817	9.25		1.23	6.15	1.37	1.68	35	
995	D		1818	4.06		0.35	2.88	0.36	0.81	39	
978	D		1831	2.52		0.42	1.32	0.71	0.42		
1018	D		1840	3.9		0.92	2.08	0.57	0.92		
1012	D		1846	6.98		0.75	4.84	0.88	1.21	26	
974	D		1847	55		33.1	15.46	6.13	33.1		3 Blackgum
979	E		1957	1.87		0.16	1.34	0.35	0.19	3	
982	E		1965	132.84		38.82	32.13	39.24	39.2	24	2 Goosegrass
			1971	6.1		1.3	2.86	1.63	1.57	17	
			1973	1.89		0.03	1.72	0.08	0.09	1	
997	E		1975	5.14		0.76	2.71	1.51	0.92	8	
970	E		1987	3.82		0.24	2.47	1.05	0.3	3	1 Weedy Legume
986	E		1990	4.96		0.29	3.75	0.82	0.34	5	
2050	E		2010	0.02		0	0	0	0		
975	E		2025	4.31		0.52	2.89	0.88	0.52		
1023	E		2107	3.43		0.34	2.46	0.58	0.38	2	
998	E		2109	3.11		0.24	1.96	0.89	0.24	1	
1013	E		2118	7.53		0.32	6.34	0.84	0.32		
1069	E		2120	4.77		0.5	3.32	0.9	0.53	1	
	E		2122	5.87		0.34	4.09	1.41	0.34		
983	E		2137	3.4		0.49	2.04	0.77	0.53	2	
1081	B		2149	4.18		0.23	2.57	1.36	0.23		
1065	E		2169	5.69		0.46	3.37	1.77	0.46		
1085	E		2176	5.07		0.64	2.86	1.52	0.64		
1088	E		2183	6.01		0.24	3.44	2.31	0.24		
1079	E		2199	5.04		0.74	3.02	1.04	0.96	12	
1086			2238	5.71		0.64	1.76	3.37	0.64		
2077	E		2276	6.25		0.2	4.15	1.76	0.3	6	
1083			2308	6.96		0.73	3.79	2.29	0.81	1	
2084	E		2484	2.74		0.43	1.49	0.79	0.43		
2326	F		2542	2.84		0.26	1.26	1.32	0.26		

Two types of weed seeds were also identified in the Windsor material. Two goosegrass seeds were found in the sample from Feature 1965. Small seeds from a weedy legume (Fabaceae) were more common. They were recovered in Features C, 1000, 1542, 1793, and 1987. The weedy legume from Feature 1000 may have been a wild bean (*Phaseolus polystachyus*). These seeds may have served as a food source or been accidentally brought into the site as weeds.

Accelerated Mass Spectrometer (AMS) dates were obtained for 10 of the analyzed features at the Windsor site (Seibel and Russ 2009). (See Table 5.4.) Feature 1542 had a calibrated date of 7070 ± 60 BC, placing it in the Early Archaic. This feature contained a modest amount of hickory (n=15) and a single weedy legume. Feature 1000 had a calibrated date of 840 ± 50 BC placing it in the transitional period between the Late Archaic and Early Woodland. This feature was one of the most diverse from the site

Table 5.4. AMS Dates for Windsor Features.

Provenience	Area	Calibrated Date	Time Period
Fea. 217	A	AD 330±40	Middle Woodland
Fea. 308	A	AD 980±40	Middle Woodland
Fea. 344	A	---	Modern
Fea. 771.1	A	AD 1040±40	Middle Woodland
Fea. 249	C	---	Modern
Fea. 1000	C	840±50 BC	Transitional
Fea. 1307	C	AD 680±40	Middle Woodland
Fea. 1542	C	7070±60 BC	Early Archaic
Fea. 1806	D	AD 1220±40	Late Woodland
Fea. 131	E	AD 880±40	Middle Woodland

and contained five blackgum seeds, a dogwood seed, the two American holly seeds, and a weedy legume. Feature 131 returned a calibrated date of AD 880 ± 40 placing it late in the Middle Woodland period. It contained a single piece of hickory and the only palmetto seed found at the site. Feature 217 had a calibrated date of AD 330 ± 40 placing it in the Middle Woodland and contained 11 pieces of hickory. Features 308 and 771 had calibrated dates later than is normally associated with the Middle Woodland period but contained diagnostic artifacts from that period. Following Seibel and Russ (2009), they are tentatively considered Middle Woodland for the purposes of this analysis. Feature 308 had a calibrated date of AD 980 ± 40 and contained only a single piece of hickory. Feature 771 had a calibrated date of AD 1040 ± 40 and contained two pieces of hickory and four blackgum seeds. Also dating to the Middle Woodland, Feature 1307 had a calibrated date of AD 680 ± 40 but contained no non-wood taxa. Feature 1806 is associated with the Late Woodland with a calibrated date of AD 1220 ± 40. Only six pieces of hickory were found in this feature. Two features, Feature 344 and Feature 249, returned modern dates. Feature 344 contained one of the most diverse arrays of taxa at the site. In addition to five pieces of hickory, it included the probable acorn meat, five blackgum and five dogwood seeds, the probable wax myrtle seed, and the only persimmon seed found at the site. Feature 249, in contrast, contained no non-wood taxa. Because of the multiple occupations of the site, features not directly dated could not be definitively associated with any time period.

Southside (31NH802)

I analyzed 26 samples from Southside, a site with Late Archaic to Middle Woodland occupations on the southern outer coast. Plant materials from Southside are presented in Table 5.5 and more detailed information is presented in Table A.3 of the appendix. The majority of the analyzed samples contained carbonized wood and few other taxa. The only food remains recovered from the site are represented by hickory nutshells found in small quantities in ten contexts. Only two seeds, both wax myrtle, were recovered from Feature 24. A single pinecone scale was found in Feature 16B. Pine trees are common components of forests in the area around the site.

Table 5.5. Plant Remains from the Southside (31NH802) Site.

Bag #	Provenience	Level	Block	Wt.	Wood Wt.	Contaminant Wt.	Plant Wt.	Hickory Ct.	Other
1035	TU 156B	2	I	1.52	0.55		1.52	6	
15	EU 16	3	A	0.1	0.1		0.1		
89	EU 24	2	B	0.11	0.11		0.11		
576	EU 113	3	E	0.19	0.19		0.19		
643	EU 127	PP	C	0.01			0		
649	EU 128	3	C	0.11			0.11	2	
797	EU 145	4	H	0.29	0.29		0.29		
808	EU 146	PP	H	0.16			0.16	1	
813	EU 147	3	H	0.38			0.38	2	
1008	EU 155	3	I	0.03	0.03		0.03		
1018	EU 156	2	I	0.26	0.26		0.26		
1081	EU 160	4	C	0.8	0.37		0.8	2	
1139	Fea 5		B	0.16	0.16		0.16		
222	Fea 8		C	0.12			0.12	1	
1135	Fea 14		C	0.46	0.22	0.05	0.38	3	
1140	Fea 16B		E	0.04	0.01		0.01		1 Pinecone
1141	Fea 17		C	0.26	0.24		0.24		
1137-1138	Fea 18/22		C	0.31	0.31		0.31		
1134	Fea 19		F	0.08	0.08		0.08		
1133	Fea 23		C	0.24	0.2	0.01	0.23	2	
1144	Fea 24		H	0.23	0.21	0.01	0.21		2 Wax Myrtle
1145	Fea 25		C	0.07	0.05	0.01	0.05		
1147, 1136	Fea 27		I	0.37	0.17	0.02	0.35	6	

Eleven features analyzed from the site can be assigned to a time period (Russ and Seibel 2010). Feature 16B was a small shell-filled pit in Block E. It contained just one ceramic sherd and is tentatively identified as an Early to Middle Woodland cooking pit (Russ and Seibel 2010). However, it contained no non-wood taxa. Feature 19, a small hearth, contained Middle Woodland Hanover and Cape Fear ceramics. An AMS radiocarbon date of charcoal from the feature gave a 1-Sigma calibrated date of 380 - 350 BC and 300 – 210 BC. This would place it very early in the Middle Woodland period.

Feature 19, however, contained no non-wood taxa. Features 5, 18/22, 23, and 24 were all associated with the Middle Woodland occupation of the site. All contained Middle Woodland ceramics and Feature 18/22 had a calibrated radiocarbon date of AD 330 – 410. Features 5 and 18/22 had no non-wood taxa. Feature 23 contained two pieces of hickory and Feature 24 had two wax myrtle seeds. Features 14 and 27 contained Middle Woodland Hanover and Cape Fear ceramics. Calibrated radiocarbon dates from both features are later than typically associated with the Middle Woodland but the ceramic traditions may have been in use for longer than previously thought. Feature 14 had a calibrated date of 1160 – 1230 and Feature 27 dated to AD 900 – 1000. This would place the features very late in the Middle Woodland. Feature 14 contained three piece of hickory and six hickory fragments were recovered from Feature 27.

Brooks Island (31DR32)

I analyzed six samples from Brooks Island, a Middle Woodland site on the northern outer coast. Summary information on plant materials from Brooks Island are presented in Table 5.6 with more details found in Table A.4 of the appendix. The only non-wood taxon recovered from the site is a single piece of hickory nutshell found in level 2 of square S-B. Given the small number of samples from this site, the lack of plant remains is not completely unexpected. However, the amount of plant material recovered in all analyzed samples was very small so preservation may also have been a factor.

Table 5.6. Plant Remains from the Brooks Island (31DR32) Site.

Square	Level	Depth	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory
S-B	1	0-10	1664.78	239.3	0.05	68.61	170.23	0.05	
S-B	2	10-20	1065.19	236.53	0.07	78.8	157.3	0.11	1
S-B	3	20-30	1699.85	389.96	0.3	99.76	289.59	0.3	
S-B1	1	0-10	1526.16	211.23	0.11	43.47	167.52	0.11	
S-B1	2	10-20	2121.13	321.67	0.31	139.76	194.71	0.31	
S-B1	3	20-30	747.97	240.57	1.2	124.8	113.26	1.2	

Broad Reach (31CR218)

I analyzed 124 samples from Broad Reach, a site occupied from the Early to Late Woodland on the southern outer coast. Plant materials from Broad Reach are summarized in Table 5.7 and more detailed information on the samples is presented in Table A.5 of the appendix. Broad Reach had a large and diverse botanical assemblage. Eighteen different taxa were present in the analyzed samples. The most abundant taxon at Broad Reach, in terms of count, was maize. It was found in 15 features (ubiquity = 20%) but the distribution of maize between those features was very uneven. Two charcoal pits, Features 15762 and 17790, had very large amounts of cupules (n = 357 and n = 143, respectively), modest amounts of glumes (n = 38 and n = 14), and a few kernels (n = 3 and n = 1). These two features represent the overwhelming majority of maize from the site. Three features, Features 858, 6434, and 6661, had more moderate amounts of cupules (n = 7, n = 23, n = 14) and a few glumes (n = 1, n = 2, n = 2). Feature 858 also contained a single kernel. The rest of the features (Features 7323, 8198, 9681, 9700, 10506, 15610, 18128, 19991, 19998, and 21069) contained very small amounts of maize.

The most ubiquitous taxon from Broad Reach, however, was hickory. It was found in 19 features giving it an ubiquity of 25%. The distribution of hickory was also much more even across features. Four features (2432, 15355, 18140, and 19997) had 10 to 16 hickory fragments. Seven features (858, 866, 1883, 1951, 13424, 18134, and 19998) had 5 to 9 pieces of hickory. Eight features (1618, 14344, 15561, 17918, 18128, 18152, 24571, and 26383) had fewer than five pieces of hickory.

Acorn was recovered from only two features. Feature 858 had two pieces and Feature 8006 had one. One piece of acorn meat was also recovered from Feature 19989.

Two fragments of black walnut were found in the sample from Feature 19998. Interestingly, three pieces of nut husk, the tough, fibrous flesh that surrounds nuts, were recovered from Feature 858. They probably came from hickory nuts. The only two beans found at Broad Reach also came from Feature 858.

The remainder of the taxa found at Broad Reach were recovered in very low numbers. A few starchy and oily seed taxa were recovered from the site. One chenopod seed was recovered from Feature 17918. One knotweed seed was found in Feature 7803 and the feature also had one seed which may have been either chenopod or amaranth. A possible maygrass seed was found in Feature 7803 along with one possible bramble seed. Two bearsfoot seeds were found in Feature 19998.

Two other fruit taxa, hackberry and palmetto, were found at Broad Reach. Four hackberry seeds were found in Feature 17918 and one palmetto was found in Feature 19989.

Seeds from two trees were recovered from the Broad Reach samples. Wax myrtle was the only taxon other than maize and hickory that was found in large numbers. It was found in six features. Features 1883, 7803, and 18134 each had a single wax myrtle seed. Feature 21811 had two and Feature 7323 had nine. Feature 8198, however, had a concentration of 170 wax myrtle seeds. The other tree taxon at the site, dogwood, was found as a single seed in Feature 15561.

Several weedy taxa were also found in the Broad Reach samples. One bedstraw seed was recovered from Feature 26383. Six spurge seeds were found in Feature 7803 with one additional seed in Feature 858. Grass seeds were recovered from Features 10506 and 17918 but could not be identified beyond family level. Feature 15101 also

Table 5.7. Plant Remains from the Broad Reach (31CR218) Site.

Bag	Feature	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Cupules	Glumes	Kernel	Hickory	Other
7	20		23.83		3.62	18.46	1.58	3.62					
6	707	N	74.67		11.78	59.81	2.28	11.78					
22-23	775	NW	15.95		0.44	15.3	0.18	0.44					
39	800	N	13.82		0.08	12.96	0.73	0.08					
168-169	826	W	39.46		14.08	24.87	0.3	14.08					
257	858		231.02	73.76	19.35	45.54	8.15	19.65	7	1	1	5	2 Acorn, 3 Nut Husk, 2 Bean, 1 Spurge
142	866	N	99.84		5.32	79.27	14.81	5.43				8	
128	875	NW	221.15	171.5	112.39	50.58	0.95	112.39					
171-172	879		51.71		18.84	32.4	0.02	18.84					
45	1337		18.58		12.4	2.82	3.24	12.4					
299	1338	NW	229.42	48.78	24.34	23.52	0.69	24.34					
74, 81-82, 114-116	1457		147.92		75.39	66.38	0.47	75.39					
76	1618	E	103.31		2.08	41.42	59.54	2.19				3	
50	1883		42.49		25.67	10.39	7.14	25.89				8	1 Wax Myrtle
104-108	1951	W	202.94	117.34	15.34	98.02	3.39	15.48				5	
51	2432		185.23	146.87	38.58	96.59	10.85	39.17				16	
103	2434	N	35.04		30.23	0.74	4.01	30.23					
125	2788	N	25.89		0.61	24.41	0.79	0.61					
102	3571		36.51		3.73	31.03	1.26	3.73					
188	4316	N	13.46		0.28	12.53	0.62	0.28					
137	4728	W	45.23		7.47	37.18	0.82	7.47					
296	5623		141.44	101.5	32.59	62.3	5.98	32.59					
157-158	6434		553.95	228.31	83.6	136.55	6.68	83.7	23	2			
160	6452	N	10.62		1.06	9.48	0.06	1.06					
231-232, 238	6661		190.87	100.61	42.66	47.4	0.03	42.7	14	2			
366	7257	N	137.74		0.54	86.28	50.86	0.54					
262-264	7323		36.97		2.39	33.53	0.93	2.39	1		1		9 Wax Myrtle
244	7803	E	16.51		2.78	12.86	0.79	2.78					1 Knotweed, 1 Cheno-am, 1 Wax Myrtle, 6 Spurge, 1 cf. Bramble, 1 cf. Maygrass
319-320	7881	S	12.71		1.77	10.54	0.37	1.77					
354-355	8006	N	38.7		4.88	30.62	3.04	4.88					1 Acorn
303-304	8198		236.83	153.35	26.76	119.29	5.83	26.76	1				170 Wax Myrtle
314A-B	8319	W	8.85		0.52	8.04	0.25	0.52					
286-287	8321		34.59		20.02	14.44	0.03	20.02					
280-281	9681		65.03		10.35	54.17	0.52	10.38			2		

Table 5.7 (continued). Plant Remains from the Broad Reach (31CR218) Site.

Bag	Feature	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Cupules	Glumes	Kernel	Hickory	Other
332-333	9700	E	56.13		20.67	30.22	5.06	20.67	1				
241-243, 273	10506		60.88		2.46	54.26	3.88	2.46	3				1 Grass
316-318	11478	N	138.77		0.61	70.78	67.22	0.61					
359-361	13424		39.24		15.37	20.21	3.12	15.65				9	
380	14340	W	5.5		2.78	2.28	0.38	2.78					
345	14344	NW	4.87		3.34	0.55	0.88	3.41				4	
413	14780B	N	11.41		0.39	10.06	0.85	0.39					
409-411	15101		311.36	256.88	91.03	157.13	2.89	91.03					184 Pinecone
106, 401	15355	W	50.06		7.17	35.14	7.31	7.38				11	
420-421	15359	SW	14.1		1.45	10.62	1.99	1.45					
464	15544	NW	20.47		2.5	14.16	3.76	2.5					
431, 456	15561	S	105.83	59.77	4.28	49.06	5.71	4.29				1	1 Dogwood
434	15610		8		1.85	5.6	0.53	1.86	3	2			
418	15697		24.2		5.02	16.54	2.68	5.02					
521	15720	E	330.17		0.17	3.94	326.02	0.17					
479	15724	E	117.45		3.89	48.15	65.25	3.89					
476	15762		177.44	94.71	34.21	54.34	1.11	36.78	357	38	3		
602	16763	E	17.87		3.58	12.47	1.76	3.58					
392	17659	N	31.11		11.6	14.25	5.09	11.6					
471-472	17790		579.51	154.08	89.14	61.01	1.24	90.36	143	14	1		
502-506, 563	17918	E	106.81		9.85	82.47	13.53	10.07				2	4 Hackberry, 1 Chenopod, 3 Grass
627	18128		102.71		12.99	74.27	13.55	13.04		2		1	
467-468	18134		41.96		3.7	26.61	11.44	3.82				5	1 Wax Myrtle
511	18139	N	20.68		1.07	12.85	6.72	1.07					
571	18140	E	7.98		2.8	4.25	0.63	3.08				12	
525, 527	18152	W	154.95		7.87	75.12	71.54	8.06				4	
501	18157A	N	147.3		1.47	54	91.63	1.47					
541	19989	N	52.81	25.76	2.76	21.15	1.71	2.76					1 Acorn Meat, 1 Palmetto
499-500	19991		74.33		9.27	57.35	2.22	9.27	1				
477	19997	E	47.87		11.99	30.49	4.84	12.28				10	
550-551	19998	N	100.15		25.13	60.43	12.32	25.42	1			7	2 Walnut, 2 Bearsfoot
536	20088	E	1527.02	279.02	1.28	154.17	123.03	1.28					
558-559	21069	W	76.33		10.46	58.97	6.52	10.46	1				
611	21093	N	24.69		2.14	16.84	5.59	2.14					
532	21811	E	74.05		3.29	36.88	33.67	3.29					2 Wax Myrtle
649	22746	NW	7.19		0.43	5.17	1.59	0.43					
?	23778	E	18.78		3.31	11.63	3.7	3.31					
633	24570		19.57		2.46	13.7	3.33	2.46					
625	24571		24.54		15.16	2.69	6.5	15.25				2	
587-589	24572		36.94		9.39	25.3	2.12	9.39					
548	26383	S	79.15		5.1	39.28	34.5	5.25				4	1 Bedstraw

contained many fragments of pinecone.

Four of the features analyzed from Broad Reach had diagnostic artifacts belonging to more than one period. They all contained ceramics associated with the Early and Late Woodland periods. Feature 826 contained Early Woodland New River and Late Woodland White Oak ceramics as well as Hanover ceramics. This feature, however, did not contain any non-wood taxa. Three features (1951, 8321, and 16763) contained both Early Woodland ceramics and Hanover ceramics, which I am tentatively assigning to the Late Woodland for Broad Reach based on the AMS date acquired for the site (See Chapter 4). The only non-wood taxon from these features was hickory found in Feature 1951. One feature (7323) contained Middle Woodland Mockley, Late Woodland White Oak, and Hanover ceramics. This feature had only one cupule, one kernel, and nine wax myrtle seeds.

Only two features had strictly Early Woodland diagnostics. Feature 20 contained no non-wood taxa and Feature 1618 contained only three pieces of hickory. Another two features (11478 and 14340) had only Middle Woodland (Mockley) ceramics. They did not, however, contain any non-wood taxa.

In total, 48 features contained ceramics associated with the Late Woodland. Five features (3571, 6661, 7803, 8006, and 19989) had both Hanover and Late Woodland White Oak ceramics. Feature 3571 contained no non-wood taxa. Feature 6661 had 14 cupules and two glumes. Feature 7803 contained a fairly diverse array of small seeds: one knotweed, one possible chenopod or amaranth, one wax myrtle, six spurge, one possible bramble, and one possible maygrass. Feature 8006 contained a single piece of acorn shell. Feature 19989 contained the only acorn meat and palmetto seed found in the samples.

Thirty-three features had only Hanover ceramics. Hickory was the most common botanical in these samples and was found in 12 features. Maize was found in four (Feature 15610, 19991, 19998, and 21069). Some of the maize from Feature 15610 was the sample that was submitted for AMS dating and provided a Late Woodland date of AD 1290 to 1400. The two pieces of walnut shell found at Broad Reach came from Feature 19998, which also contained the two bearsfoot seeds found at the site. Features 15561, 18134, and 26383 all contained hickory and a single seed: dogwood, wax myrtle, and bedstraw respectively. Feature 21811 contained two wax myrtle seeds. Feature 17918 had the most diverse assemblage of the Late Woodland features. It contained hickory, hackberry, chenopod, and grass seeds.

Ten features had only Late Woodland White Oak ceramics. Of these only two had non-wood botanicals. Feature 6434 had 23 maize cupules and two glumes while Feature 866 had eight pieces of hickory.

The 19 features that had no diagnostic artifacts include the two charcoal pits, Features 15762 and 17790, with the largest concentrations of maize. These features also contained hickory but no other plant taxa. These features may have served instead as smudging, roasting, or cooking pits.

31ON1578

I analyzed 51 samples from 31ON1578, an Early to Late Woodland site on the southern outer coast. Summary information on plant remains from 31ON1578 is presented in Table 5.8 with more detailed information in Table A.6 of the appendix. Along with Broad Reach, 31ON1578 had one of the largest and most diverse botanical assemblages of the sites analyzed here. Besides wood, fourteen different taxa are represented in the samples.

Table 5.9 presents the ubiquity of the three most common taxa at 31ON1578. The most abundant and ubiquitous non-wood taxon recovered from the site was maize. Cupules, glumes, and kernels were all present. Maize was found in samples from 14 features. By far the largest amount of maize was from Feature 860 which had 9.18 g of cupules, 2.5 g of glumes, and 0.11 g of kernels. It should be noted that the counts given in Table 5.8 for cupules and glumes for this feature are estimates. To save time, I counted a subsample of the cupules and glumes and used their weight to estimate the total number found in the sample. Large numbers of cupules and glumes were also found in Feature 698 with smaller amounts of cupules (n = 1-14) in Features 630, 661, 667, 676, 691, 736, 763, 770, 794, 819, and 846. A single kernel was also found in Feature 870, which interestingly had no cob parts.

The second most ubiquitous taxon was hickory, which was recovered from 13 features. Features 630 and 736 had relatively large amounts of hickory with the rest of the features having moderate amounts. Acorn was much less common, being found in only five features.

Seeds of four starchy and oily seed taxa were found in the samples from 31ON1578. Chenopod was represented by a single seed from Feature 627 and one squash seed was recovered from Feature 763. Amaranth was represented by 136 seeds all from Feature 650. One bearsfoot seed was also found in Feature 859.

Single seeds of two fruits were recovered from 31ON1578. A maypop seed was

Table 5.8. Plant Remains from 31ON1578.

Prov.	Block	Feature	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Conatminant Wt.	Plant Wt.	Cupules	Glumes	Kernel	Hickory	Acorn	Other
630.101	5	630	N	19.78		4.67	13.61	0.9	5	1			40		
627.101	5	627		4.71		1.14	3.17	0.34	1.14						1 Chenopod
610.101	3	610	S	35.63		6.15	23.33	5.14	6.15						
676.101	5	676		76.16		14.96	53.26	7.75	15.01	10			3		1 Spurge
729.101	5	729	SW	109.22	57.77	2.04	32.68	22.92	2.04						
801.101	5	801		175.21	93.74	3	56.3	34.04	3						
923.101	2	923/924		82.61		8.04	44.48	29.2	8.31				12		
861.101	2	861	W	144.85	73.55	13.03	49.82	9.1	13.17				9		
668.101	5	668		6.81		1.99	3.24	1.4	1.99						
867.000	2	867	S	119.32		13.68	86.59	17.4	13.81				13	1	1 cf. Legume
698.000	5	698	S	86.87		26.15	49.68	7.67	28.24	269	91		2	1	
926.000	2	926	N	85.87		9.46	62.7	12.02	9.46						
846.101	2	846	S	26.61		3.5	21.36	1.72	3.51	1				2	
911.101	2	911	S	145.75	77.34	1.51	48.51	26.99	1.51						
656.101	5	656	NE	14.97		3.07	10.14	1.29	3.13				3		
667.101	5	667		86.08		12.23	58.99	13.08	12.61	6			17		
859.000	2	859/913		143.59		28.9	100.87	12.03	29.07				14		1 Bearsfoot, 1 cf. Legume, 1 cf. Sedge
794.000	5	794	W	36.33		2.68	27.91	5.26	2.71	1			5		1 Sedge
862.000	2	862		144.33		20.81	110.37	9.51	20.92				10	1	
819.000	3	819	S	390.8	300.52	3.19	160.17	136.65	3.19	1					2 Wax Myrtle
714.101	5	714		7.34		1.48	3.83	1.83	1.48						1 Prickly Pear
736.101	5	736		59.84		19.63	32.24	6.84	20.41	14			45		1 Maypop
860.101	2	860		72.41		14.52	41.16	1.43	26.31	1623	870	13			68 Pinecone
870.101	2	870	S	107.79		47.36	52.7	2.12	47.36			1			
940.000	1	940		61.18		8.74	44.35	7.27	8.74						1 Wax Myrtle
814.101	3	814		47.83		6.65	33.23	8.17	6.65						
650.101	5	650	S	24.96		9.25	14.07	1.27	9.38				10	3	136 Amaranth
763.101	5	763	S	14.71		1.42	12.17	0.82	1.42	2					1 Squash
871.101	2	871	S	153.06	78.23	4.26	48.2	25.54	4.26						
661.101	5	661	S	55.41		3.1	29.07	22.85	3.12	6					
691.101	5	691	N	11.19		2.3	8.26	0.47	2.3	4					
770.101	5	770	S	46.68		8.02	30.02	8.2	8.02	3					
815.101	3	815	S	397.91	119.12	26.53	62.82	27.94	26.53						

Table 5.9. Ubiquity of Three Taxa from 31ON1578.

Taxon	Ubiquity
Maize	42%
Hickory	39%
Acorn	15%

found in Feature 736 and a prickly pear seed was found in Feature 714. Only one tree taxon, wax myrtle, was found at the site in Features 819 and 940.

Weed seeds found at the site include one spurge from Feature 676 and one sedge from Feature 794. A possible sedge seed was also recovered from Feature 859/913. Two possible legumes were recovered from 31ON1578: one from Feature 859 and one from Feature 867. The seed from Feature 859/913 was not a bean but may have been one of the tree legume species. These seeds were too badly damaged to allow more precise identification. Many pinecone scale fragments were also recovered from Feature 860.

Twenty of the analyzed features had diagnostic ceramic artifacts. Two of these had ceramic types associated with more than one period (Southerlin et al 2008). Features 610 and 627 contained both Early Woodland Hamp's Landing and Hanover ceramics, which I am tentatively assigning to the Late Woodland for 31ON1578 based on the AMS date acquired for the site (see Chapter 4). Feature 610 contained no non-wood taxa and Feature 627 contained a single chenopod seed.

In total, 18 features contained ceramics from only one period: one from the Early Woodland and 17 from the Late Woodland. Feature 630, a large non-shell pit, was the only feature with strictly Early Woodland ceramics. It contained one cupule and forty pieces of hickory.

Six features contained both Hanover and Late Woodland White Oak ceramics.

Feature 656 (Burial 1) included only three pieces of hickory. Feature 667 (Burial 3) had six cupules and 17 pieces of hickory. Feature 794 (Burial 10) contained one cupule, five pieces of hickory, and a sedge seed. Feature 819, a large shell pit, had one cupule and two wax myrtle seeds. Feature 859/913, which had multiple zones, contained a fairly wide array of taxa. It included 14 pieces of hickory, a bearsfoot seed, a possible legume, and a possible sedge. Ten pieces of hickory and a single acorn shell fragment were recovered from Feature 862, a dog burial.

Eight features contained only Hanover ceramics. Three of these, Features 668, 911, and 926, contained no non-wood taxa. Features 861 (Burial 12) and 923/924 (Burial 11) contained only hickory. Feature 698, a multizone feature, contained a very large amount of maize cupules and glumes (though no kernels), two pieces of hickory, and a single piece of acorn shell. Some of the maize from this feature was submitted for AMS dating and provided a Late Woodland date of AD 1330 to 1340 and AD 1400 to 1440. Feature 846 contained a single maize cupule and two pieces of acorn. Feature 867 contained hickory, acorn and a possible legume. Finally, three features contained only Late Woodland ceramics other than Hanover. Two of these, Features 729 and 801, contained White Oak ceramics and no non-wood taxa. The third, Feature 676 (Burial 2), contained Swansboro ceramics, maize cupules, hickory, and a spurge seed.

Unfortunately, the feature with the largest concentration of maize from 31ON1578 contained no diagnostic artifacts. Feature 860 was a charcoal pit and had a large number of cupules, glumes, and kernels. The only other non-wood taxon it contained was a concentration of 68 pinecone fragments. Feature 650, a large shell pit which contained a large concentration of amaranth seeds, also had no diagnostic artifacts. This feature also contained hickory and acorn.

Jordan's Landing (31BR7)

I analyzed seven samples from Jordan's Landing, a Late Woodland site on the northern outer coast. Plant remains from Jordan's Landing are presented in Table 5.10 and more detailed information is presented in Table A.7 of the appendix. The only non-wood taxon recovered from the site was hickory nutshell which was found in modest amounts in two of the water-screened samples and one of the flotation samples. As with Brooks Island, the dearth of plant remains from Jordan's Landing may in part be a function of the small sample size and partly a result of poor preservation.

Table 5.10. Plant Remains from Jordan's Landing (31BR7).

Square	Plot	Level	Feat.	Type	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory
-12L12		2	77	Water-screened	3525.88	184.55	0.29	56.39	127.2	0.45	14
-12L12		2	77	Water-screened	2196.84	151.09	0.24	58.85	91.48	0.28	4
-12L12		3	77	Water-screened	1481.25	180.1	0.34	76.86	102.43	0.34	
-12L12		4	77	Water-screened	2365.37	168.77	0.3	68	100.06	0.3	
12L12		3	77	Water-screened	548.25	124.73	0.2	60.72	53.19	0.2	
22R68		1	82	flotation	60.88	60.88	0.25	27.92	28.98	0.49	7
22R68		2	81	flotation	45.12	45.12	0.13	20.99	23.93	0.13	

Cape Creek (31DR1)

I analyzed 26 samples from Cape Creek, a Late Woodland and historic site on the northern outer coast. Plant material from Cape Creek is presented in Table 5.11 and described in more detail in Table A. 8 of the appendix. A fairly diverse array of taxa were recovered from the Cape Creek site. Two types of nuts were found in the samples. This is the only site among those analyzed were acorn was more ubiquitous and abundant than hickory. Acorn was recovered in small amounts from Square M-A7 Zone III B and Square M-H2 Zone III B. Square M-H2 also had one piece of acorn nutmeat. Square M-

Table 5.11. Plant Remains from the Cape Creek (31DR1) Site.

Square	Zone	Level	Feature	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory	Acorn	Chenopod	Other
M-A4	Hearth C W1/2	1	4	83.74		3.22	51.48	17.99	3.22				
M-A4	Hearth A Extension S ½	1	4	56.74		3.24	26.56	18.77	3.24			2	
M-A7	III B	1		1189.69	520.21	13.86	138.17	323.07	13.86		2		
M-H	III B	1-4		10899.52	1581.04	25.57	399.02	1135.21	25.57			3	2 Hackberry, 4 Cheno-am
M-H1	III A	1		276.53	167.14	1.25	148.1	11.28	1.25				
M-H1	III B	1-3		2718.4	398.47	5.59	122.11	263.79	5.71	2	49	3	1 cf. Wild Plum/Cherry, 1 Purslane, 1 Morning Glory
M-H2	III A	2		945.11	435.24	2.41	251.77	174.35	2.41			3	
M-H2	III B	1, 3		3120.41	513.25	7.92	118.13	167.96	7.92		1	4	1 Acorn Meat, 1 Bean, 1 Wax Myrtle
M-H2		2		1418.46	175.2	1.76	57.54	112.91	1.76				2 Cheno-am
M-H2		2		45.81		3.89	35.46	2.9	3.89				3 Cheno-am

H1 Zone III B contained a much larger concentration of acorn (n=49). It also contained the only two pieces of hickory found at the site.

The only domesticate at the site was a bean found in Square M-H2 Zone IIIB. The site also contained ten chenopod seeds though examination of several with a scanning electron microscope (SEM) at the University of North Carolina - Chapel Hill proved that these were the wild rather than the domesticated forms. The seeds had the thick seed coats and wide margins typical of wild chenopods (see Fig. 5.2).

Fig. 5.2. Scanning electron micrograph of chenopod seed from the Cape Creek site.

Chenopod was actually the most ubiquitous taxon from Cape Creek being found in five contexts (Squares M-A4, M-H Zone III B, M-H1 Zone III B, M-H2 Zone III A, and M-H2 Zone III B). There were also five seeds that may have been chenopod or amaranth.

They were found in Squares M-H Zone III B and M-H2. Purslane, morning glory, and a possible wild plum/cherry (cf. *Prunus* sp.) were all represented by single seeds in Square M-H1 Zone III B. One wax myrtle seed was also found in Square M-H2 Zone III B. Two hackberry seeds were recovered from Square M-H Zone III B. These seeds were uncarbonized but, because of their high calcium content, they have a very hard bone-like texture and preserve extremely well. It is entirely possible, therefore, that these seeds were deposited during prehistory and survived in their uncarbonized state while most other taxa would have rotted.

Four of the analyzed contexts are from Zone III B and are therefore associated with the Late Woodland occupation of Cape Creek. Square M-H1 Zone III B was the most diverse context containing hickory, most of the acorn from the site, chenopod, purslane, morning glory, and the possible wild plum/cherry. Square M-H2 Zone III B was nearly as diverse containing acorn shell and meat, bean, chenopod, and wax myrtle. Square M-H had chenopod, possible chenopod or amaranth, and hackberry seeds. Square M-A7 Zone III B contained only acorn shell.

Two of the analyzed contexts are from Zone III A and therefore associated with the Colonial Period occupation of the site. Square M-H1 Zone III A contained no non-wood taxa and Square M-H2 Zone III A contained only three chenopod seeds.

Summary

The sites I analyzed for my dissertation contained a fairly wide array of plant taxa including nuts, introduced crops, starchy and oily seeds, fruit, trees, and weed seeds.

Most of these taxa were found in fairly low quantities, however, except for the nuts. Maize was also abundant in a very few contexts but few other domesticated plants were recovered from these coastal sites. I will discuss some of the patterning of these plant remains more in the next chapter.

Chapter Six

Discussion of the Archaeobotanical Analysis

Having presented the results of my archaeobotanical analysis of the eight newly analyzed sites, in this chapter I turn to a discussion of those results and what they can tell us about prehistoric subsistence on the North Carolina coast. First, I discuss the floral assemblages from each site individually. Next, I look at the coast as a whole and discuss trends in plant use through time and by coastal region. In these sections, I use data from both the eight sites I analyzed and presence/absence data from previously reported sites. Finally, I present the results of correspondence analyses for these two groups of data.

Barber Creek (31PT259)

Barber Creek on the northern inner coast is an important site for our understanding of North Carolina coastal prehistory as it is a rare example of a stratified, multi-component site. Along with one of the features from the Windsor site, it also contains the earliest plant remains recovered from a coastal site to this point. While most of the seeds found at the site come from the Woodland occupation levels, hickory is present at depths of almost a meter. As can be seen from Figure 6.1, if the counts are standardized by the total weight of plant material found in each sample, there is actually more hickory in the Archaic levels than in the Woodland levels though the difference is not statistically significant. Even though there are slightly more samples from the Archaic levels, there is slightly less plant material overall. This may be due to poorer preservation in the older samples. However, the weedy legume found in the Archaic samples suggests that at least some plant material more delicate than hickory shell could survive in the older levels. It also suggests that the lack of small seeds in the Archaic levels may not be entirely due to poor preservation. The presence of only hickory nuts in the Archaic levels, unfortunately tells us relatively little about the season of occupation. The site may have been occupied during the fall when people were collecting hickory nuts. On the other hand, they may have collected the nuts elsewhere and brought them to Barber Creek at any time of the year if they had been previously stored.

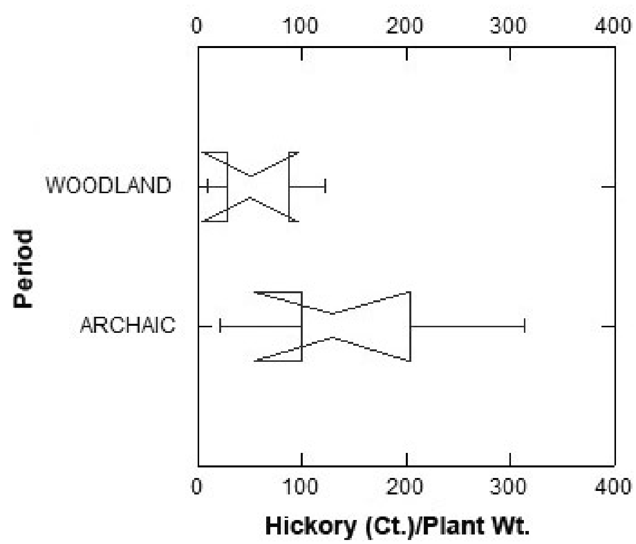

Fig. 6.1. Standardized counts of hickory by period from Barber Creek.

The Woodland occupation levels of Barber Creek contained all of the recovered acorn and seeds except for the weedy legume found in the earlier occupation levels. The seeds found at Barber Creek represent a fairly wide range of taxa including an oily seed plant (sumpweed) and three fruits (grape, blackgum, and haw). Only one sumpweed seed was recovered from the site and, at 3 mm long, it falls well within the range of modern wild sumpweed seeds (ca. 2.5 to 3.2 mm; Asch and Asch 1985; Smith 2007). Although sumpweed was cultivated in many places during the Woodland period, it is therefore very likely that this seed was collected from the wild. While all of the seeds were recovered in small numbers, they do seem to indicate an increasing diet diversity for the later occupants of the site. They also suggest that during the Woodland period the site was occupied during the fall and possibly the late summer. While hickories ripen in the fall from September to November, the fruits found here ripen from August through October.

The difference in the ratio of hickory to other plants suggests that hickory may have played a more important role in the diet of people living at the site during the Archaic than in the Woodland. This might have been because of a shift in dietary focus or it could have been a result of changing use of the site. During the Archaic, the site may have only been used as a temporary camp for part of the year, possibly in the fall to collect and process hickory nuts. If the site was used more frequently or for longer parts of the year in the Woodland period, we might expect to see a wider array of plant foods in the archaeological record.

The recovery of identifiable plant remains from Early Archaic contexts on the coast is an encouraging sign that preservation issues are not insurmountable and further study of early sites on the coast may yield more dietary information about this period.

Windsor (31BR201/201**)

Like Barber Creek, the Windsor site, located on the northern outer coast, is interesting because it gives us a rare glimpse at early subsistence practices on the coast. While the site seems to have primarily been occupied during the Late Archaic through Middle Woodland periods, there are also indications of Early Archaic and Late Woodland use of the site. Unfortunately, lacking Barber Creek's stratigraphy, the site is a palimpsest of features of various ages, some intruding or overlapping others. Because of this, only directly dated features can be definitively associated with any given period.

Plant remains found at the site in general suggest that the occupants probably relied on tree products (nuts, berries/drupes, and fruits) for a substantial portion of their plant diet. As in many other prehistoric sites in the area, hickory seems to have been an important staple for the prehistoric residents of the Windsor site. The lack of acorn shell at the site is interesting, especially given the presence of possible acorn meat. The absence of acorn shell cannot be used to rule out the possibility that acorn was consumed at the site. Acorn shell is very thin and if preservation at the site was poor it may not have survived. It is possible that the acorns represented by the acorn meats were harvested and processed elsewhere since acorn meats are easily transported and stored. However, the possible acorn meats were found in a feature that had a modern radiocarbon date so it is also possible that they are modern intrusions.

The fruit and tree seeds found at Windsor all belong to taxa that probably grew near the site, especially in the wetter areas around the Cashie River. While the persimmon, blackgum, and palmetto do not seem to have been collected in bulk, they probably contributed variety and nutrients to the diet of the site's occupants. The tree (dogwood, American holly, and wax myrtle) and weed seeds (weedy legume) suggest that the area around the site included disturbed places. These may have occurred naturally along the river or been created in part by human activities at the site. The weedy legume seeds, especially the possible wild bean, may have also been another food source. It should be pointed out that the persimmon and possible wax myrtle seeds came from a feature that returned a modern radiocarbon date and may therefore be modern contaminants. Even though the site was used well into the Woodland period when cultivation was established elsewhere, there is no evidence for the use of any domesticated or cultivated foods at Windsor.

The single Early Archaic-dated feature at Windsor is almost identical to those of the same period at Barber Creek in that it contained only hickory and a weedy legume. The single feature dating to the transitional period between the Late Archaic and Early Woodland is unusual; while it contained a variety of fruit, tree, and weed seeds, it had no hickory. If hickory had been present in this feature when it was created, it should have been preserved since the more fragile seeds survived intact. The five Middle Woodland features contained only hickory, blackgum, and palmetto. The single Late Woodland feature contained only hickory.

The transitional period feature aside, it seems that hickory was the most consistently used taxon at the site. The use of weeds and fruit also seems to have been part of the activities at the site during multiple time periods.

The plant remains from the Windsor site can give some indication of what time of year the site was occupied. Hickory and acorns are collected in the fall, though they may be stored and used for the majority of the year. The fruit of dogwood and blackgum also ripen in the late summer and early fall. Since these taxa are less likely to be stored, they indicate a strong possibility that the site was occupied at that time. Occupation of the site at other times of the year cannot be ruled out but a late summer-fall occupation seems likely. As the multiple occupations of the site seem to have been short-term, Windsor has been interpreted as possibly being a seasonal camp. If this is true, hickory collection and processing may have been one of the main activities at the site.

Southside (31NH802)

Since very little plant material was recovered from the Southside site, located on the southern outer coast, it is perhaps unsurprising that it contained few non-wood taxa. Only the ubiquitous hickory and two wax myrtle seeds were found. While the Southside site contained artifacts associated with the Late Archaic to Middle Woodland periods, the occupation of the site seems to have been most intense during the Middle Woodland period. All of the features with radiocarbon dates and/or diagnostic artifacts were dated to the Middle Woodland. These features contained both the hickory and wax myrtle seeds. The small amount of plant material may be due to several different reasons: few plants were used at the site, poor preservation, small flotation samples, or errors during the processing of the samples. Like Windsor, this site may have been occupied for only part of the year as a processing or collecting camp for plants (most likely hickory) or shellfish.

Brooks Island (31DR32)

Brooks Island is another fairly small Middle Woodland site on the northern outer coast. Although 10 L soil samples were taken and the floated samples are quite large (in the range of 1,000 – 2,000 g), there was very little plant material in them. None of the samples contained even 0.5 g of plant remains. The bulk of the material was shellfish shells. Given this paucity of material, it is perhaps less surprising that non-wood taxa are rare and more surprising that there are any at all. The presence of hickory in these samples once again emphasizes its importance in coastal subsistence. It is entirely possible that Brooks Island was occupied mainly to procure shell-fish or some other marine resource. The lack of plant food, therefore, does not mean the inhabitants of the site did not eat plants but that they did not remain at the site long enough for any indications of the plants they ate to make it into the archaeological record.

Broad Reach (31CR218)

Broad Reach, on the southern outer coast, had the largest and most diverse plant assemblages of those analyzed for this dissertation. The Broad Reach assemblage makes several interesting contributions to our understanding of coastal subsistence patterns.

The Early Woodland component, though not a large part of the site, adds to the subsistence data for this period. Only hickory was found in the two features dating to this period. This seems to be consistent with the plant remains reported from other Early Woodland coastal sites. It is possible that Broad Reach was not inhabited frequently during the Early Woodland. The two features with Middle Woodland ceramics did not contain any non-wood taxa so it is possible the Middle Woodland occupation of Broad Reach was also infrequent.

The most intensive use of the site seems to have been in the Late Woodland. The presence of maize in these samples indicates that the occupants of the site were carrying out agricultural activities for at least part of the year. The chenopod found in this component of the site may also have been cultivated, though given that only one seed was found, it was most likely gathered from the wild. Hickory, however, still seems to have played an important role in the diet of the site's inhabitants at this time. Hickory nut shell was more abundant and appeared in more features than maize. Interestingly, only two features at Broad Reach contained both hickory and maize (Features 858 and 19998). This could be entirely coincidental or it could indicate different uses for the various features. The Late Woodland samples also included a variety of fruit, starchy and oily seeds, tree, and weed seeds. These suggest that the area around the site contained disturbed, open habitats that people may have exploited frequently. The use of maize also does not seem to have decreased the use of wild resources or narrowed the diet of the site's occupants.

Maize was found in 14 features at Broad Reach. Most of these features were charcoal pits that contained little other than maize and wood. No other edible taxa were present. A large number of wax myrtle seeds and a large number of pinecone fragments were found in two of these pits and may be indicators of the types of wood being burned. Six features containing maize also had diagnostic ceramics. All but one (Feature 6434) contained Hanover ceramics, though one (Feature 6661) contained both Hanover and

White Oak ceramics. Feature 6434 had only White Oak ceramics. As mentioned in Chapter 4, I submitted maize from one of the features with Hanover ceramics for AMS dating and it returned a date in the last half of the Late Woodland. The presence of Late Woodland White Oak ceramics in features with maize suggests that maize use at Broad Reach was probably heaviest during the Late Woodland.

As mentioned in Chapter 2, Lynette Norr (2002) conducted stable isotope analysis of skeletal remains from many individuals from Middle and Late Woodland coastal sites. Broad Reach was one of the sites included in this study and samples from 14 individuals were analyzed. She found that the nitrogen values of the Broad Reach individuals suggested that they were either eating more terrestrial protein than their neighbors on the outer coast or they were selectively exploiting fish with low δ15N values. Looking at the difference between carbon values in bone apatite and collagen, Norr (2002:203) also concluded that they consumed a carbohydrate source (such as C3 plants) with less 13C than in their marine fish diet and thus the isotopes left "little room for interpreting maize as any significant part of the … diet." While it is impossible to determine exactly how large a role maize played in the diets of the people of Broad Reach, the archaeobotanical analysis clearly shows that it was a part during the Late Woodland. Since the individuals in Norr's study were believed to be from the Late Woodland period, there is a contradiction between the archaeobotanical and isotopic evidence. It is possible that good preservation at Broad Reach has ensured the recovery of maize in relatively significant quantities even though it was not the mainstay of the diet. Maize, for example, may have been consumed regularly in small amounts or restricted to special occasions such as feasts or ritual occasions. On the other hand, the isotopic signature characteristic of maize may have been masked by some unknown factor in the Broad Reach population.

Relatively little can be said about the season of occupation of the Broad Reach site during the Early and Middle Woodland since so few features date to these periods. Both contained hickory, which may indicate a fall occupation, but, as has been noted, hickory nuts are easily stored and therefore may be used year-round. The Late Woodland features, however, showed a greater diversity of taxa. They included taxa (chenopod and bedstraw) that could have been eaten as greens in the spring. Chenopod seeds may also have been eaten along with seeds from bearsfoot. These two taxa would have been available from July through November. Also present were fruit and tree seeds (hackberry, dogwood, and wax myrtle) that ripen in late summer to early fall. Together, these taxa suggest a definite fall occupation of the site and possible late summer and spring ones as well. Maize, also found in these features, may be preserved for use at any time during the year. If it was grown at the site, however, it would require people to be there in the spring to plant and in the fall to harvest. The presence of permanent or semi-permanent housing structures at Broad Reach, which is unusual at coastal sites, and crops like maize and bean strongly imply that the site was occupied year-round during the Late Woodland.

31ON1578

31ON1578, on the southern outer coast, shares many characteristics with the nearby Broad Reach site. Both contained maize and hickory in fairly substantial numbers and a variety of fruit, weed, and tree taxa in smaller numbers. The two sites were also occupied at roughly the same time periods.

One maize cupule was found in a feature (Feat. 630) containing Early Woodland Hamp's Landing ceramics. However, this feature was small and shallow. The Hamp's Landing sherds found in this feature also refit with sherds from other features containing Hanover and White Oak ceramics. It seems likely, therefore, that this feature contained material from more than one time period. Even if most of the material in this feature was deposited in the Early Woodland, the cupule may have been an intrusion from another feature.

As at Broad Reach, the Late Woodland occupation of 31ON1578 seems to have been the most intensive. The features dating to this period contained maize, hickory, acorn and tree and weed seeds. Most of the maize from this period is found in one feature (Feature 698), while the hickory is more evenly distributed between features.

Some edible seeds were recovered from 31ON1578 in features without diagnostic artifacts. These included a large number of amaranth seeds and a rare squash seed. The large number of amaranth seeds indicates that it was probably collected intentionally and not an accidental inclusion in the site. The squash seed is the only one of its kind found in the sites analyzed here although squash had previously been reported from other coastal sites (Detwiler and Scarry 1999; Scarry and Scarry 1997). This squash seed is the only obvious domesticate at the site aside from maize. There was also a chenopod in a feature with mixed Early and Late Woodland artifacts that was probably not cultivated. The mixture of cultivated and wild plants indicates that the inhabitants of the site carried out a mixture of foraging and farming during the Late Woodland.

As with Broad Reach, the largest amount of maize found at 31ON1578 was found in a charcoal pit (Feature 860) that contained little else. In this case, pinecone was the only additional taxon in the feature and probably represents the burning of pine as fuel. This feature may have been a smudge pit or associated with maize processing or cooking.

The variety of plants found at 31ON1578 can give us some clues about the season of occupation of the site. The hickory and acorn found at the site ripen in the fall, but as previously discussed, can be stored for use throughout the year. The fruit (maypop and prickly pear) found in the samples are available from July to October. Chenopod and amaranth could have been eaten as greens in the spring or as seeds from July to November. Other seeds (wax myrtle and bearsfoot) found at the site also ripen from July to October. A late summer to fall occupation of the sites seems likely for all time periods. During the Late Woodland, the possible use of greens and the certain use of cultivated plants also suggests a spring occupation as this would be the time of year when greens were available and crops would need to be planted. Although no permanent house structures were identified at 31ON1578, it is possible the site was occupied year-round during the Middle and Late Woodland.

Jordan's Landing (31BR7)

The small number of samples analyzed from Jordan's Landing, which is found on the northern inner coast, limit the conclusions that can be made about subsistence at the site. The only non-wood taxa recovered was hickory. This once again emphasizes the importance of hickory in the diet of prehistoric coastal people. Even in the Late

Woodland, when cultivated plants were most likely available, hickory still played an important role in the diet.

Phelps (1983) reported that maize, beans, and nutshell were seen in the ditch surrounding the site and in hearths during excavation. The lack of maize and beans in the analyzed samples is most likely due to sampling error. It may also indicate, however, that, like at Broad Reach, the maize at Jordan's Landing may have been restricted to only some features and not widely spread throughout the site.

Cape Creek (31DR1)

The Cape Creek site on the northern outer coast provides a bridge between prehistoric and historic subsistence practices on the coast. Interestingly, very little hickory was found at the site. Only two pieces were recovered from the Late Woodland zone and it was greatly outnumbered by acorn fragments recovered from the same zone. This is the only site where acorn outnumbered hickory.

Also interesting is the fact that no maize was recovered from the site even though maize was certainly available on the coast at this time. A domesticated bean was recovered from the Late Woodland zone, however. The location of the site on the Outer Banks means that the soil in the area may have been unsuitable for agriculture without modern fertilizers (Loftifield 1976).

Cape Creek also contained a fair amount of chenopod and cheno-ams. This is unusual because none of the other sites analyzed for this dissertation had more than a single chenopod seed. Chenopod also seems to have been fairly uncommon among previously reported coastal sites as well (Scarry and Scarry 1997). As discussed in Chapter 5, however, these seeds belonged to the wild variety of chenopod and were not domesticated.

Chenopod was also the only taxon found in the samples from the historic period zone found at the site. This lack of plant material, in comparison to that seen in the Late Woodland zone, may be due to the smaller sample size, poorer preservation, or a change in site use in the later period.

The samples from the Late Woodland zone contained all of the taxa found at the site. Besides the aforementioned taxa, these included fruit, tree, and weed seeds. All were found in low numbers but they indicate that the site's occupants may have had a fairly diverse diet.

The taxa found in the Late Woodland zone include some greens (chenopod, purslane) that would have been available in the spring and early summer. If gathered for seeds, the chenopod would have been available from July through November. The fruit taxa (hackberry and cf. wild plum/cherry) would also have been available from July through October. The wax myrtle and nuts would have ripened from August through November. These taxa suggest that the site was most likely occupied during the fall and possibly during the spring and summer as well. Given the presence of structures at Cape Creek, a year-round occupation of the site during the Late Woodland seems probable.

Intersite Comparisons

While individual sites can tell us a great deal about the diet of local prehistoric people, comparisons between sites can give us a better picture of the coast overall and of temporal and regional patterns. In this section, I will turn to comparing the recovered plant taxa from the eight sites I analyzed and then incorporate data from the 13 previously recorded coastal sites described in Chapter 2. Table 6.1 presents presence/absence data of plant taxa recovered from the eight sites analyzed here by assemblage. See Table 2.1 for comparable data from previously analyzed sites.

Temporal Patterns

While the addition of eight new sites and 16 new temporal assemblages contributes greatly to the comprehensive picture of coastal subsistence, there are still some time periods for which there is very little botanical data. Perhaps unsurprisingly, the Archaic is much more poorly represented in the reported archaeobotanical assemblages than the Woodland period. The features from Windsor and Barber Creek are, to the best of my knowledge, the first reported plant remains from the Early Archaic. There are no Middle Archaic assemblages and only one (31CB114) from the Late Archaic. The Early Woodland is slightly better represented by six sites but the majority of reported plant remains are from the Middle and Late Woodland. Bearing in mind these weaknesses, it is still possible to begin to discern patterns of plant use for the coast through time. Over all, plant food use on the coast of North Carolina seems to be fairly consistent throughout much of prehistory. A similar set of starchy and oily seeds, fruit, tree, and weed seeds are found in many of the sites. The largest change in coastal subsistence seems to have been the incorporation of maize into the diet beginning in the Late Woodland.

Table 6.1. Plant Taxa from the Newly Analyzed Sites.

Site #	31PT259	31PT259	31BR201/201**	31BR201/201**	31BR201/201**	31NH802	31DR32
Site Name	Barber Creek	Barber Creek	Windsor	Windsor	Windsor	Southside	Brooks Island
Time Period	Early Archaic	Middle - Late Woodland	Early Archaic	Middle Woodland	Late Woodland	Middle Woodland	Middle Woodland
Location:							
North/South	North	North	North	North	North	South	North
Inner/Outer	Inner	Inner	Outer	Outer	Outer	Outer	Outer
Corn							
Bean							
Chenopod							
Amaranth							
Knotweed							
Little Barley							
Squash							
Sumpweed		x					
Bearsfoot		x					
Maygrass							
Wild Rice							
Ragweed							
Acorn		x					
Hickory	x	x	x	x	x	x	x
Walnut							
Blackgum		x		x			
Grape		x					
Haw		x					
Hackberry							
Huckleberry							
Maypops							
Sumac							
Palmetto				x			
Persimmon							
Prunus							
Dogwood							
Tulip Poplar							
Wax Myrtle						x	
American Holly							
Bedstraw							
Vetch							
Clover							
Purslane							
Carpetweed							
Copperleaf							
Spurge							
Spurge family							
Sedge							
Gromwell							
Indian Turnip							
Morninglory							
Weedy Legume	x		x				
Goosegrass							
Mustard family							
Grass family							
Cane							
Cedar							
Pine cone		x					

Table 6.1 (continued). Plant Taxa from the Newly Analyzed Sites.

Site #	31CR218	31CR218	31ON1578	31ON1578	31BR7	31DR1	31DR1
Site Name	Broad Reach	Broad Reach			Jordan's Landing	Cape Creek	Cape Creek
Time Period	Early Woodland	Late Woodland	Early Woodland	Late Woodland	Late Woodland	Late Woodland	Historic
Location:							
North/South	South	South	South	South	North	North	North
Inner/Outer	Outer	Outer	Outer	Outer	Inner	Outer	Outer
Corn		x	x	x		x	
Bean						x	
Chenopod		x				x	x
Amaranth							
Knotweed		x					
Little Barley							
Squash							
Sumpweed							
Bearsfoot		x		x			
Maygrass		x					
Wild Rice							
Ragweed							
Acorn		x		x			
Hickory	x	x	x	x	x	x	
Walnut		x					
Blackgum							
Grape							
Haw							
Hackberry		x				x	
Huckleberry							
Maypops							
Sumac							
Palmetto		x					
Persimmon							
Prunus						x	
Dogwood		x					
Tulip Poplar							
Wax Myrtle		x		x		x	
American Holly							
Bedstraw		x					
Vetch							
Clover							
Purslane						x	
Carpetweed							
Copperleaf							
Spurge		x					
Spurge family							
Sedge				x			
Gromwell							
Indian Turnip							
Morninglory						x	
Weedy Legume				x			
Goosegrass							
Mustard family							
Grass family		x					
Cane							
Cedar							
Pine cone							

Table 6.2 shows ubiquity values for major taxa and categories of taxa found in dated contexts from the eight newly analyzed sites reported here. Table 6.3 shows the ubiquity for the same taxa and categories across the temporal assemblages of all coastal sites. Note that, as required to use ubiquity measures accurately, only contexts with at least one non-wood taxa are included in these figures. (See Chapter 2.)

Table 6.2. Ubiquity of Major Taxa Found at the Eight Newly Analyzed Sites by Period.

	Total Contexts	Hickory	Acorn	Maize	Starchy and Oily Seeds	Fruit	Trees	Weeds
Historic	1	0%	100%	0%	0%	0%	0%	0%
Late Woodland	42	67%	21%	29%	17%	12%	21%	19%
Middle Woodland	11	82%	0%	0%	0%	18%	9%	0%
Early Woodland	2	100%	0%	0%	0%	0%	0%	0%
Early Archaic	6	83%	0%	0%	0%	0%	0%	33%

Table 6.3. Ubiquity of Major Taxa Found in All Coastal Site Assemblages by Period.

	Total Assemblages	Hickory	Acorn	Maize	Starchy and Oily Seeds	Fruit	Trees	Weeds
Historic	2	50%	50%	50%	100%	50%	0%	50%
Late Woodland	15	87%	47%	53%	53%	47%	27%	40%
Middle Woodland	10	80%	20%	0%	0%	10%	10%	20%
Early Woodland	6	100%	0%	0%	17%	0%	0%	17%
Late Archaic	1	100%	0%	0%	0%	100%	100%	100%
Early Archaic	2	100%	0%	0%	0%	0%	0%	100%

Hickory. Hickory was probably an important part of the diet throughout the Archaic and Woodland periods. As discussed in Chapter 5, hickory nutshell is thick and may be over-represented in the archaeobotanical record because it is better preserved even at sites where conditions (e.g. moisture, soil chemistry, disturbance) promote the breakdown of floral remains. It is difficult, therefore, to estimate precisely how much of prehistoric coastal people's diets were made up of hickory. Since hickory is easily collected in bulk and highly storable, however, it was probably collected in fairly large quantities when available. Figure 6.2 presents hickory counts standardized by plant weight for all dated features from the eight sites analyzed here. (Note that the x-axis is scaled logarithmically here.) As can be seen by the overlapping of the box plot notches, these samples show no significant difference between the use of hickory in the Early Archaic and Early and Middle Woodland periods. There does seem to have been slightly more hickory used in the Early Archaic but the difference between the Early Archaic and Early and Middle Woodland is not significant. There is, however, a significant difference between the amount of hickory found in Early Archaic and Late Woodland contexts. Interestingly, there is also a significant difference between the amount of hickory in the Middle and Late Woodland contexts (though not between the Early and Late Woodland contexts) with the Late Woodland material containing less hickory in comparison to other plant material.

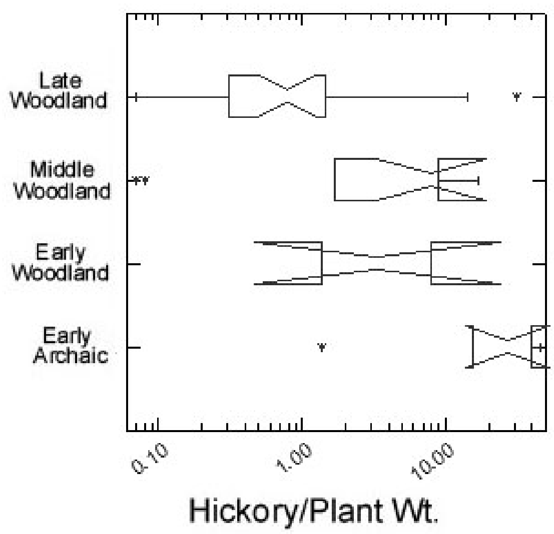

Fig. 6.2. Standardized counts of hickory from eight newly analyzed sites by period.

Hickory is the only taxon present in all time periods and virtually every coastal site. Of the 36 reported assemblages, only five did not have any hickory and these five had few other taxa. Sites with maize almost always also had hickory. Hickory clearly continued to be important to coastal people even after they began farming maize. This may be in part because maize and hickory played different nutritional roles in the diet. Hickory is a good source of oil and fats and a relatively poor source of carbohydrates. Maize on the other hand is a good carbohydrate source but very low in fat. The two taxa would make good nutritional complements.

Acorn. Acorn is a rarer but regular element of coastal plant assemblages through most of the Woodland. One piece of acorn was found in a level associated with the Archaic occupation at Barber Creek. However this piece of acorn was just one level below a larger concentration of acorn pieces in a "Woodland" level. It seems entirely possible that the acorn in the lower level was originally in the Woodland level but moved through some sort of disturbance. Other than this dubious piece there is no acorn dating to the Archaic found in the eight sites analyzed for this dissertation. There is also no acorn in any of the Early or Middle Woodland contexts. Acorn was recovered from nine Late Woodland contexts and the one historic context from Cape Creek.

Looking at the expanded database of all reported coastal sites reveals a similar pattern. There is no recorded acorn for any assemblage before the Middle Woodland. Acorn was found at one-fifth of all Middle Woodland sites and in nearly half of all Late Woodland sites. It is unclear if this reflects an increase in the frequency or intensity of acorn use between the two periods. Given the fragility of acorn shell, it is possible that it is underrepresented in these samples, especially in the older assemblages. I expect that analysis of more flotation samples from Archaic and Early Woodland sites would reveal more acorn use in these time periods. However, there may have been a shift in the use of acorn starting in the Middle Woodland and continuing into the Late Woodland. This would be interesting because it would mean an intensification of the use of acorn began around the same time as the increased use of maize. Both maize and acorns are primarily carbohydrate sources and would serve basically the same nutritional role. In some areas of the Southeast, acorn did continue to be used after the introduction of maize while in others the use of maize decreased the use of acorn (Scarry 2003).

The relative dietary contributions of acorn and hickory are hard to determine from archaeobotanical remains given the differences between them. However, throughout most of prehistory on the coast, hickory does seem to have been the more common food source. It is not only found in larger numbers but also in more contexts than acorn. This is slightly unusual since oak trees are generally more abundant in coastal environments than hickory trees so the disparity between the two is most likely not due to availability. It may instead reflect preferential collection of hickory, the superior preservation of hickory, or a combination of these two factors.

Maize. When Hutchinson (2002:29) conducted his bioarchaeological research of coastal North Carolina, maize had been found in few archaeological contexts dating before A.D. 1400. The sites analyzed in this dissertation have greatly added to our picture of maize use in coastal contexts and support the late adoption of the crop on the coast. One cupule of maize was recovered from a feature at 31ON1578 with ceramics associated with the Early Woodland. As discussed above, however, this cupule was most likely intrusive. Maize dating to the Late Woodland was found at Broad Reach and 31ON1578. While it is difficult to determine the role of maize in people's diets, when present in a site, some features seem to contain very large quantities of maize. Maize was certainly not ubiquitous, however, in the Late Woodland sites analyzed here. Not only was it restricted to a few of these sites, maize was also found in a limited number of features within them. This may suggest that maize was not the main staple of the diets of these people and the continued use of wild plant resources, especially hickory, may support that conclusion. Maize, therefore, may have been only one subsistence option among many and one that some coastal communities chose to forgo.

The data from all reported coastal sites shows a similar temporal pattern. Maize was only found in Late Woodland and Historic assemblages and it was found in only about half of each. There are also definite spatial patterns in maize adoption that will be discussed in the next section.

Bean. While beans were a large part of prehistoric people's diets in some parts of the Eastern Woodlands, they seem to have been a very late and probably minor addition to the diet of the people of coastal North Carolina. Only three beans were found in the eight sites analyzed here. Two of those came from an undated feature from Broad Reach. These probably date to the Late Woodland since that was the time when Broad Reach was most heavily in use. The last bean was found in one of the Late Woodland levels of the Cape Creek site.

Beans were also found at three other sites dating to the Late Woodland (Mount Pleasant, Cape Island, and 31ON195) and in the historic period assemblage from the Amity site. It seems, therefore, that beans were not generally grown on the coast before the Late Woodland. Upon their introduction, they were also not universally adopted but some communities chose to grow them while others did not.

Starchy and Oily Seeds. The starchy and oily seeds, many of which were cultivated and domesticated in other parts of the Southeast, do not seem to have played a major role in the diet of people on the coast of North Carolina but are a sporadic part of coastal assemblages. As can be seen from Table 6.2, no starchy or oily seeds were recovered in Archaic or Early and Middle Woodland contexts from the eight newly analyzed sites. Starchy and oily seeds found in the Late Woodland contexts are rare and found only in low numbers. Chenopod is the most common of these taxa, thanks in part to its presence in several contexts at Cape Creek. The seeds at Cape Creek belong to the wild variety of chenopod and those found at other sites are also likely to be wild. Sumpweed, knotweed, and a possible maygrass were all represented by only one seed each in these eight sites. The low numbers of these seeds recovered suggest that they may also have been collected from the wild rather than cultivated Bearsfoot was found in both a Late Woodland feature at Broad Reach and in a Woodland context at Barber Creek. One squash seed, which probably was cultivated, was also found in an un-dated feature from 31ON1578.

Examining the presence of starchy and oily seed taxa in all coastal sites reveals similar patterns. While chenopod and wild rice (*Zizania aquatica*) were found in one Early Woodland assemblage from Cape Island (31ON190), starchy and oily seeds were not present in any of the Archaic sites or any Middle Woodland contexts. The Late Woodland does seem to see more widespread use of starchy and oily seeds. Chenopod and amaranth were found at two sites and squash at three. Sumpweed, knotweed, wild rice, bearsfoot, and ragweed (*Ambrosia* sp.) were each found at one site. The Contact era assemblage at the Amity site (31HY043) is unique among coastal sites because it appears to have contained almost the full complement of starchy and oily seed taxa, including knotweed, maygrass, squash, and little barley, which has not been found at any other coastal site. Over all time periods, chenopod was the most widespread followed closely by squash while all the other taxa were found at only one or two sites. Without quantitative data from these sites, it is impossible to discover how intensively the starchy and oily seeds were exploited. The presence/absence data, however, makes it clear that while these taxa were not unfamiliar to coastal people, their use was sporadic and highly localized. None of these taxa ever achieved the nearly universal adoption of something like hickory. Their use does seem to have increased in the Late Woodland and continued into the Historic period though each community seems to have chosen only one or two of the available species to exploit.

Fruit. Fruit taxa, like the starchy and oily seeds, do not seem to have played a major role in the diet of coastal people but probably played a recurring supplementary role. They are sporadically found in coastal botanical assemblages throughout prehistory. In the eight sites analyzed here, no fruit were found in the Archaic, Early Woodland, or Historic contexts. Blackgum and palmetto were recovered in low numbers from Middle Woodland contexts. Late Woodland contexts included hackberry, palmetto, a possible bramble, and a possible wild plum/cherry. Fruit taxa not clearly associated with any specific time period included grape, maypop, prickly pear, persimmon, and haw. This is a fairly diverse array of species and the use of such fruit probably depended heavily on local availability.

The only other fruit species found at a coastal site but not in the eight newly analyzed sites are sumac (*Rhus* sp.) and huckleberry (*Gaylussacia* sp.). Presence/absence data of fruit at all coastal sites reveals they are frequently but not universally recovered. The most commonly recovered fruit taxon, grape, is found at only four of the 21 sites included in this data. Hackberry was the second most common, found at three sites. No fruit was recovered from an Early Archaic setting. Huckleberry was found in the Late Archaic assemblage of 31CB114. No fruit has been discovered in Early Woodland contexts on the coast so far. The only Middle Woodland fruit remains are the blackgum and palmetto from Windsor. Grape was found in three Late Woodland sites, hackberry in two, and maypop and wild plum/cherry in one site each. Grape and sumac were also found in the Amity site (31HY043) historic period assemblage. More fruit taxa were recovered at later sites, therefore, but it is not clear if this reflects an intensification of use or the fact that later sites are more numerous and likely to have better preservation. Grape was probably the most commonly consumed fruit. Hackberry, though seemingly almost as common as grape, may be slightly over-represented in these assemblages because it has an uncommonly hard seed that preserves better than most. Hackberry is also a common component of Coastal Plain forests along river levees and calcerous hammocks (Schafale and Weakley 1990).

Tree Seeds. The tree seeds represented in coastal assemblages were probably not used as food sources. They can, however, give indications of the environment around the site and the season of occupation. As with the starchy and oily seed and fruit taxa, there are no tree taxa found in the Archaic or Early Woodland contexts from the eight sites analyzed in this dissertation. Wax myrtle was the only taxa recovered from Middle Woodland contexts while wax myrtle and dogwood were found in Late Woodland contexts. There were no tree taxa seeds in the historic assemblage.

When all reported coastal sites are considered, there are still no tree taxa recorded for the Early Archaic or Early Woodland. There was, however, tulip poplar (*Liriodendron tulipfera*) recovered from the one Late Archaic site. The aforementioned wax myrtle were the only tree seeds recovered from Middle Woodland contexts. In the Late Woodland, dogwood was found at two sites while wax myrtle was found at three sites. There were no tree seeds identified in the historic assemblages.

As these tree taxa were not used for food, their inclusion at coastal sites was probably largely accidental. Some of these trees do have medical uses but these uses tend to be rare and hard to see in the archaeological record. They may have been burned as fuel more frequently. Their sporadic occurrence in the assemblages of coastal sites, then, is probably not directly related to changing use. It may instead be related to differential preservation, sampling size, or intensity of site use in different time periods.

Weed Seeds. The seeds of weedy taxa are slightly more common than those of tree taxa at coastal sites. In the eight newly analyzed sites, weedy legumes were found in two Early Archaic contexts while no weedy taxa were found in the Early or Middle Woodland contexts. Bedstraw, weedy legume, purslane, morning glory, spurge, sedge, and grass seeds were all recovered from Late Woodland contexts. There were also no weed seeds in the historic contexts.

Looking at all coastal sites, both of the Early Archaic sites reported on here had weedy taxa. The Late Archaic site also included bedstraw. Cape Island (31ON190) was the only Early Woodland site that had weedy taxa but it had a fairly diverse assemblage: bedstraw, gromwell (*Lithospernum* sp.), Indian turnip (*Arisaema triphlyum*), and seeds from the mustard family (Brassicaceae). Weedy taxa found in Middle Woodland assemblages included bedstraw and morning glory. The Cape Island Late Woodland assemblage also contained a large number of weedy taxa. It included bedstraw, vetch (*Vicia* sp.), clover (*Trifolium* sp.), spurge (*Euphorbia* sp.), gromwell, indian turnip, morning glory, mustard family, and grass family. Other Late Woodland assemblages also include purslane, carpetweed (*Mollugo* sp.), copperleaf (*Acalypha virginica*), and spurge family (Euphorbiaceae). The only weed taxa found at a historic coastal site was copperleaf.

Some of the weed taxa may have been used as food sources, especially as greens, while others may have only been accidentally introduced into cultural features. Weed seeds were found in all time periods but seem to be more frequently a part of Late Woodland sites. There was certainly a larger number of weed taxa in the Late Woodland than in any other period. This may indicate a broadening of diet or an increasing frequency of crop weeds.

Regional Patterns

Table 6.4 presents ubiquities for major taxa and categories of taxa from all of the contexts, both dated and undated, at the eight sites analyzed in this dissertation by region. Note that no sites from the southern inner coastal plain were analyzed. Table 6.5 presents the same data for all reported coastal assemblages separated by region.

Table 6.4. Ubiquities of Major Taxa Found at the Eight Newly Analyzed Sites by Region.

	Total Contexts	Hickory	Acorn	Maize	Starchy and Oily Seeds	Fruit	Trees	Weeds
North Inner Coast	156	29%	2%	0%	1%	3%	0%	1%
North Outer Coast	164	29%	2%	0%	3%	5%	4%	6%
South Outer Coast	131	31%	6%	23%	3%	4%	8%	8%

Table 6.5. Ubiquities of Major Taxa Found at All Coastal Sites by Region.

	Total Assemblages	Hickory	Acorn	Maize	Starchy and Oily Seeds	Fruit	Trees	Weeds
North Inner Coast	6	100%	17%	0%	33%	17%	0%	17%
North Outer Coast	10	70%	30%	20%	30%	40%	10%	30%
South Inner Coast	3	100%	0%	0%	0%	33%	33%	67%
South Outer Coast	19	89%	26%	53%	26%	21%	16%	42%

While there are some ecological differences between the coastal regions, as discussed in Chapter 2, for the most part coastal sites in all regions seem to share a common set of plant resources and fairly even distribution of them. However, several interesting patterns are apparent in the data. Hickory, predictably, was present in all coastal regions and most of the sites in each. Acorn was fairly widespread but less common than hickory. The southern inner coastal plain is the only area where no acorn has been found and this may be in part because only one site (with three temporal assemblages) has been analyzed from there. Starchy and oily seeds, fruit, tree, and weed seeds show generally similar patterns to acorn. They are present in almost all of the regions in roughly a third of the assemblages or less although a few exceptions occur. No starchy or oily seeds were found at the one site on the southern inner coastal plain and no tree seeds have been found in northern inner coastal plain sites. Weed seeds were found in two of the three temporal components of 31CB114 on the southern inner coastal plain.

Maize, on the other hand, shows some interesting regional patterning. In the eight sites analyzed for this dissertation, only sites from the southern outer coast had maize. This may be in part because more sites were analyzed from the southern coast and more sites from the southern coast dated to the Late Woodland period when maize use was apparently more common. As noted above, maize has been reported from Jordan's Landing on the northern inner coastal plain but none was found in this analysis. Looking at all coastal sites, there was still no maize reported for the northern inner coastal plain or the southern inner coastal plain. Maize also seems to have been more common on the southern outer coast than on the northern outer coast. Onslow County, in particular, and perhaps the neighboring Carteret County seem to have been an area where maize agriculture was common during the Late Woodland. Maize farming on the coast may have been a highly localized activity, restricted to areas with favorable growing conditions or to communities that placed a high value on maize.

Correspondence Analysis

To approach the coastal subsistence data from another angle to see if other pattens could be discerned, I conducted correspondence analysis on both the data from all dated contexts in the eight sites I analyzed for this dissertation and on the presence/absence data from all coastal sites compiled by Scarry and Scarry (1997). I conducted three different correspondence analyses on these two sets of data. In the first, I tested the correlation between the major taxa and categories of taxa identified in the samples with the temporal assemblages from each site. In the second, I tested the correlation between taxa and the areas of the coast on which they were found. The last analysis, tested the correlation between taxa and time periods.

Assemblage and Taxon

Figure 6.3 and Tables 6.6 and 6.7 present the results of the correspondence analysis of major taxa categories and site assemblages for the newly analyzed sites. The variables used in this analysis are the presence/absence of hickory, acorn, maize, beans, starchy and oily seeds, fruit, tree seeds, and weed seeds from the dated samples at each site. The presence of one of these taxa in any sample from a given period at the site counted as "presence" for that category of taxa for the assemblage. In this figure, the taxa and site assemblages are plotted against the first two factors produced by the correspondence analysis. These two factors together explain only 50% of the variation in the data. Factor 1 separates hickory, the only taxon found in almost every assemblage, from the other taxa and from the historic component of Cape Creek (DR1), which was the only assemblage that did not contain hickory. The historic assemblage at Cape Creek did contain chenopod, so starchy and oily seeds are closely associated with this assemblage. Factor 2 separates fruit and the Middle Woodland assemblage from Windsor (BR201) from the other taxa and assemblages. Fruit were only found in three assemblages and the other two (Late Woodland Broad Reach and Late Woodland Cape Creek) had a wider variety of taxa than Windsor, which only had hickory and fruit.

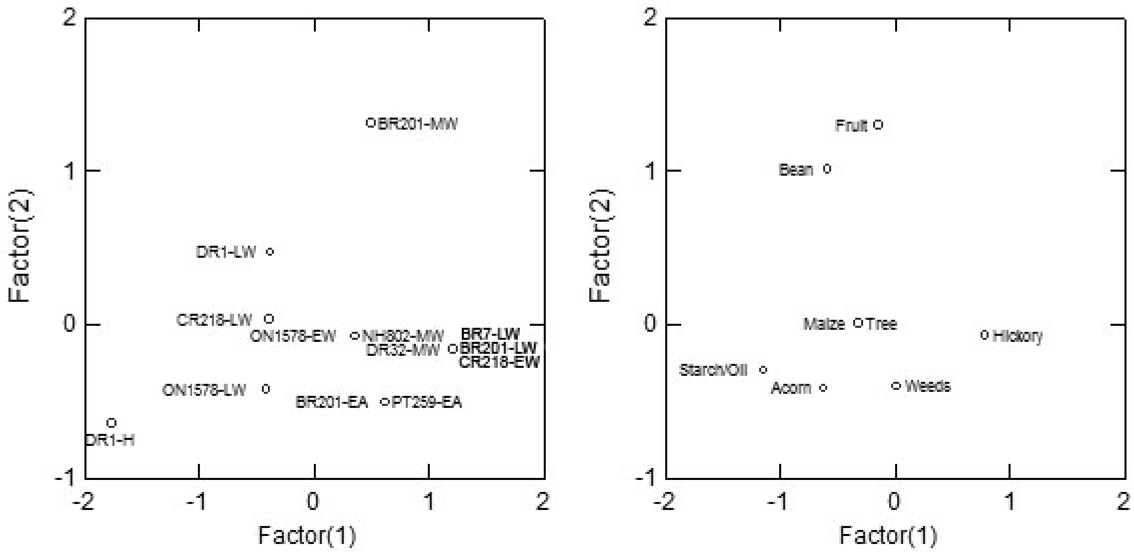

Fig. 6.3. Correspondence analysis of assemblage and taxon for new sites.

Table 6.6. Correspondence Analysis Statistics of Assemblage and Taxon for the New Sites.

Factor	Eigenvalue	Percent	Cumulative Percent
1	0.418	32.990	32.990
2	0.218	17.160	50.150
3	0.187	14.770	64.920
4	0.168	13.260	78.180
5	0.127	10.030	88.200
6	0.125	9.850	98.060
7	0.025	1.940	100.000

Table 6.7. Variables and their Contribution to Factors 1 and 2 for the Correspondence Analysis of Assemblage and Taxon for the New Sites.

Variable	Mass	Quality	Inertia	Factor 1	Factor 2	Contribution to Factor 1	Contribution to Factor 2
Assemblage:							
BR201-EA	0.057	0.430	0.085	0.613	-0.510	0.051	0.068
BR201-MW	0.057	0.739	0.151	0.493	1.308	0.033	0.449
BR201-LW	0.029	0.778	0.055	1.211	-0.159	0.100	0.003
BR7-LW	0.029	0.778	0.055	1.211	-0.159	0.100	0.003
CR218-EW	0.029	0.778	0.055	1.211	-0.159	0.100	0.003
CR218-LW	0.200	0.462	0.067	-0.391	0.035	0.073	0.001
DR1-LW	0.200	0.533	0.138	-0.384	0.470	0.070	0.203
DR1-H	0.029	0.457	0.221	-1.770	-0.640	0.214	0.054
DR32-MW	0.029	0.778	0.055	1.211	-0.159	0.100	0.003
NH802-MW	0.057	0.069	0.110	0.355	-0.075	0.017	0.001
ON1578-EW	0.057	0.069	0.110	0.355	-0.075	0.017	0.001
ON1578-LW	0.171	0.720	0.084	-0.419	-0.422	0.072	0.140
PT259-EA	0.057	0.430	0.085	0.613	-0.510	0.051	0.068
Taxon:							
Maize	0.114	0.097	0.124	-0.324	0.004	0.029	0.000
Bean	0.029	0.342	0.114	-0.593	1.008	0.024	0.133
Acorn	0.057	0.330	0.098	-0.626	-0.415	0.053	0.045
Hickory	0.343	0.897	0.237	0.783	-0.074	0.503	0.009
Starchy and Oily	0.114	0.644	0.249	-1.145	-0.299	0.358	0.047
Fruit	0.086	0.826	0.176	-0.145	1.295	0.004	0.660
Tree	0.114	0.097	0.124	-0.324	0.004	0.029	0.000
Weeds	0.143	0.156	0.148	0.010	-0.402	0.000	0.106

Figure 6.4 and Tables 6.8 and 6.9 present the results of the correspondence analysis of major taxa categories and site assemblages for all coastal sites. This analysis incorporates the presence/absence of the taxa categories in all coastal assemblages. Again, the first two factors produced by the correspondence analysis explain less than half of the variation in the data (45%, in this case). Interestingly, Factor 1 in this analysis also separates hickory, the most common taxon, from all other plant taxa. Factor 2 separates acorn from the other plant taxa and also separates a few assemblages from the others. The Middle and Late Woodland components of the Tillet site (DR035) have very little except for acorn and they cluster on the same end of the axis as acorn. The Middle Woodland assemblage from Cape Island (ON190), on the other hand, has only weed seeds (morning glory) and is clustered closer to the weed taxa and away from acorn.

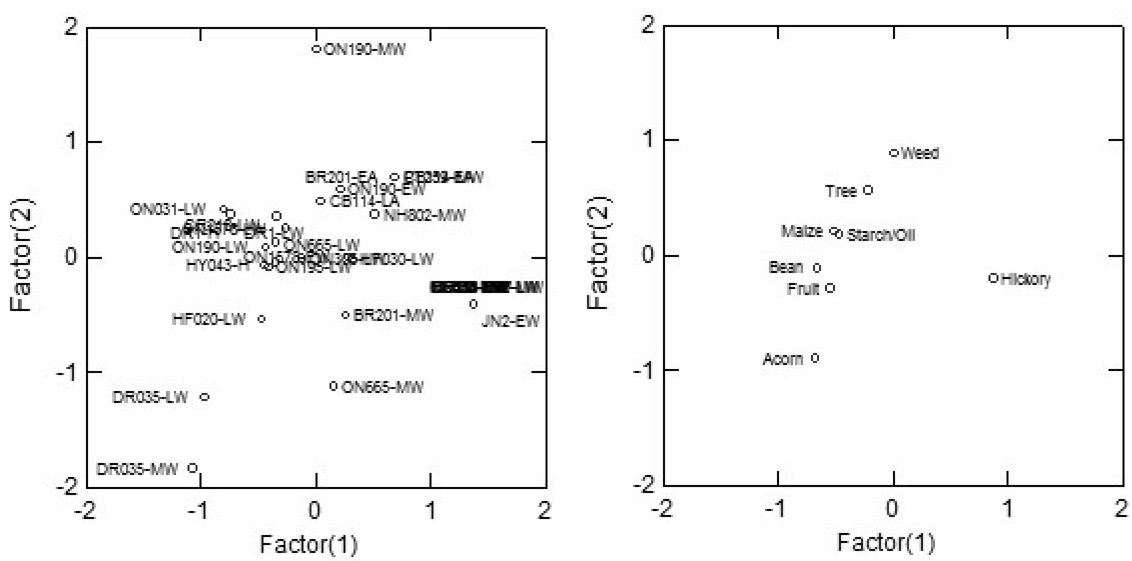

Fig. 6.4. Correspondence analysis of assemblage and taxon for all sites.

Table 6.8. Correspondence Analysis Statistics of Assemblage and Taxon for All Sites.

Factor	Eigenvalue	Percent	Cumulative Percent
1	0.403	28.450	28.450
2	0.240	16.950	45.400
3	0.219	15.460	60.860
4	0.184	13.000	73.870
5	0.172	12.150	86.020
6	0.131	9.280	95.300
7	0.067	4.700	100.000

Table 6.9. Variables and their Contribution to Factors 1 and 2 for the Correspondence Analysis of Assemblage and Taxon for All Sites.

Variable	Mass	Quality	Inertia	Factor 1	Factor 2	Contribution to Factor 1	Contribution to Factor 2
Assemblage:							
BF115-LW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
BR201-EA	0.021	0.591	0.034	0.691	0.693	0.025	0.042
BR201-M	0.021	0.150	0.045	0.258	-0.509	0.003	0.022
BR201-LW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
BR7-LW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
CB114-LA	0.042	0.186	0.052	0.045	0.481	0.000	0.040
CB114-EW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
CB114-MW	0.021	0.591	0.034	0.691	0.693	0.025	0.042
CR218-EW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
CR218-LW	0.073	0.443	0.022	-0.347	0.124	0.022	0.005
DR035-MW	0.010	0.525	0.090	-1.070	-1.836	0.030	0.146
DR035-LW	0.021	0.637	0.079	-0.964	-1.221	0.048	0.129
DR1-LW	0.073	0.482	0.037	-0.344	0.352	0.021	0.038
DR1-H	0.010	0.088	0.080	-0.737	0.368	0.014	0.006
DR32-MW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
HF020-LW	0.052	0.510	0.053	-0.467	-0.544	0.028	0.064
HF030-EW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
HF030-MW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
HF030-LW	0.021	0.052	0.041	0.319	-0.022	0.005	0.000
HY043-H	0.073	0.554	0.027	-0.448	-0.073	0.036	0.002
JN2-EW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
JN2-MW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
JN2-LW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
NH556-MW	0.010	0.983	0.022	1.375	-0.413	0.049	0.007
NH802-MW	0.021	0.106	0.079	0.517	0.365	0.014	0.012
ON031-LW	0.010	0.094	0.090	-0.803	0.410	0.017	0.007
ON1578-EW	0.021	0.038	0.045	0.286	-0.002	0.004	0.000
ON1578-LW	0.062	0.251	0.032	-0.262	0.245	0.011	0.016
ON190-EW	0.031	0.342	0.035	0.215	0.585	0.004	0.044
ON190-MW	0.010	0.507	0.067	0.006	1.799	0.000	0.140
ON190-LW	0.083	0.649	0.025	-0.434	0.079	0.039	0.002
ON195-LW	0.052	0.179	0.053	-0.414	-0.095	0.022	0.002
ON305-LW	0.042	0.018	0.036	-0.123	-0.010	0.002	0.000
ON665-MW	0.021	0.592	0.045	0.153	-1.125	0.001	0.110
ON665-LW	0.062	0.369	0.021	-0.348	-0.046	0.019	0.001
PT259-EA	0.021	0.591	0.034	0.691	0.693	0.025	0.042
Taxon:							
Maize	0.104	0.174	0.180	-0.510	0.201	0.067	0.017
Bean	0.052	0.215	0.110	-0.664	-0.115	0.057	0.003
Acorn	0.104	0.615	0.215	-0.679	-0.900	0.119	0.351
Hickory	0.323	0.991	0.262	0.873	-0.202	0.610	0.055
Starch/Oil	0.115	0.170	0.169	-0.468	0.180	0.062	0.016
Fruit	0.104	0.302	0.133	-0.546	-0.296	0.077	0.038
Tree	0.062	0.142	0.159	-0.216	0.560	0.007	0.082
Weed	0.135	0.556	0.189	0.004	0.881	0.000	0.438

The correspondence analyses of taxa and assemblages demonstrate that hickory is different from other taxa found on the coast because of its almost universal presence. It also highlights the fact that some assemblages are very distinct from others in the taxa they contain. The different taxa categories are not evenly distributed at coastal sites.

Location and Taxon

Figure 6.5 and Tables 6.10 and 6.11 present the results of the correspondence analysis of major taxa categories and site locations for the newly analyzed sites. For each subregion of the coast, I counted how many assemblages contained a given taxon or category of taxa. There were two assemblages from the northern inner coast, six from the northern outer coast, and five from the southern outer coast included here. The two factors produced by the correspondence analysis explain all of the variation in the data. The first factor, which explains the majority of the patterning, separates the southern outer coast from the northern parts of the coast and acorn from the other taxa. Acorn was found only in two assemblages from the southern outer coast (Late Woodland Broad Reach and 31ON1578). Maize and weed seeds were found most often in southern outer coastal assemblages but occasionally in northern outer coast assemblages. Therefore these two categories fall in between these two regions but closer to the southern outer coast. Factor 2 separates the northern inner coast from the other two subregions. The two assemblages from this region (Early Archaic Barber Creek and Late Woodland Jordan's Landing) contained only hickory and weed seeds.

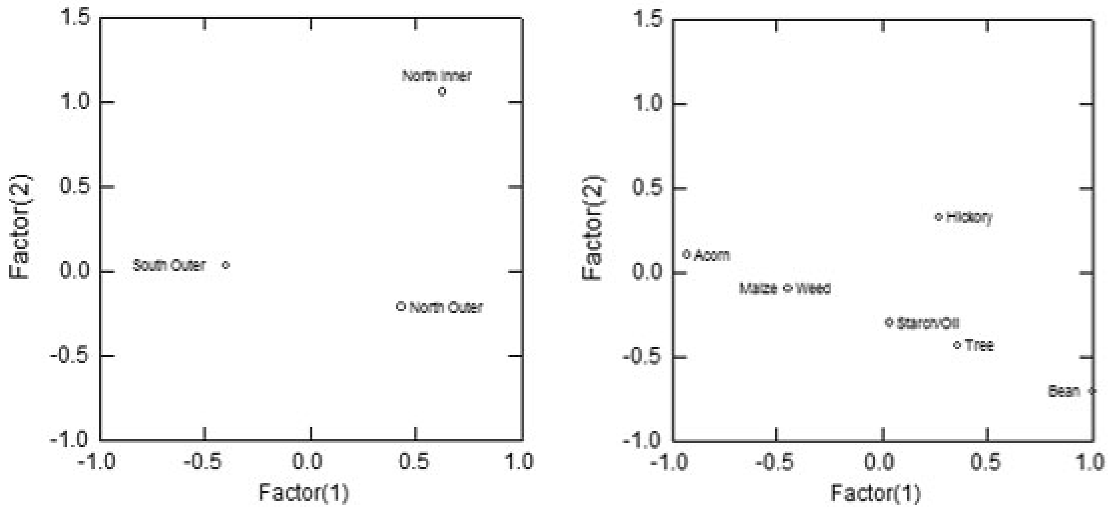

Fig. 6.5. Correspondence analysis of location and taxon for new sites.

Table 6.10. Correspondence Analysis Statistics of Location and Taxon for the New Sites.

Factor	Eigenvalue	Percent	Cumulative Percent
1	0.186	66.670	66.670
2	0.093	33.330	100.000

Table 6.11. Variables and their Contribution to Factors 1 and 2 for the Correspondence Analysis of Location and Taxon for the New Sites.

Variable	Mass	Quality	Inertia	Factor 1	Factor 2	Contribution to Factor 1	Contribution to Factor 2
Location:							
North Inner	0.067	1.000	0.100	0.626	1.053	0.140	0.793
North Outer	0.400	1.000	0.093	0.431	-0.217	0.399	0.201
South Outer	0.533	1.000	0.086	-0.401	0.031	0.461	0.005
Taxon:							
Maize	0.133	1.000	0.028	-0.448	-0.102	0.144	0.015
Bean	0.033	1.000	0.050	0.998	-0.709	0.178	0.180
Acorn	0.067	1.000	0.058	-0.930	0.101	0.309	0.007
Hickory	0.400	1.000	0.070	0.270	0.321	0.157	0.443
Starch/Oil	0.133	1.000	0.013	0.034	-0.304	0.001	0.132
Tree	0.100	1.000	0.032	0.356	-0.439	0.068	0.207
Weed	0.133	1.000	0.028	-0.448	-0.102	0.144	0.015

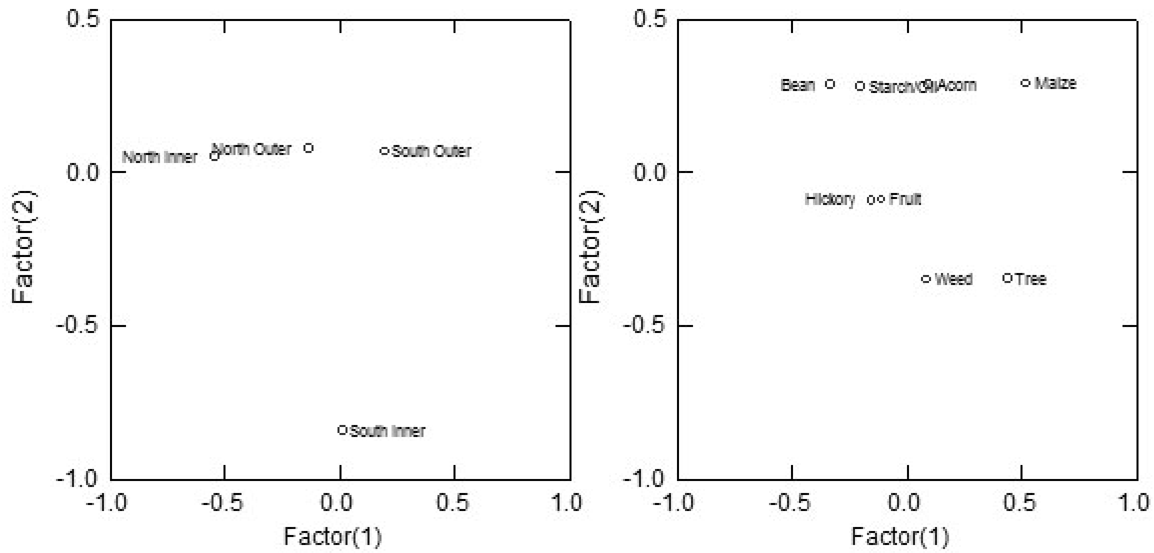

Table 6.6. Correspondence analysis of assemblage and taxon for all sites.

Table 6.12. Correspondence Analysis Statistics of Location and Taxon for All Sites.

Factor	Eigenvalue	Percent	Cumulative Percent
1	0.063	45.350	45.350
2	0.057	41.310	86.670
3	0.018	13.330	100.000

Table 6.13. Variables and their Contribution to Factors 1 and 2 for the Correspondence Analysis of Location and Taxon for All Sites.

Variable	Mass	Quality	Inertia	Factor 1	Factor 2	Contribution to Factor 1	Contribution to Factor 2
Location:							
North Inner	0.128	0.885	0.043	-0.542	0.051	0.599	0.006
North Outer	0.266	0.354	0.018	-0.134	0.077	0.076	0.028
South Inner	0.074	1.000	0.053	0.011	-0.841	0.000	0.925
South Outer	0.532	0.924	0.025	0.195	0.067	0.325	0.042
Taxon:							
Maize	0.106	0.995	0.038	0.518	0.289	0.456	0.156
Bean	0.053	0.894	0.011	-0.335	0.284	0.095	0.075
Acorn	0.106	0.967	0.010	0.092	0.287	0.014	0.153
Hickory	0.330	0.649	0.017	-0.158	-0.091	0.131	0.048
Starch/Oil	0.106	0.983	0.013	-0.203	0.280	0.070	0.146
Fruit	0.106	0.183	0.012	-0.114	-0.090	0.022	0.015
Tree	0.064	0.999	0.020	0.439	-0.347	0.197	0.134
Weed	0.128	0.970	0.017	0.084	-0.349	0.014	0.272

Figure 6.6 and Tables 6.12 and 6.13 present the results of the correspondence analysis of major taxa categories and site locations for all coastal sites. As with the analysis for the eight new sites, I counted how many assemblages from each subregion contained a given taxon or category of taxa. The two factors produced by this correspondence analysis explain 87% of the variation in the data. Factor 1 was most influenced by the northern inner coastal assemblages and maize. No maize was found in northern inner coastal assemblages. Factor 2 strongly separates the southern inner coast from all other coastal subregions. There were only three assemblages analyzed from the southern inner coast, all from the 31CB114 site. These assemblages did not contain any maize, beans, starchy or oily seeds, or acorn. Consequently those categories are clustered with the other coastal locations. The southern inner coastal assemblages did contain hickory, fruit, tree, and weed seeds so those categories fall in between the southern inner coast and the other regions.

These two correspondence analyses demonstrate that there is indeed some spatial patterning in the type of taxa found on the coast. However, it seems that this may be at least in part influenced by sample size. The regions with the most distinct collections of taxa, the northern and southern inner coasts, are also those where the fewest assemblages have been analyzed.

Period and Taxon

Figure 6.7 and Tables 6.14 and 6.15 present the results of the correspondence analysis of major taxa categories and time periods for the eight sites I analyzed. For this analysis, I counted the presence of each taxa category in all assemblages belonging to

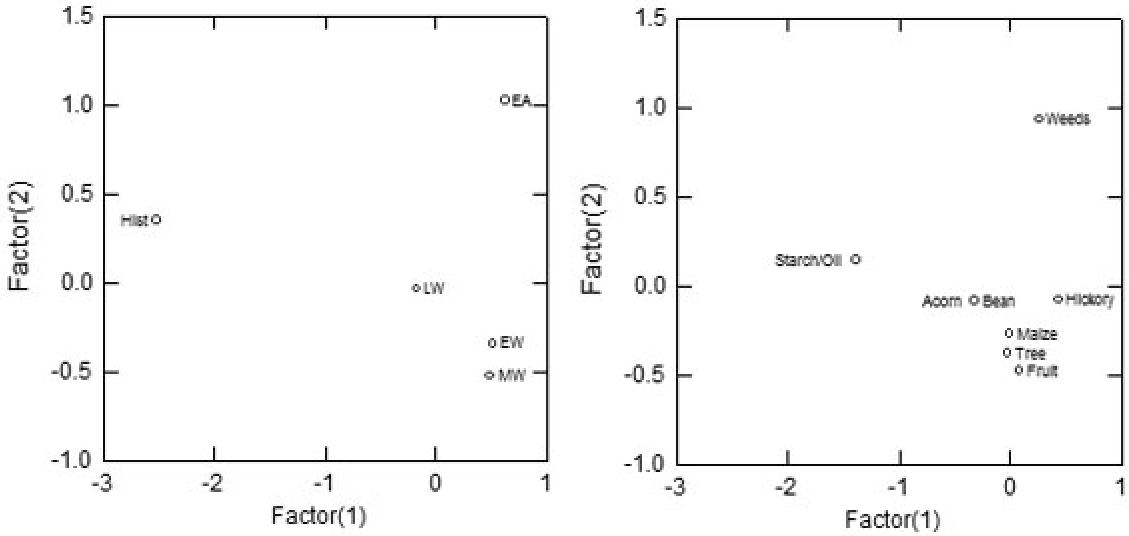

Fig. 6.7. Correspondence analysis of period and taxon for new sites.

Table 6.14. Correspondence Analysis Statistics of Period and Taxon for the New Sites.

Factor	Eigenvalue	Percent	Cumulative Percent
1	0.303	44.960	44.960
2	0.173	25.710	70.660
3	0.102	15.170	85.840
4	0.096	14.160	100.000

Table 6.15. Variables and their Contribution to Factors 1 and 2 for the Correspondence Analysis of Period and Taxon for the New Sites.

Variable	Mass	Quality	Inertia	Factor 1	Factor 2	Contribution to Factor 1	Contribution to Factor 2
Period:							
EA	0.114	0.971	0.169	0.624	1.023	0.147	0.690
EW	0.086	0.300	0.109	0.513	-0.342	0.074	0.058
MW	0.143	0.594	0.124	0.488	-0.526	0.112	0.228
LW	0.629	0.407	0.052	-0.180	-0.036	0.067	0.005
Hist	0.029	0.838	0.221	-2.524	0.350	0.600	0.020
Taxon:							
Maize	0.114	0.117	0.071	-0.012	-0.270	0.000	0.048
Bean	0.029	0.192	0.017	-0.326	-0.086	0.010	0.001
Acorn	0.057	0.192	0.034	-0.326	-0.086	0.020	0.002
Hickory	0.343	0.680	0.096	0.430	-0.079	0.209	0.012
Starch/Oil	0.114	0.938	0.238	-1.390	0.146	0.728	0.014
Fruit	0.086	0.484	0.042	0.078	-0.478	0.002	0.113
Tree	0.114	0.436	0.038	-0.023	-0.380	0.000	0.095
Weeds	0.143	0.959	0.139	0.257	0.931	0.031	0.714

each time period. The two factors produced by the correspondence analysis explain 71% of the variation in the data. The first factor separates starchy and oily seeds from other taxa and historic assemblages from other periods. Starchy and oily seeds were only recovered in Late Woodland and historic assemblages. The only historic assemblage in this analysis, found at Cape Creek (31DR1), was very different from all of the other assemblages because it contained only chenopod. The second factor separates the Early Archaic assemblages from other periods. The two Early Archaic assemblages I analyzed contained only hickory, which was found in most other assemblages as well, and weed seeds, which were found in relatively few assemblages. Consequently, weed seeds are closely associated with the Early Archaic in this correspondence analysis.

Figure 6.8 and Tables 6.16 and 6.17 present the results of the correspondence analysis of major taxa categories and time periods for all coastal sites. For this analysis, I counted the presence of each taxa category in all assemblages on the coast belonging to each time period. The first two factors produced by the correspondence analysis explain 80% of the variation in the data. Factor 1 separates hickory from the other taxa and from Late Woodland and historic assemblages. While hickory was found in most assemblages, one of the two historic assemblages included here and two Late Woodland assemblages did not contain any hickory. Factor 2 separates the Late Archaic assemblage from the other time periods. There is currently only one site on the coast with reported plant remains from the Late Archaic, 31CB114. This assemblage contained hickory, fruit, tree, and weed seeds. Since tree seeds are only infrequently found on the coast, they are closely associated with the Late Archaic in this analysis.

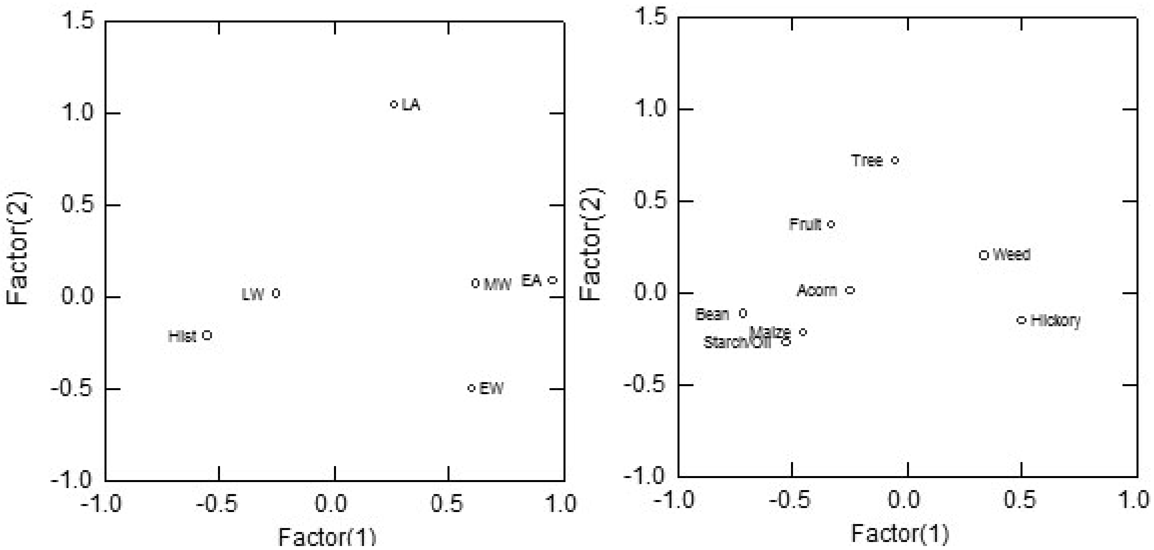

Fig. 6.8. Correspondence analysis of period and taxon for all sites.

Table 6.16. Correspondence Analysis Statistics of Period and Taxon for All Sites.

Factor	Eigenvalue	Percent	Cumulative Percent
1	0.194	58.010	58.010
2	0.074	22.010	80.020
3	0.043	12.910	92.940
4	0.019	5.620	98.550
5	0.005	1.450	100.000

Table 6.17. Variables and their Contribution to Factors 1 and 2 for the Correspondence Analysis of Period and Taxon for All Sites.

Variable	Mass	Quality	Inertia	Factor 1	Factor 2	Contribution to Factor 1	Contribution to Factor 2
Period:							
EA	0.042	0.564	0.068	0.952	0.083	0.195	0.004
LA	0.042	0.911	0.052	0.259	1.038	0.014	0.610
EW	0.094	0.882	0.065	0.599	-0.503	0.174	0.323
MW	0.146	0.792	0.071	0.618	0.067	0.288	0.009
LW	0.594	0.966	0.040	-0.254	0.015	0.197	0.002
Hist	0.083	0.770	0.038	-0.554	-0.215	0.132	0.053
Taxon:							
Maize	0.104	0.829	0.032	-0.451	-0.222	0.109	0.070
Bean	0.052	0.935	0.029	-0.713	-0.116	0.137	0.009
Acorn	0.104	0.281	0.023	-0.248	0.008	0.033	0.000
Hickory	0.323	0.954	0.094	0.502	-0.155	0.420	0.106
Starch/Oil	0.115	0.931	0.043	-0.524	-0.274	0.163	0.117
Fruit	0.104	0.956	0.026	-0.330	0.366	0.059	0.189
Tree	0.062	0.848	0.038	-0.052	0.715	0.001	0.434
Weed	0.135	0.419	0.049	0.336	0.200	0.079	0.074

As with the correspondence analysis for location and taxon, these analyses indicate that there is some temporal patterning in the coastal assemblages. However, the most distinct time periods are those with the fewest assemblages so sampling error may also play a part. There may be some decline in hickory during the Late Woodland and historic periods but it was clearly still in common use. Maize is also clearly associated with the Late Woodland and historic periods.

Chapter Seven

Diet-Breadth on the North Carolina Coast

In this chapter, I will discuss the implications of human behavioral ecology and the diet-breadth model for our understanding of prehistoric subsistence patterns on the North Carolina coast. Since zooarchaeological data are limited, this analysis will be restricted to plant use only. This is unfortunate because plant and animal food sources usually play complementary roles in people's diets. While plants are often high in carbohydrates that serve as good energy (calorie) sources, animals are high in protein and fat, which are essential for proper growth and development. Shellfish, in particular, may have served as an important protein source to complement carbohydrate-rich plant foods (Erlandson 1988). The presence of large amounts of shell at most coastal sites certainly indicates they were a consistent and important part of the diet. For this analysis, I will therefore assume that shellfish and terrestrial animal resources provided enough protein to meet the dietary needs of coastal people and note that they probably contributed calories and fat as well. Examining plant-based subsistence using a human behavioral ecology framework has the potential to greatly increase our understanding of subsistence decision making and the use of local resources.

Estimated Return Rates

As discussed in Chapter 3, the first step in constructing a diet-breadth model is to rank potential food resources based on their handling return rate. Handling return rates are found by dividing the caloric return per unit of the resource by the handling time necessary to exploit it. There are several factors that make this a difficult process for archaeological research. While nutritional information, including caloric content, is available for most domesticated plants and many wild ones, such information is not available for all potential wild foods.

There are also several potential problems in estimating handling times. Many plant resources are not consumed or handled in the same ways by modern people as they would have been during prehistory. People no longer regularly collect many wild plants that were important food sources in prehistory. Some plants that were clearly used as food and grown as crops in the past, like sumpweed, are no longer cultivated at all. Other foods that were raised as crops during prehistory may be raised in very different ways today. The way maize is currently grown in the eastern United States by industrial monocropping, for example, has basically no resemblance to how it would have been farmed by the prehistoric people of the same area. Thus, it may be impossible to derive handling return rates by direct ethnographic observation.

Finally, the activities that should be included as handling tasks are open to interpretation and debate. Handling tasks include pursuit time and processing time (Thomas 2008). Once encountered during a foraging session, animals generally need to be pursued to be caught and collected. This is obviously not the case for plants but the edible portions (nuts, fruit, leaves) need to be collected. Generally this process is fairly rapid per edible part, but collecting plant resources in bulk, like nuts, can consume a large amount of time. Processing time includes all tasks needed to prepare a resource for consumption although cooking time is generally not included (Thomas 2008). Processing time can vary widely among plant foods (Scarry 2003). Fruit and greens are often eaten raw as soon as they are picked with no processing required. On the other end of the spectrum, all nuts must be cracked, sometimes a time-consuming process, and acorns from some oaks have to be processed to remove bitter tannins. Processing times also do not include the time required to prepare foods for storage although this is a task that obviously would have been practiced regularly by many prehistoric people. The conditions of the diet-breadth model assume immediate consumption of the gathered resources. Storage, however, might actually increase the value of some resources, despite the additional handling costs, because it ensured that the stored foods were available at times when other resources may be scarce (Gremillion 2004). Transportation time and the energetic costs of carrying food resources are also generally not included in the handling cost in diet-breadth models. They are, however, a major focus of central place foraging models, which I will discuss later in the chapter (Thomas 2008; Winterhalder and Kennett 2006). Cultivated or farmed foods, of course, are not acquired in the same ways as wild resources so they require a different method to calculate their energetic return rates. The most common method is to use ethnographic information about how long farmers spend on agricultural tasks to produce a given yield each year. The time spent on activities such as planting, weeding, watering, and harvesting are added to the time required to process the crop before consumption (Barlow 2006; Thomas 2008).

Given these problems, it is still possible to begin to estimate the average handling return rates for most potential food resources. The accuracy of these estimates may vary greatly depending on the method in which they were generated but I will describe the origin of each of these estimates as explicitly as possible in the following discussion. For the most part, these estimates rely on experiments carried out by archaeologists in collecting and processing plant foods. As Thomas (2008) points out, it is highly unlikely that modern non-foragers will be as efficient or skilled at these tasks as full-time prehistoric foragers. Therefore, where multiple return rate estimates are available, I will chose the highest.

Nuts

Since nuts were an important wild food resource for much of prehistory in the Southeast, archaeologists have made several attempts to estimate the return rates of various nut taxa. Many of these attempts, as discussed below, included experimental nut harvesting trials but the availability of stands of nut trees and the inexperience of most modern archaeologists as foragers put some limits on the results of these trials.

Hickory. Several attempts have been made to estimate the energetic return rates of hickories. Talalay et al (1984) conducted some limited experiments on hickory, walnut, and hazelnut collection and processing. Their collections included nuts from three different hickory species which are native to North Carolina although one of them (bitternut) is rare on the coast. They collected shagbark hickory (*Carya ovata*) nuts from four trees at a rate of about 5 kg of whole nuts per hour, from two mockernut (*C.*

tomentosa, also called *C. alba*) trees at 2.8 kg per hour, and from two bitternut (*C. cordiformis*) trees at a rate of 2.5 kg per hour including the time to remove the hulls from the nuts. They also explored three different methods of preparing hickory. The first was to crack the nuts individually and separate the nutmeats by hand. This is a relatively tedious process that produces a low amount of edible nutmeat for the time required. It is so inefficient that it is likely this method would have only been used occasionally to procure nutmeat for use in other dishes for texture and flavor or as "nibbles" (Talalay et al 1984). Their second processing method was to place the nuts on an anvil stone and smash them with a hammerstone. The crushed nuts were then placed in boiling water to separate the nutmeats and oil from the shells. This process yielded 2.8 to 17 times more nutmeat per unit of time than hand picking. The final method they reported on was very similar to the second except a wooden mortar and pestle were used to crush the nuts before boiling. This method was even more efficient and yielded 7.5 to 38 times more nutmeat per unit time than hand picking. Table 7.1 presents the estimated time in hours to collect and process a kg of nutmeat by each of these methods assuming that about 35% of each nut is edible nutmeat (Gardner 1992). Talalay et al (1984: 344) also report estimated caloric values for 100 gram portions of nutmeat for shagbark (704 kcal/100 g) and hickories in general (709 kcal/100 g). Using these figures, Table 7.2 presents the estimated handling return rate (kcal/hr of collection and processing) of hickories for each of the three processing methods.

Table 7.1. Time (in Hours) Required to Process One Killogram of Hickory Nutmeat Using Three Methods.

Species	Hand Picking	Hammerstone	Mortar and Pestle
Shagbark	32.83	3.8	2.01
Mockernut	48.64	3.84	2.28
Bitternut	24.95	2.67	2.33

Table 7.2. Estimated Handling Return Rate (kcal/hr) for Hickory Processing Using Three Methods.

Species	cal/kg	Hand Picking	Hammerstone	Mortar and Pestle
Shagbark	7040	214.44	1854.68	3497.27
Mockernut	7090	145.76	1847.85	3108.24
Bitternut	7090	284.17	2658.75	3038.59

Sanger and Thomas (2008) conducted experiments to determine return rates for hickory nuts on St. Catherines Island off the coast of Georgia. In 2005, they carried out 22 independent trials of 15-minute collections of hickories in different patches on the island. The best collection rate in their trials procured 57.04 kg of nuts/hr, though, unlike Talalay et al, they did not include the time required to husk the nuts in this estimate (Sanger and Thomas 2008: 169; Talalay et al 1984). They processed the hickories in two ways. In the first, they cracked the nuts using a 10-pound sledge hammer and removed the meat from the shell by hand. Using an estimate of 700 kcal/100 g derived from a nutritional analysis by Siliker Laboratory, Sanger and Thomas (2008: 172) derived an estimated handling return rate of 101 kcal/hr for this method of processing. The second method they used was similar to Talalay et al's second and third methods. In this case, however, Sanger and Thomas used a 10-pound sledgehammer to crush the nuts before boiling them in water to collect oil. They found that the oil contained about 40 kcal/100 g and therefore the estimated return rate for this process was 2234 kcal/hr.

Acorn. Petruso and Wickens (1984) conducted collecting and processing trials with several species of oaks native to Indiana. Three of these, white oak (*Quercus alba*), black oak (*Q. velutina*), and red oak (*Q. rubra*), also occur in North Carolina, although red oak is very rare on the coast. They carried out five minute trials by collecting acorns from the ground by hand. Table 7.3 presents the amount of nuts (in kg) collected per hour for these species. Note that there seems to be an error in the figures for white oak. Although white oak acorns are roughly the same size as black oak acorns, the table from Petruso and Wickens (1984) shows that nearly five times as many black oak acorns could be collected in the same time as the white acorns. Gardner (1992) believes this is due to a typo in the table and I am inclined to agree. Petruso and Wickens (1984) also conducted trial in processing the acorns. For these experiments they used a hammerstone to crack the nuts on an anvil stone and then extracted the nutmeat by hand. Since acorn nutmeats are fairly cohesive and the shells thin, this is a much easier process than it is for hickories. Red and black oaks took longer to process than white oaks because the inner seed coat had to be peeled from the nutmeat by hand. The amount of nutmeat that can be shelled per hour and the total energy derived from this process are included in Table 7.3. Petruso and Wickens (1984) did not, however, do any experiments on leaching the tannins from the acorns although this would have been necessary to make the acorns edible and palatable.

Table 7.3. Estimated Return Rates for Acorn.

	Collection Rate (kg/hr)	Processing Rate (kg/hr)	Handling Return Rate (kcal/hr)
White Oak	3.2	0.12	288
Black Oak	14.3	0.39	1204
Red Oak	12.3	0.32	998

Bettinger et al (1997) also reported information on acorn collection and processing. Drawing on ethnographic studies of Native American groups in California by Goldshmidt (1974) and McCarthy (1993), they present information on the processing of large black oak acorns. Acorns among these groups were generally collected by hand and then spread out to dry. The time required to collect 15.9 kilogram of whole acorns was

1.4 hours and these could be spread out to dry in 7.1 minutes. Nuts were then cracked with a nutting stone and shelled. It took nine hours to produce 6.5 kg of shelled nutmeat. An additional 7.8 hours were spent on removing the bitter papery coating around the nutmeat. Bettinger et al (1997), however, point out that this step may not be entirely necessary as modern producers were competing with each other to produce acorn meal with the best taste and texture possible. After cleaning, the nutmeats were pounded by mortar and pestle to produce flour. Five kilograms of flour could be produced in 6.9 hours. The flour then had to be leached of tannins, which took about 2.3 hours for five kilograms. The leached flour contained 4443 kcal/kg. In total, therefore, acorn collection and processing took 27.5 hours to produce 5 kg of leached flour with an estimated handling return rate of 807 kcal/hr.

Semon and Thomas (2008) conducted trials to determine the return rates for acorns on St. Catherines Island. They collected both live oak acorns (*Q.virginiana*) and laurel oaks. The laurel oak category, as used here, actually includes two species of the red/black oak group, sand laurel (*Q. hemisphaerica*) and water oak (*Q. nigra*), and their hybrids. All three of these species grow on the North Carolina coast, although live oaks are more common in the southern half of the region. Semon and Thomas (2008) carried out ten collection trials of live oaks in October 2005 when only some of the acorns were ripe. Each trial lasted 20 minutes and consisted of one person collecting the ripe acorns from the ground. Their best collection time yielded an estimated 3.6 kg of whole nuts per hour and a total of 2.59 kg of nutmeat in that time. Since live oaks are “sweet” acorns, they may not require leaching to remove tannins. If no leaching is done, the nuts are simply processed by cracking them and removing the shells. Two shelling trials produced rates of 2.79 and 5.51 hr/kg. Using nutritional data from samples analyzed by QC Laboratories, they estimated a handling return rate of 1012 kcal/hr for live oaks (Semon and Thomas 2998: 180). Live oaks, however, do have some bitterness so leaching improves their palatability. Semon and Thomas (2008), therefore, carried out leaching experiments with live oak acorns. They did this by boiling the nutmeats and replacing the water frequently when it became full of tannin. This process took 48 minutes during the first trial and 79 minutes during the second but may have not removed all of the tannin from the acorns. Including leaching in the processing time yielded an estimated return rate of 486 kcal/hr.

Semon and Thomas (2008) also carried out collecting and processing trials with laurel oaks on St. Catherines Island. As with the live oaks, these trials were carried out in October when only a portion of the acorns were ripe. They carried out 14 collection trials of 20 minutes each and the best trial yielded an estimated 1.4 kg/hr of whole nuts or 1.01 kg/hr of nutmeat. In the processing experiments, they followed the same cracking and leaching procedures as for the live oaks. Laurel oaks are much more bitter than live oaks so leaching is necessary to make them edible. Two processing trials produced rates of 19.95 hr/kg and 14.02 kg/hr. Using nutritional data, they estimated a handling return rate of 254 kcal/hr for laurel oaks (Semon and Thomas 2008: 184).

It should be noted that there are other methods for leaching not included in any of these studies. The most energy efficient of these might be the process of leaving acorn nutmeats in running water. The constant flow of water would remove the tannins without the need to manually change the water periodically when it became contaminated or the monitoring that must be done with boiling methods.

Walnut. Talalay et al (1984) also calculated return rates for black walnuts (*Juglans nigra*) and butternut (*J. cinerea*). They carried out two collecting trials for each of these species and, as with the hickories, included the time necessary to remove the hulls from the nuts in the collecting time. The two black walnut collections took place in October when 5.2 kg were collected and hulled in an hour and in December when 9.5 kg were collected in an hour. The authors attribute the difference between these two trials to the fact that the hulls of the walnuts later in the season had rotted and were much easier to remove. Two collecting sessions of butternuts were carried out in September yielding 4.4 kg per hour. Both species were processed by simply cracking them and picking out the nutmeat by hand. For black walnuts, this yielded 95 g of nutmeat per hour while only 36 g of butternut nutmeat were processed in an hour. Water separation methods do not work for these species because the remnants of the hulls that cling to the convoluted shells contaminate the water and make it very bitter. With an estimated 654 and 709 kcal per 100 g, this gives handling return rates of 621 kcal/hr for black walnut and 247 kcal/hr for butternuts.

Fruit

Since fruit can be eaten raw, their handling times are generally very low and include only the time required to collect them. These times obviously will vary with the abundance and density of the fruit. Collecting trials have been carried out for a few of the fruit taxa found on the coast of North Carolina but unfortunately not many. Additionally, nutritional information is not available for many of the smaller tree and shrub fruits (blackgum, hackberry, huckleberry, sumac, and palmetto).

Gardner (1992) conducted small collecting experiments on blackberries and maypop. His collecting trials of blackberries in July of 1981 indicated that a kilogram of blackberries could be collected in 0.44 hours. Since a kilogram of raw blackberries contains 430 kcal, blackberries have a handling return rate of 977 kcal/hr (USDA NDL 2010). Reidhead (1976) reported that several informants who collected wild blackberries and raspberries to sell at a local farmer's market could collect 1.7 kg/hr. This yields a slightly lower return rate of 731 kcal/hr. While the bramble seeds found in these samples could not be identified to species, blackberries and raspberries have roughly similar amounts of calories per kilogram. Thus, this return rate is reasonable for the brambles found on the coast.

Gardner (1992) also collected a 10 x 10 m patch of maypop from an overgrown cornfield. This trial produced a kilogram of edible fruit in 2.26 hours. Maypops have 400 kcal/kg and, therefore, an estimated handling return rate of 177 kcal/hr (Gardner 1992: 105).

Limited information is available for wild cherries. Reidhead (1976) collected wild black cherries from a single tree in southern Indiana. He found he could collect 4.5 kg of whole fruit per hour. He also suggested that this same rate would probably be applicable to wild plums. Wild cherries contain 695 kcal/kg and wild plums contain 753 kcal/kg giving return rates of 3127 and 3388 kcal/hr for these two taxa respectively.

While Gardner (1992) did not carry out timed collection trials for grapes, he reasoned that the collection time for wild grapes would probably be similar to those of brambles. Since raw grapes have 690 kcal/kg, this would produce an estimated return rate of 1568 kcal/hr. Reidhead (1976), on the other hand, suggested that the collecting rate for grapes would be similar to his collection rate for wild black cherry, namely 4.5 kg/hr. This would produce an estimated return rate of 3105 kcal/hr.

Reidhead (1976) also suggested that the rate of collection for haw (*Viburnum* sp.) would be similar to that of wild cherries since the trees cluster in a similar manner. Haw contain 664 kcal/kg yielding an estimated handling return rate of 2988 kcal/hr.

Nutritional information is available for persimmons but no collection experiments have been conducted. Intuitively, I would suspect that their collection times are closest to those of wild cherries and plums. Unlike the weedy brambles, persimmons and wild cherries/plums are tree fruit that do not occur in such dense thickets. Persimmons have 1270 kcal/kg If we accept the collection rates of wild cherries as a very rough equivalent to those of persimmons, they would have a return rate of 5715 kcal/hr.

Starchy and Oily Seeds

As previously discussed, most of the starchy and oily seeds recovered from paleoethnobotanical samples on the coast of North Carolina were probably collected from the wild although some may have been cultivated deliberately by humans. More archaeological experiments have focused on the use of wild varieties of these plants than on the energetics of their cultivation.

Greens. Two of these plants, chenopod and knotweed, can be eaten as both greens and seeds. These varying uses produce very different potential return rates. Greens require almost no processing. Rinsing is usually sufficient and they can be eaten either raw or cooked. The only cost associated with the use of greens is the time required to collect them. Gardner (1992) conducted collecting trials of chenopod greens from a fallow backyard garden plot. He was able to gather a kilogram of leaves in 0.77 hours. As chenopod greens contain 430 kcal/kg, that produces an estimated return rate of 558 kcal/hr (King 1984). Reidhead (1976) conducted a small experiment on the harvesting of knotweed. He found that he could collect enough knotweed plants to yield a kilogram of edible leaves in 0.25 hours. If the whole plant was collected, the edible leaves would have to be stripped from the stems, which would require another 0.16 hours per kilogram. With an estimated 339 kcal/kg, the return rate for knotweed greens would be 827 kcal/hr.

Chenopod. Asch and Asch (1978) reported collection rates for chenopod seeds based on two 15 minute trials conducted in two 1 m^2 plots. These trials produced 0.83 - 1.12 kg of seeds per hour. However, Asch and Asch (1978) did not conduct processing trials. Seeman and Wilson (1984) conducted collection and processing experiments on wild chenopod seeds in southern Indiana. Two harvesting methods were used to collect the seeds on ten dates from September through December. In the first, the harvester "stripped" the seeds from the inflorescences by enclosing them in their fist and gently pulling them off of the stem. The second method involved cutting the whole inflorescence off of the plant. The harvested material was dried and then further processed to separate the seeds. The stripped material was sieved through two mesh screens while the cut seed heads had to be threshed before screening. To remove the brittle perianth that remained clinging to the seed, the seeds were rolled under a wooden rolling pin on a limestone surface and winnowed. The cutting method seems to have been about two to three times more effective than stripping although the extra processing time decreased this margin somewhat. At the peak of the harvest in early November, 233 g of chenopod seeds could be harvested, screened, and processed with the stripping method per hour. At the same time, 304 g of chenopod seeds could be collected and processed using the cutting method per hour. Chenopod seeds contain 4000 kcal/kg (Scarry 2003). Therefore, the stripping method produces an estimated handling return rate of 932 kcal/hr while the cutting method returns 1216 kcal/hr. Gremillion (2004), on the other hand, reports a much lower return rate of 433 kcal/hr for wild chenopod collection and processing. This is in part because she used a lower estimate of the calories contained in chenopod seeds (2729 kcal/kg) and because of a longer estimated processing time of 5.3 hr/kg. It should be noted, however, that Gremillion's (2004) processing estimates are based on proxy data from the processing of an Australian chenopod.

Knotweed. Murray and Sheehan (1984) carried out collection and processing experiments on knotweed (*Polygonum* sp.) in southern Indiana. They conducted short collection trials of 5 to 30 minutes depending on the size of the patch of knotweed available. They also used several different collecting techniques, partly based on the species of *Polygonum* being harvested. The first technique, as with Seeman and Wilson's (1984) chenopod experiments, was to simply strip the seeds from the plant by hand. This was most efficient in species that had clustered seed heads. The second method used was cutting. In species with seed heads, only the seed heads were cut from the plant. In those species with more dispersed seeds, the whole plant was harvested. All harvested material was dried after collection. The cut material had to be threshed and winnowed. Like chenopods, knotweed seeds have a tightly attached perianth that must be removed before cooking. This could be accomplished by lightly grinding them with a mortar and pestle or against a coarse stone or by parching them. After the perianths are detached the seeds were winnowed again. Harvesting knotweed by the stripping method produced yields of 0.046 and 0.067 kg/hr for two different species after processing. Harvesting by cutting of four different species yielded 0.09, 0.013, 0.058, and 0.029 kg/hr after processing. Since knotweed contains about 4000 kcal/kg, the best return rate for the stripping method is 268 kcal/hr and the best return rate for cutting is 360 kcal/hr (Scarry 2003).

Sumpweed. Asch and Asch (1978) conducted experimental harvests of sumpweed in the Mississippi River Valley of Southern Illinois. They found it easiest to harvest the plants when they were mostly dried and the achenes were only loosely connected to the spikes. This means some of the seeds were lost during harvesting but helped avoid the effort of threshing that would be required if the spikes were tightly attached to the achenes. Seeds were stripped from the plants by hand. The best rate from their timed collection trials was 0.78 kg/hr. They did not, however, provide data on processing. While the paleofeces found in Salts Caves contained sumpweed shells, Asch and Asch (1978) argue that most prehistoric people would have processed sumpweed to remove the majority of the shells. The shells are tough, fibrous, and indigestible. They pointed to a collection of sumpweed seeds in a refuse dump at the Newbridge site in the lower Illinois Valley that had clearly been processed to remove their shells. The processing methods used for sumpweed are not perfect, however, and some shells remain, which might account for some sumpweed shells in paleofeces even if the sumpweed had been processed. Gremillion (2004) conducted a small experiment on processing wild sumpweed seeds. She alternated rubbing the harvested material between her hands and winnowing the material with a fan. After most of the non-achene material was removed, she pounded the achenes to release the kernels from their shells. Her total processing time was a rather extreme 70 hours per kilogram. Reasoning that this was probably too long and that an experienced forager would be more efficient at sumpweed processing, she instead used the time required for only one round of rubbing and winnowing the achenes to yield a processing time of 24 hr/kg of kernels. Since a kilogram of sumpweed kernels contains 5350 kcal, this produces an estimated return rate of 212 kcal/hr (Asch and Asch 1978).

Maygrass. There are no direct experimental records of harvesting or processing times for maygrass. According to Gremillion (2004), Simms (1987) determined that a kilogram of seeds from a close relative of maygrass (*Phalaris arundinacea*) can be harvested in 5.8 hours. It takes an additional 2.3 hours to winnow and clean the seeds after harvesting. Since maygrass contains 3700 kcal/kg, this yields an estimated return rate of 457 kcal/hr.

Little Barley. As with maygrass, there are no reported harvesting or processing times for little barley. Gremillion (2004), however, does indicate that Simms (1987) recorded data for a closely related species (*Hordeum jubatum*) in the Great Basin. A kilogram of seeds could be harvested in 2.5 hours and processed in 8.7 hours. Since little barley contains 3070 kcal/kg, this yields an estimated return rate of 274 kcal/hr.

Squash. There are currently no known wild forms of squash native to North Carolina. Some squash were domesticated in the eastern United States, therefore, it is likely that the squash seeds found on the coast belong to varieties domesticated elsewhere in the region and grown in North Carolina as crops. Unfortunately, the sheer variety in squash makes deriving an estimate of their possible return rates very difficult. Some species, such as modern zucchini, are capable of producing very large amounts of fruit with thick edible rinds while other species have very thin, hard rinds. Based on ethnographic data on the Hidatsa of North Dakota, Gardner (1992) estimates that 1270 to 1820 kg of squash could be raised by traditional farming methods on one hectare of land per year. Reidhead (1976) used ethnographic studies from several different areas of the world to estimate the time it would take to raise corn and squash using traditional slash and burn agriculture. This process would include clearing the land, planting, weeding, harvesting, building storage facilities, getting crops ready for storage, and protecting the crops from animals. Added together, Reidhead (1976: 282) estimated that it would take 838 man-hours to raise one hectare of fresh squash. Gardner (1992) derived agricultural costs from the ethnographic example of slash-and-burn maize farmers from Belize. His estimates include 50 days of land preparation, five days of planting, 20 days weeding, five days of preparing for harvest, and 30 days of harvesting. This would give a total of 880 hours of agricultural labor per hectare. Squash contains roughly 5530 kcal/kg (Scarry 2003). Since squash can be consumed with no elaborate processing required, the return rate of farming squash would be 12010 kcal/hr using Reidhead's estimate or 11437 kcal/hr using Gardner's.

Cultivating the Starchy and Oily Seeds

Gardner (1992) used his estimate of 880 hours of work need to raise one hectare of crops to apply to raising the other starchy and oily seeds too. He assumed that this effort produced the same yield per hectare as would have been found in wild populations. This raises the amount of effort that would have been put into obtaining the food and subsequently lowers the return rate. This led him to predict costs of 2.9 hr/kg of chenopod, 2.3 hr/k for maygrass, and 5.1 hr/kg for sumpweed. These costs would include all activities from planting to harvesting and processing the food for consumption. This would give return rates of 1379 kcal/hr for cultivated chenopod, 1609 kcal/hr for cultivated maygrass, and 1049 kcal/hr for cultivated sumpweed. It should be noted that Gardner did not have experimental data on processing methods for any of these taxa. Therefore, he seems to have underestimated the time required to process the seeds and these estimates are consequently much higher than expected.

Gremillion (2004) used another method to estimate the cost of agricultural production. She assigned a standard agricultural cost of 0.25 hr/kg of crops produced in addition to the normal harvesting and processing times. This is a fairly low investment of labor for an agricultural crop but may be accurate since the starchy and oily seeds are weedy and relatively easy to cultivate. Planting can be done by broadcasting the seeds across a prepared piece of ground and further tending or maintenance tasks are optional. Gremillion also posited that domesticated chenopods would have more calories per kilogram than their wild counterparts. This makes sense because domestication increased the size of chenopod seeds while decreasing the thickness of their inedible seed coats. Domestication also increased the size of sumpweed seeds but the kernel to seed coat ratio does not seem to have changed. Therefore, the caloric content of domesticated and wild sumpweed are considered equal. The agricultural cost of raising chenopod raises their total cost to 6.55 hr/kg while the cost of sumpweed increases to 25.67 hr/kg. This produces estimated return rates of 611 kcal/hr for cultivated chenopod and 208 kcal/hr for cultivated sumpweed.

As noted before, however, Gremillion's estimates for the caloric content of chenopod seeds were lower than reported elsewhere. Her estimates of harvesting and processing times for chenopod were also much higher than those reported by Seeman and Wilson (1984). Since Gremillion's data are based on analogy from an Australian case and Seeman and Wilson's data are based on direct experimental trials from species available in North Carolina, I am inclined to use processing and harvesting costs from the later. Adding Gremillion's 0.25 hr/kg agricultural labor cost to Seeman and Wilson's estimate of 0.304 kg/hr produces an estimated handling cost of 3.539 hr/kg (0.28 kg/hr). Because Gremillion's estimate of the caloric content of chenopod seeds seems lower than most other published ones (see Scarry 2003 and Seeman and Wilson 1984), I will also retain the estimate of 4000 kcal/kg for domesticated chenopod. This yields a return rate of 1130 kcal/hr for domesticated chenopod, a figure slightly lower than that of wild chenopod but much closer to it than Gremillion's original estimate.

Gremillion's estimate of the harvesting time for sumpweed was also higher than that of Asch and Asch (1978). I will therefore use their collecting time and add Gremillion's estimate of 0.25 hr/kg of domesticated sumpweed. Given that the processing costs of sumpweed were estimated to be very high (24 hrs/kg), this addition hardly changes the estimated cost of sumpweed production, going from roughly 0.04

kg/hr to 0.0396 kg/hr. Therefore the return rate of domesticated sumpweed is still basically 212 kcal/hr.

Introduced Crops

Crops introduced to North Carolina during prehistory were never available in the area as wild resources. Therefore, the return rates discussed here are for farming rather than foraging. These crops are no longer farmed the same way in North Carolina as they would have been during prehistory. These estimates use ethnographic data from farmers in other parts of the world who use techniques more analogous to those that would have been used in North Carolina during prehistory.

Maize. Since maize was an important aspect of the subsistence practices of many prehistoric people of the New World, considerable research has gone into understanding the energetics of maize farming. Unfortunately, however, there is a great deal of variety in the ways maize can be farmed. Technological changes, such as the use of steel farming implements, and changes in maize varieties also add variability in crop yields and the effort required to produce them. Generally speaking, it is assumed that putting more time and effort into farming by completing tasks like weeding or protecting the crops from animals that would eat them will increase yield sizes. However, some tasks expend more energy than is returned by the greater harvest. Therefore, in some situations, it is not worth the farmer's time to spend more energy on agricultural labor, especially when there are other subsistence activities that they could be pursuing. This means some agricultural tasks may be skipped or reduced. Only planting and harvesting are absolutely necessary to obtain crops, though this least-effort farming is likely to have very low yields in most cases.

Barlow (2002; 2006) synthesized ethnographic data from subsistence farmers in Mexico, Guatemala, Peru, South Africa, and southern Utah to examine the predicted yields for given agricultural tasks. She excluded any cases where people used draft animals or machinery in farming and preparing fields and instead only included cases where hand tools were used exclusively. Maize farming is a spectrum of varying levels of investment; reports of agricultural labor range from 133 to 772 hr/acre. Average maize harvests also varied from 3 to 50 bushels per acre. In order to calculate the caloric return rates of different farming strategies, Barlow multiplied the number of bushels of shelled, dried maize produced per acre by the average weight of a bushel of kernels (25.2 kg/bushel) and the caloric content of one kilogram of kernels (3550 kcal/kg). This number was divided by the sum of all the time spent in agricultural tasks like land clearing, weeding, and harvesting plus the time required to process corn into meal using manos and metates (43.55 hr/bushel). In the Latin American cases, this resulted in return rates of 300 to 1800 kcal/hr.

Using these data, Barlow (2002) identified four potential agricultural strategies of varying effort and compared them to return rates from foraging for wild resources. The strategies with the highest return rates per maize yield are those with the least time placed in farming tasks. The least-effort strategy Barlow described was a plant and harvest style of horticulture in which the farmer only spent about 50 hours to plant and harvest the crop with no maintenance or improvement tasks in between. Maize harvests between 1 and 20 bushels per acre produced estimated return rates of 1300 to 1700 kcal/hr using this strategy. The second highest return rates belonged to a slash-and-burn style of horticulture with 200 hours of agricultural labor per acre. Return rates for this strategy varied between 1000 and 1500 kcal/hr. The third strategy was "typical" subsistence agriculture in which 400 hours were invested per acre. This yielded return rates between 100 and 1000 kcal/hr. The fourth strategy was intensive agriculture in which 800 hours of labor were carried out per acre. This yielded return rates of only 50 to 350 kcal/hr.

A few implications of this analysis are worth noting. When expected maize yields are low (below five bushels per acre), the return rates for intensive agriculture are extremely low. The return rates for "typical" agriculture are also low at low yields but increase rapidly up to about 10 bushels per acre. In other words, if farmers can not produce harvests of at least five bushels per acre, intensive agriculture, and to a lesser extent "typical" agriculture, is probably energetically inefficient. A farmer would simply be spending too much time and energy on agricultural labor with not enough reward. For all agricultural strategies, return rates level off with yields between roughly 5 to 15 bushels per acre. At 15 to 20 bushels of maize per acre, there is very little difference in the return rates of plant and harvest, slash and burn, or "typical" agriculture. This is in part because the cost of processing maize does not change with larger harvests and the effort required for that counteracts the gain in energy that would normally be seen by investing less labor in agricultural production (Barlow 2002; 2006).

Beans. The energetics of bean farming are unfortunately less well studied. I have encountered no direct measurements of the time required to plant, tend, or harvest beans. Gardner (1992) used an estimate derived from an ethnographic study of Central American farming suggesting that the highest average yield of beans would be 700 kg/ha. When combined with his estimate of 880 hours of agricultural labor per hectare, it yielded a cost of 1.3 hr/kg for cultivation of beans. Since raw beans contain roughly 1180 kcal/kg, this produces an estimated return rate of 908 kcal/hr. Beans (and squash) can be grown intercropped with maize, which may reduce the agricultural labor required to produce a harvest of beans. This practice, however, may reduce yields.

Ranking Food Resources

Table 7.4 presents potential plant food sources found on the coast of North Carolina ranked by their estimated handling return rate. As mentioned above, these rates include collecting, processing, and agricultural labor costs but do not include transportation costs or cooking times. Where multiple estimates were available, I selected the highest estimated return rate that included both collection and processing times. In the following discussion I will address the implications of this ranking for coastal subsistence and consider diets that include only wild plants and those that contain both wild and cultivated plants.

Wild Plant Resources

Table 7.5 presents the rank order of only the wild plants found on the coast. Several interesting patterns are visible here. Firstly, many of the fruits are very highly ranked. The return estimate of persimmons may perhaps be too high since this estimate was only roughly based on the collecting times for wild cherries. However, persimmons

Table 7.4. Estimated Handling Return Rates for Coastal Plant Foods.

Taxon	Nutritional Content kcal/kg	Handling Rate kg/hr	Return Rate kcal/hr	Source
Squash	5530	2.170	12010	Reidhead 1976
Persimmon	1270	4.500	5715	
Hickory	7040	0.500	3492	Tallalay et al. 1984
Wild Plum/Cherry	753	4.500	3388	Reidhead 1976
Grape	690	4.500	3105	Reidhead 1976
Haw	664	4.500	2988	Reidhead 1976
Maize (plant and harvest)	3550		1700	Barlow 2002
Maize (slash-and-burn)	3550		1500	Barlow 2002
Chenopod seeds (wild)	4000	0.304	1216	Seeman and Wilson 1984
Chenopod seeds (domesticated)	4000	0.282	1130	Gremillion 2004
Maize ('typical" agriculture)	3550		1000	Barlow 2002
Bramble	430	2.270	977	Gardner 1992
Bean	1180	0.790	908	Gardner 1992
Knotweed greens	339	2.400	827	Reidhead 1976
Acorn	4443	0.180	807	Bettinger et al. 1997
Walnut	6540	0.095	621	Tallalay et al. 1984
Chenopod greens	430	1.300	558	Gardner 1992
Maygrass	3700	0.120	457	Gremillion 2004
Knotweed seeds	4000	0.090	360	Murray and Sheehan 1984
Little Barley	3070	0.090	274	Gremillion 2004
Sumpweed (wild)	5350	0.040	212	Asch and Asch 1978; Gremillion 2004
Sumpweed (domesticated)	5350	0.0396	212	Gremillion 2004
Maypop	400	0.440	177	Gardner 1992

do contain a noticeably higher amount of calories per kilogram than all of the other fruit. If persimmon can be collected at rates comparable to the other fruit, it probably should be the highest ranked among them. The fruits fall high on the ranking of the estimated return rates in large part because they require virtually no processing. Many of these fruits also tend to cluster in patches that facilitate collecting. The only low ranking fruit is maypop. The collecting time used here, however, was produced by only one very limited experiment by Gardner (1992) and additional trials may show that maypop could be collected more quickly. It is highly, unlikely, however, that fruit would ever play the largest role in the diet of coastal people since they are not abundant enough to provide all of the calories a group of foragers would need to sustain themselves. The relatively low abundance of fruit and their scattered growth patterns, compared to trees like oaks, also means that collection times for a diet relying mostly on fruit would be very high. The diet-breadth model predicts, therefore, that fruit should be collected whenever they are available but that other resources would also have to be included in the optimal diet.

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Secondly, despite a moderately high processing time, hickory is the highest ranked resource besides fruit. The return rate used here for hickory reflects the fastest processing method reported by Talalay et al (1984) using a mortar and pestle to smash the nuts and then boiling them to recover nutmeat and oil. This method is much more efficient that trying to separate the nutmeats by hand and contributes greatly to hickory's rank. Even the slightly more laborious method of cracking the nuts with a hammerstone and then boiling, however, would still make hickory a more highly ranked resource than everything except fruit. This is because hickory contains a large amount of calories per kilogram. It is, in fact, the most calorie rich plant resource on the coast, making it a very attractive food source. This rank certainly agrees well with the seeming importance of hickory in coastal subsistence patterns.

The next highest ranking non-fruit taxon is wild chenopod seeds. While chenopods have a relatively long processing time, longer than hickory, they also have a relatively high amount of calories per kilogram. Even though chenopod seeds are small, they might have been an attractive supplementary food source. Chenopod was the most common of the starchy seeds at coastal sites. The other starchy and oily seeds rank near the bottom of the estimated return rates, despite high caloric content, because of long processing and collecting times. Since these processing times were derived largely by a very few trials by archaeologists with no former experience at these tasks, it is possible that the estimated return rates are lower than they should be. However, it is undeniable that maygrass, knotweed, little barley, and sumpweed are all small-seeded species that are sometimes fairly labor intensive to collect and to separate from other plant parts.

Knotweed and chenopod greens fall near the middle of the ranking list. Despite having a slightly higher caloric content, chenopod greens have a lower estimated return rate than knotweed greens. This is because the estimated collection time for chenopod reported by Gardner (1992) is longer than that reported by Reidhead (1976) for knotweed greens. I suspect the return rates for these two should be closer to each other but more trials would be needed to determine if Gardner or Reidhead's collection estimates are more accurate. In either case, greens seem to be a reasonably productive resource because of their low processing cost. They may have been attractive as well because they were available in the spring and early summer when many other plant food resources were not yet ripe and stored food from the previous year may have been running low.

Acorns and walnuts fall in between knotweed and chenopod greens in the ranking of estimated return rates. Both of these nuts, while fairly high in calories, have long processing times. The majority of the processing time for acorn was spent on shelling, cleaning, and leaching the nutmeats. The processing estimate from Bettinger et al (1997) also included the time required to pound the acorn into flour. Though this was a fairly common process, processing times would be reduced if the nutmeats were eaten whole. Time spent leaching the acorns could also be reduced if the acorns were left in running water. In some cases, therefore, the return rate of acorns might be closer to that of chenopod seeds. The processing time for walnuts, however, was entirely based on picking the nutmeats out of the shells by hand. There does not seem to be any alternative method to accomplish this task efficiently. Despite the relatively high caloric content of walnuts, therefore, they were probably always a minor part of the diet of coastal people. This is compounded by the fact that, while individual walnut trees can be very productive, they are usually isolated from each other and are consequently hard to collect in bulk.

Cultivated and Wild Resources

Table 7.4 ranks all cultivated and wild resources found on the coast by their estimated handling return rates. The estimated return rate for squash seems like it may be too high in comparison to the other agricultural foods. This return rate was based partly on Gardner's (1992) estimation of 1820 kg of squash being raised on one hectare. This yield is no doubt possible in some situations but it is not clear if that could or would be achieved on the coast of North Carolina. Many farmers grow squash intercropped with other plants and would therefore produce a smaller squash crop. It is also not clear whether the squash grown in North Carolina would have been equivalent to the squash grown by the Hidatsa on which the estimate was based. As discussed before, there is a large amount of variation in squash varieties and the amount of edible material (rind or seeds) per fruit. A squash with a thinner rind would produce far less food per hectare than a larger variety. Nevertheless, the low amount of processing time required for squash would probably make it one of the more attractive agricultural foods. More direct evidence of squash yields and agricultural labor costs would help to clarify the relative position of this crop in the ranking of resources.

Maize farming, even using the most efficient plant and harvest strategy, seems to provide a smaller return rate than hickory collection. Intensive maize agriculture was probably not practiced on the coast during prehistory and is therefore not included in the ranking. At their highest estimated yields, the plant and harvest and slash-and-burn maize farming strategies yield fairly similar return rates. The plant and harvest strategy may work best in very specialized microenvironments. Thomas (2008) discusses the possibility of using this technique on the rich edges of freshwater lakes during dry periods, for example. The slash-and-burn strategy, on the other hand, may be a more reliable method of producing acceptable maize yields and would certainly be possible in a wider variety of habitats. The diet-breadth model, therefore, would suggest that farmers would carry out a plant and harvest strategy wherever possible but that slash-and-burn farming would be a close second choice. Even the more labor intensive "typical" maize agriculture provides a reasonable return rate. It would seem to provide more calories per unit time than collecting acorns or most of the starchy and oily seeds. As with acorn, the processing cost used here for maize includes time spent turning the maize into flour. This step, while common, is not absolutely necessary so the estimated return rate for maize production might be higher if it was eaten in some other form.

Farming beans also seems to be more productive than collecting acorns or most of the starchy and oily seeds. While it ranks below maize, in part due to a lower caloric content, beans require relatively little processing time and like squash could be intercropped with maize.

Unfortunately, there have not been any direct experimental trials of the agricultural labor or processing times required to farm the starchy and oily seeds. We can only estimate what the return rates of these crops might be based on their wild counterparts and proxy data on agricultural tasks. Presumably, cultivation would raise the yields of these crops, if not by increasing edible seed size through the genetic changes of domestication, then by creating denser stands that would be easier to harvest and require less travel time. However, there are no estimates currently available for this effect. Therefore, the estimates for domesticated starchy and oily seeds are probably slightly lower than they should be in this ranking. The highest ranked cultivated starchy seed is chenopod. As with wild chenopod, domesticated chenopod has a fairly long processing time but a high amount of calories per kilogram. The processing time for domesticated chenopod forms may actually have been smaller and their caloric content higher because of the reduction in seed coat thickness and the increase in seed size that accompanied domestication. Nevertheless, the estimated return rate for domesticated (and wild) chenopod used here is roughly comparable to that of maize and higher than that of beans, acorns, and the other starchy and oily seeds. Thus, the diet-breadth model suggests that chenopod cultivation should have been one of the first farming activities undertaken by farmer/foragers seeking to optimize their net caloric return rate. Sumpweed has one of the lowest return rates of the plants found on the coast and domesticated sumpweed would have had a slightly lower return rate if the cost of agricultural production is added to its already long processing time. The same may have been true of cultivated and/or domesticated maygrass, knotweed, and little barley. Gremillion (2004), while acknowledging that cultivated starchy and oily seeds generally have low return rates because of their long processing times, points out that their value as a predictable, storable food source may have made them more valuable to prehistoric people than the simple return rates suggest. They could provide a plentiful supply of food even if wild resources were scarce. In addition, she suggests that much of the processing required for these seeds could be postponed until the winter when few other subsistence activities took place (Gremillion 2004). The seeds could be harvested in the fall and not threshed or winnowed until later. In this manner, seed processing would not interfere with any other foraging opportunities.

Optimal Diet on the Coast of North Carolina

The ranking of estimated return rates discussed above is roughly the order in which different resources should be added to the diet of coastal people in order to optimize the production of calories per time spent foraging. The first ranked resource should always be included in the diet and lower ranked ones will be added until adding another resource would decrease the average foraging return rate (the caloric content of the resource divided by the handling and search times) of the diet as a whole. Very rare resources will have high search times and therefore low foraging return rates. However, if they have very high handling return rates, they will still be worth pursuing whenever encountered. For example, on the coast of North Carolina, grapes are not the most abundant plant. They grow in some habitats but not others and are certainly not a major forest component. Any forager attempting to eat a diet entirely or largely of grapes would spend far too much time searching for enough to eat, if they did not already know where the grapes were. Grapes do, however, have very high handling return rates because they have a high caloric content and no processing cost. Therefore, a forager behaving optimally would stop to collect them whenever he or she ran across grapes during a foraging session. Items with very low handling return rates, on the other hand, may not be worth pursuing even if they are very abundant because it will cost more energy to collect and process them than could be gained by doing something else. In this analysis, sumpweed is estimated to have a very high processing time and thus a low handling return rate. Even if sumpweed is very common in a given area, therefore, and easy to collect, a forager would have to spend a long time processing the seeds and gain relatively few calories in return. Instead, the diet-breadth models suggests it would be in his or her best interest to ignore the sumpweed and pursue more productive resources.

Adding more resources to the diet, i.e. increasing the breadth of the diet, decreases the overall search time since all resources are searched for simultaneously. If the highest ranking resource is very abundant, and consequently has a very low search time, it could theoretically be the only resource in the optimal diet. This is rarely the case, however. More resources in the diet increases the frequency with which a forager will encounter one of those resources. Search times, however, may not be the most appropriate way to construct optimal diet models for plant resources. As discussed in Chapter 3, foragers familiar with their local area are likely to know before they begin a foraging session where plant foods will be found and their general condition (i.e. ripeness, abundance, density, etc.). Travel and transportation costs, therefore, may be more relevant factors in influencing foraging decisions since widespread or rare foods will take more effort to collect. These issues are addressed by central place foraging and will be discussed in the next section.

Once a resource is added to the optimal diet for whatever reason, it should always be collected when encountered and will never be dropped from the diet unless the handling costs for one of the resources changes and reorders the ranking. Change in handling costs could be caused by the introduction of new techniques to more efficiently process a given resource or the introduction of a more productive domesticated variety. Switching from the "stripping" method of gathering chenopod to the "cutting" method, for example, would reduce handling costs and make chenopod a more attractive resource. Similarly, adopting the use of a mortar and pestle to crack hickory nuts would lower handling times compared to cracking them with a hammerstone. Resources not included in the optimal diet, on the other hand, should never be collected, no matter how often they are encountered.

The diet-breadth model, however, does not indicate how much of the diet each resource should make up. Resources with the highest estimated handling return rates may make up almost all of the food in a forager's diet if they are common or it may make up only a small portion of the diet if it is rare. For example, persimmons seem to be the highest ranked wild plant resource for the coast of North Carolina but it is highly unlikely that persimmons were ever abundant enough to make up the bulk of the diet.

Based on the estimated handling return rate rankings for plant taxa available on the coast of North Carolina, fruit and hickory nuts are most likely to have always been part of the optimal diet of prehistoric foragers. Chenopod seeds, greens, acorns, and walnuts may have been added to the diet based on local circumstances. The starchy and oily seeds besides chenopod seem to have had the poorest return rates and therefore would have been the last things added to an optimal diet.

After their introduction to the coast, squash, maize, and, to a lesser extent, beans may have been included in the optimal diet because of their fairly high handling return rates. While hickory nuts and fruit seem to have had higher return rates than all of the domesticated plants (except perhaps squash), maize and beans compare favorably to most of the other wild resources available. In some cases, these crops may have displaced acorn and the other starchy and oily seeds from the optimal diet. Whether or not these domesticated taxa were incorporated into the optimal diet may have depended in part on the variety of the species and their yields. As discussed above, if yields of at least 5 bushels per hectare of maize could not be achieved, maize farming may not have been productive enough to join the optimal diet. The amount of time and effort put into raising these crops would also have to be weighed against other foraging opportunities. As Barlow (2006) pointed out, whether or not a farmer should perform additional agricultural tasks should be decided by comparing the expected increase in yield for that task to the expected return rates of other foraging opportunities. For example, weeding crops soon after they begin to sprout may greatly increase the yields at harvest time by eliminating the competition of weeds in the field. Weeding shortly before harvest, however, may have little to no impact on yields and that time might be better employed collecting fruit. The fairly late adoption of maize farming on the coasts suggests that return rates for maize on the coast may have been fairly low, perhaps because of the sandy soils found in many areas, or other resources were plentiful enough to make the effort of farming unprofitable until conditions changed in some manner.

These rankings seem to correspond fairly well with the distribution of plant remains found at archaeological sites on the coast. Hickory, one of the highest ranking resources, is found at most coastal sites. Fruit, which also have high return rates, are less common but a fairly frequent component of coastal plant assemblages. Of the starchy and oily seeds, chenopod had the second highest handling return rate in both its wild and domesticated forms. It was also the starchy seed species found most often at coastal sites. Squash, whose handling return rate may be overestimated here, was the second most common starchy and oily seed species in North Carolina. Acorns seem to have been less commonly exploited on the coast than hickory and this corresponds well with their respective estimated return rates. Even though oaks are more common in the forests of North Carolina, the high collecting and processing costs of acorns may have meant foragers often passed over them. Maize was the highest ranked of the introduced crop and definitely the most common on the coast. It did not, however, replace most of the wild plants in the optimal coastal diet and seems to have been used alongside wild resources.

Interestingly, the variety of taxa found at coastal sites of different ages seems to show a broadening of diet-breadth through time. Middle and Late Woodland sites typically contained many more taxa than earlier sites. It is very difficult, however, to determine if this is because of ecological changes, social changes, or preservation issues. It is possible that some change in resource abundance or processing encouraged a widening of diet-breadth in response to a lack of higher-ranked resources. Overexploitation of resources, one of the most common explanations for widening diet-breadth, seems relatively unlikely for the coast of North Carolina where population sizes do not appear to have been very large. However, it is also possible that people later in prehistory were choosing to remain at one settlement on the coast for longer periods of the year and that may have contributed to the depletion of resources in a very localized area. Additionally, more permanent settlements would increase the likelihood that plant remains would be incorporated into the archaeobotanical record. People may have been exploiting the same range of taxa in earlier time periods, therefore, but if they were only living at each site for limited portions of the year, the full range of their foods may not have been preserved. Finally, natural taphonomic processes may mean that the seeming increase in diet-breadth through time is an artifact of the better preservation of fragile seeds in younger sites. Even if people were eating small seeds like sumpweed in the Early Archaic, it is highly possible they would not have survived in the archaeological record.

Central Place Foraging

Diet-breadth models generally do not include travel and transportation costs in their calculation of handling costs. However, travel and transportation are very necessary steps in the foraging process that warrant consideration and are well-addressed by central place foraging theory. Foragers generally take food back to their homes for consumption.

The cost of traveling to and from food sources and carrying a load of collected food back will vary based on the distribution of resources around the home site, the density of resources, the size of the load carried, and the local topography (Gremillion 2006). Since the coast of North Carolina has a fairly diverse array of plant communities and their distribution is not even, no attempt has been made here to estimate transportation costs for the coast as a whole.

A few aspects about transportation are worth considering, however. Firstly, travel costs tend to be higher for resources that are scattered over the landscape rather than clustered in patches. This is because a forager must spend more time moving from plant to plant carrying their collected food than if they were able to forage within a large patch. This would mostly apply to some of the fruits and walnuts as the other taxa tend to grow in thickets or stands. Transportation costs are also higher for bulkier items at a given distance from the home or base camp. Since a large proportion of the weight of nuts is inedible nutshell, a much greater weight of nuts must be carried back to camp to produce one kilogram of edible nutmeat than would be required to bring back one kilogram of edible grapes. Field processing could potentially be used to remove inedible parts and lessen the amount of material that would have to be carried back to camp. For most of the resources described below, however, the processing techniques are either complicated and hard to carry out in the field or would make little difference in the weight of the resources. In the case of nuts, field processing may actually be counterproductive if long term storage is one of the forager's goals. Nuts last longer in storage if they are left in the shell. Some temporary camps may have been set up for nut collecting and harvesting during the fall but I expect field processing to be minimal.

Transportation costs, however, should be considered along with the caloric content and handling costs of the resources. Hollenbach (2009) found that the distance from camp at which it is efficient for foragers to collect certain resources depends on both of these factors. Some resources such as fruit and greens with high caloric content and low handling times are best collected in an area fairly close to the central place. This is because the additional cost of transport means that their return rates drop off steeply if they are collected further from the camp. Seeds and nuts, however, despite having high caloric content also have high handling costs as discussed earlier in this chapter. This means that the addition of transportation costs does not affect their return rates as drastically as they do for fruits and greens. Return rates for seeds and nuts diminish only relatively slowly as the forager collects them farther away from their home base. The very high caloric content of hickory in particular makes it worthwhile for foragers to travel a significant distance to collect them despite their bulk. Somewhat counterintuitively, this means it would be more efficient for foragers to place their camps in areas near plant resources that require little processing, like fruit, and travel from there to collect things that require more processing, like seeds and nuts (Hollenbach 2009).

On the coast, transportation costs could also have been greatly reduced by transporting hickories or other resources partly or entirely from their collection site to the central place by canoe. The many waterways on the coast mean a single person with a canoe could easily transport large amounts of bulk resources like nuts. This could have essentially increased the foraging radius of coastal groups greatly.

Chapter Eight

Conclusions

Since there have been relatively few prior studies of prehistoric North Carolina coastal subsistence, I have attempted in this dissertation to add to our knowledge of this subject both by the addition of new data from previously un-analyzed sites and by the synthesis of existing data. In total, I examined 606 flotation samples from 337 contexts at eight coastal sites. These sites included all subregions of the coast except for the southern inner coastal plain. I also included presence/absence data on plant remains from an additional 13 previously reported sites. While there are definite physiographic and ecological differences between the inner and outer coastal plains and the northern and southern parts of the coast, there appears to have been modest differences in plant use between these areas. The most interesting spatial pattern appears to be the highly localized use of maize, which will be discussed in more detail below.

Use and Value of Coastal Resources

Studies of North Carolina coastal subsistence can contribute to the study of how humans use and interact with coastal environments in general. As discussed in Chapter 2, the coast of North Carolina is a fairly ecologically rich environment and may have parallels to other resource-rich coasts throughout the world. The large estuaries and sounds of North Carolina protected by barrier islands, especially in the northern half of the coast are ideal areas for shellfish development and the spawning of anadromous fish. The extensive inshore wetlands also provide habitats for fish, birds, and other animals, as well as water-loving plants. Even slightly elevated areas near the estuaries and streams or on the larger barrier islands, however, are home to plants that prefer drier habitats, including oaks and hickories. This means the coast of North Carolina contains a variety of plant and animal resources and that many resources may be within easy travel distance of a settlement. Even though sites from periods before the Late Archaic may have been destroyed by rising sea levels, there is evidence of coastal habitation from the Early Archaic on. The number and size of shell midden sites also indicates that coastal resources, especially shellfish, may have been attractive for prehistoric settlers.

While Glazier (1986) was correct in recognizing that plant food remains sometimes make up a very small percentage of the total carbonized plant material recovered from some coastal sites, I do not agree with his and Loftfield's (1988) conclusion that plants were therefore an unimportant food source for coastal people. Even in interior sites, it is not uncommon for carbonized wood to greatly outweigh food remains. I think a number of factors may contribute to the perceived dearth of plant food remains at coastal sites. Firstly, while preservation is variable over the coastal region, preservation at many sites seems to have been less than ideal for plant remains. At many of the sites analyzed for this dissertation, even carbonized wood is present only in small amounts. This obviously means that less common food remains may not have survived. Shell-laden features, though common and easy to find on the coast, may also not be the best contexts for plant remain recovery. Besides the abrasive qualities of shell which can destroy many of the identifying features of seeds, decomposing shell tends to form a white powder that obscures carbonized material and makes identification of seeds difficult. If any moisture is present in the samples, this shell powder almost turns into a clinging paste. I suspect fluctuating moisture levels at many sites may contribute to the breakdown of carbonized remains. Secondly, many of the sites found on the coast may have only been seasonally occupied. This obviously means that the full range of plants used by coastal people may not be represented at any one site. Only the plants used during the occupation of the site had the potential to be carbonized and enter the archaeological record there. Shorter occupations are less likely to leave a record of plants that are not very frequently used. Thirdly, as the analysis in this dissertation has shown, plant food remains *are* found at most coastal sites even if in small numbers or with little diversity. All of the sites analyzed for this study contained hickory nutshell even if there was very little carbonized material overall. Some sites had fairly diverse assemblages of plant taxa and, in a few cases, fairly high numbers of maize and hickory fragments. It is admittedly hard to reconstruct what portion of the diet these plants made up but they certainly were a part of it. The opportunity to balance the rich protein resources of coastal animals like fish and shellfish with abundant fat and carbohydrate sources like hickory, maize, and other plants may have been part of what drew prehistoric people to settle on the coast.

It is important to note that some plant resources that might have been important in prehistory may be archaeologically invisible. Early English settlers of North Carolina and Virginia reported that Native Americans collected and ate several kinds of roots and tubers including tuckahoe, smilax, ground nut, wild potato vine, and arrowroot.

Unfortunately, roots and tubers do not preserve well and are rarely found in the archaeobotanical record. Even if these plants were heavily used during prehistory, there is currently no evidence for them on the coast so far. They may have provided a valuable supplementary plant food source, especially during the spring and winter when few other resources were available.

Mobility and Seasonality of Coastal Groups

Season of occupation of a site can be difficult to determine from botanical evidence alone. Many plant foods can be stored extending their availability throughout the year. Occupation during some seasons, especially spring and early summer, are hard to detect through plant remains because few plants ripen during those periods. Nonetheless, plant remains can give us clues about when a site was used even if those clues are incomplete. Of the sites analyzed here, most contain plants that would suggest a late summer to fall occupation. Occupation at other times of the year cannot be ruled out but other lines of evidence would be needed to confirm or refute this. Broad Reach and 31ON1578, which contained a fairly wide array of taxa including maize, may have been occupied year round during the Middle and Late Woodland. The archaeobotanical assemblages of these sites include seeds that may have come from plants exploited as greens during the spring and the necessity of planting maize during the spring would have required at least a partial occupation of the site at that time. The Cape Creek site also may have been occupied year round during the Late Woodland as maize, beans, and greens were found there. Both Broad Reach and Cape Creek also had recognizable structures indicating that people living there found it worthwhile to invest time in building permanent or semi-permanent housing. 31ON1578 contained some structural patterns that do not appear to have been houses but it is possible that such structures existed at the site and were simply not encountered during the excavations.

The other sites analyzed in this dissertation, with the possible exceptions of the Woodland occupations of Barber Creek and Jordan's Landing, may have only been occupied on a seasonal basis. Seasonal mobility seems like a reasonable strategy to allow people to take advantage of the periodic wealth of resources available on the coast. Anadromous fish runs, and perhaps to a smaller extent migratory birds and turtles, could potentially provide a very large amount of meat in a short amount of time, if foragers are in place to exploit them. Shellfish are theoretically available year round. However, many cultures seem to have exploited shellfish only during certain times of the year. If, as Claassen's (1983) study of North Carolina shell middens suggests, prehistoric people were collecting shellfish most often in the fall to late winter or spring, the early part of the shellfishing season may have overlapped with the seasonal abundance of many plant resources and forced people to make decisions about which resources to exploit. The later half of the shellfishing season, however, largely coincides with a time when plant resources would have been minimal and there would have been few conflicting subsistence opportunities.

Probably the most important seasonally available plant resource on the coast was hickory nuts. The importance of hickory in coastal diets has implications for the settlement and mobility patterns of coastal groups. Hickory nuts ripen in the fall and, since they are an important food source for wildlife, humans hoping to exploit them must act fairly quickly after they fall from the trees or few nuts will be left. Hickory nuts are a good source of fat and calories and since they are highly storable they were probably a very attractive food source. This, of course, means that people had to be near hickory groves in the fall. Hickories grow in a wide variety of locations but most often are found in slightly elevated areas above water sources like rivers. In other words, they would be less common directly on the coasts or estuaries. If a group did not live within easy distance of a hickory grove, seasonal moves of part or all of the group to hickory-rich areas may have been a valuable opportunity to acquire a large amount of food. As Hollenbach's (2009), central place foraging model demonstrated hickories provide a high enough return rate to justify transporting them over fairly substantial distances. Decisions on where and when to collect hickories would have to be balanced against other foraging opportunities like fishing and shellfishing and agricultural tasks like harvesting crops.

Impact of Domesticated Plants on Coastal Subsistence

There is currently no indication that the inhabitants of coastal North Carolina practiced agriculture before the introduction of maize farming sometime during the Late Woodland. The starchy and oily seed species are found only in very low numbers in most coastal sites and, except for squash, were most likely collected from wild populations. The chenopod seeds from the Cape Creek site dating to the Late Woodland and historic periods were of a wild variety and I believe the other chenopod seeds recovered during my analysis were probably also wild varieties. Squashes, which were most likely cultivated, were only found in Late Woodland and historic sites and usually at sites that also contained maize. Beans also seem to have been a late addition to the coastal diet, appearing only in Late Woodland and historic sites, and again mostly in sites that also contain maize.

While a single cupule was recovered from a feature at 31ON1578 with Early Woodland ceramics, it is highly likely that this piece of maize was intrusive from another context and may date later than the Early Woodland. My dissertation, however, did provide much more concrete evidence of Late Woodland maize agriculture at both 31ON1578 and Broad Reach. This agrees with previous reports of maize on the coast, all of which dated to the Late Woodland or historic periods. After the introduction of maize to the coast, however, it was not universally adopted as happened in many other regions of the southeastern United States. Instead, maize farming seems to have been a highly localized activity carried out in some areas and not in others.

The southern outer coastal region centered around Onslow and Carteret counties in particular seemed to be a locus of maize farming communities. Besides Broad Reach and 31ON1578 analyzed here, the Hammocks Beach West, Flynt, Cape Island, 31ON195, and 31ON031 sites are all fairly close to each other and all have maize in Late Woodland features. More research would be needed to determine the relationship between these sites. Some of the sites seem to have been occupied repeatedly for fairly long time periods. It is unclear if they would have been occupied at the same time by multiple groups of people and if so how these groups may have been related. It is also possible that some of the sites were occupied by the same group of people at different times. As Loftfield and Loftfield and Jones (1988; 1995) pointed out, there are no indications that prehistoric people of the coast fertilized their fields and eventually continuous farming of the same plot of land would deplete the soil and reduce yields. This often encouraged slash and burn horticulturalists to shift their village location periodically to exploit new fields. They might then eventually return to the prior village and field locations after they had lain fallow for a time since they would be fairly easy to re-clear. Loftfield and Jones (1995) estimated that villages may have been moved every five to ten years. Nevertheless, it seems clear that this part of the coast was home to a community or group of communities of people who began farming maize in the Late Woodland and formed fairly permanent settlements. These farmers may have been attracted to the area by the combination of arable land and coastal resources like shellfish or other favorable environmental or social traits.

Interestingly, stable isotope studies of individuals from these sites have produced varying estimates of the importance of maize in the inhabitants' diets. Trimble's (1996) analysis of skeletal remains from the Flynt site indicated a diet high in marine resources and maize. Norr's (2002) analysis included 14 individuals from the Broad Reach site but their isotopic signatures indicated that maize was not an important part of their diet. While maize was clearly grown and consumed at Broad Reach, it is possible that it was not a major component of the diet but instead served as only one subsistence option among many. The site's inhabitants certainly consumed wild plants, especially hickory, throughout its occupation.

Since the southern outer coast is the area of the coast for which the most sites have been analyzed, it is possible that further study will reveal other areas of the coast where maize farming was common during the Late Woodland. The northern inner coastal plain may be one such area, as indicated by the maize found at Jordan's Landing during its excavation. Some groups of people on the northern outer coast also apparently farmed maize during the Late Woodland and historic periods but that does not seem to have been universally true. Of the six assemblages on the northern outer coast discussed here dating to the Late Woodland or historic periods, only two contained maize.

Coastal Diet-Breadth

Human behavioral ecology and the diet-breadth model have been successfully used to study other coastal groups and proved to be useful in understanding prehistoric subsistence strategies on the coast of North Carolina as well. In Chapter 7, I assembled estimated handling return rates for most of the major plant food resources of the region. These return rates are based on how much caloric energy a forager or farmer would derive from collecting or raising a specific taxon compared to how much energy they would have expended in collecting and processing the plants for consumption. The return rates for these plants were ranked from highest to lowest and the diet-breadth model predicts that efficient foragers should always collect the top ranked resources and add lower ranked resources depending on the abundance of the higher ranked items. If high ranked resources are scarce, diet breadth will increase to include more resources.

The ranking of coastal plant resources corresponded fairly well with the plants recovered from coastal sites. Hickory, one of the highest ranked resources, was the most frequently recovered food from coastal sites. Chenopod, the highest ranked of the starchy and oily seeds, was the most frequently recovered taxon from that category at coastal sites. The starchy and oily seeds, however, are generally only an occasional component of coastal plant assemblages and presumably therefore of the diet of prehistoric coastal people. This may be because these seeds usually require a large amount of processing and foragers may not have found it worth their time to spend so much effort on foods with relatively little reward. Acorns, similarly, were fairly low in the list of return rate rankings because of the long processing times required. This helps to explain why prehistoric coastal foragers may have chosen to focus on hickory, even though acorns were probably more common on the coast. Fruits, on the other hand, require very little processing times and so may have been exploited whenever they were encountered.

The diet-breadth model also suggested that maize farming, and the farming of other crops like squash and beans, may yield return rates that compare favorably to some wild resources but less favorably to others. Collecting hickory and fruit seem to have higher return rates than most farming activities, except perhaps for squash farming. On the other hand, maize farming seems to be more efficient than some foraging activities like collecting acorns and starchy and oily seeds. The diet-breadth model then would suggest that the inhabitants of the North Carolina coast may have turned to farming if there were not enough high ranking wild resources, like hickory and fruit, to sustain their population for one reason or another. This might be because of a change in abundance of these resources, an increase in population, or a combination of the two. An improvement in farming technology or yields would have also encouraged the adoption to domesticated plants.

There may have also been social factors influencing coastal peoples' decision to farm or to continue to rely on foraging. As may have been the case on the southern outer coast, the development of a sedentary community or group of communities may have decreased local wild resources or increased local populations to the point that diet breadth would have to be increased. Farming, in some cases, may have been a more efficient way to achieve this than collecting wild resources with low return rates. Thomas (2008) also suggested that maize farming may in some cases have served as a social form of costly signaling. In other words, farming maize may have enhanced the reproductive fitness of farmers not through energetic efficiency but by increasing the farmer's status and prestige. Demonstrating the ability to successfully produce a maize crop may convey information about the farmer's cognitive skills, work ethic, generosity, and leadership skills in much the same way successfully capturing large game seems to do for "show-off" hunters. These qualities may attract potential mates and allies and the maize produced could be used to form social relationships through sharing, trade, or hosting feasts (Thomas 2008). While costly signaling strategies are usually associated with males and most farming was conducted by women in the prehistoric Southeast, Thomas (2008) points out that women may have found the social benefits of farming to outweigh the higher risk of failure inherent in farming rather than foraging.

Suggestions for Future Research

While this dissertation added greatly to our knowledge of prehistoric North Carolina coastal subsistence, it also highlights exactly how much is left unknown. There are several obvious places where more archaeobotanical data would help greatly to flesh out the picture of coastal subsistence. Very few Archaic or Early Woodland sites, for example, have been analyzed so far. Unfortunately, because of sea-level changes and preservation issues, there may simply not be many of these sites that are potentially recoverable. However, the example of Barber Creek shows that there may be sites with intact stratigraphy dating back to the Early Archaic in at least some areas of the coast. Analysis of more early sites may help to elucidate the seeming expansion of diet-breadth through time on the coast. It is entirely possible that people used a wider variety of plant resources before the Late Woodland than are represented here but have not been recovered because of sampling error.

Currently, very little can be said about plant-based subsistence patterns on the southern inner coastal plain because so few sites have been analyzed from this area. A few more sites have been analyzed from the northern inner coastal plain but more research in this area would also be helpful. It would be especially interesting to be able to compare such data with the bioarchaeological work of Hutchinson (2002).

Further research would also allow for a more detailed discussion of the distribution of farming communities during late prehistory and the timing of the adoption of agriculture by coastal people. The current indications of different use of agriculture on different parts of the coast are tantalizing but hard to explain at this point. It would be interesting to see if areas where people decided to farm maize share common ecological or social traits.

Finally, other lines of evidence about coastal subsistence would help to create a better picture of the lives of prehistoric coastal people. Zooarchaeological evidence would be especially helpful because it seems likely that marine animal resources such as fish and shellfish may have had a very large impact on the seasonal mobility and settlement decisions of the inhabitants of the coast. Combining information on plant and animal subsistence would give us a better idea of the competing foraging opportunities that these people would have had to choose between. More bioarchaeological studies of the area would also make an interesting compliment to this research as they would provide another way of examining diet and subsistence. Stable isotope data may provide an opportunity to examine the relative contribution of maize and other plants to the diet of coastal people.

While the opportunities for future research are always endless, I believe this research presents an important step in a better understanding of how prehistoric people on the coast of North Carolina lived. Subsistence-related decisions and activities are a large part of everyone's daily concerns, whether we are consciously aware of it or not, and they influence many other aspects of our lives. Better knowledge of what decisions people on the coast of North Carolina faced and what choices they made takes us at least one step closer to a better understanding of them and adds to our understanding of how humans interact with their environment in general.

Appendix

Table A.1. Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	N	E	Feature	Half	Zone	Level	Depth (cmbs)	Quad	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.
426	443	432	4	W	1	1			171.68		0.53	167.15	3.68
1710	445	426			1	1	0-10		64.63	33.11	0.06	28.68	4.28
1709	447	426			1	1	0-10		29.72		0.61	21.9	7.14
1723	447	428			1	1	0-10		225.68	66.91	0.21	54.11	12.08
1711	447	430			1	1	0-10		59.14	34.78	0.12	29.49	5.13
1707	450	432			1	1	0-10		34.53		0.77	24.58	9
380	454	432	3	E	1	1			91.04		0.36	88.56	2.02
481	454	432	1	W	1	1			259.93		10.22	237.77	7.19
1708	454	434			1	1			42.38		0.67	27.73	13.56
1399	454	470			1	1		D	174.45		0.08	171.06	2.87
1719	445	426			1	2	10-20		27.12		0.07	22.44	4.55
598	445	432			1	2	10-20	C	74.3		0.37	72.3	1.53
313	446	442			1	2	10-20	B	75.97		0.27	74.1	1.48
1718	447	426			1	2	10-20		50.1		0.01	43.1	6.69
1730	447	428			1	2	10-20		44.7		0.29	36.35	7.92
1712	447	430			1	2	10-20		28.15		0.16	21.64	6.28
1716	454	434			1	2	10-20		20.55		0.56	16.2	3.71
1423	454	470			1	2	10-20	D	67.43		0.18	65.68	1.3
1713	456	432			1	2	10-20		18.09		0.79	13.8	3.46
346	442	442			1-2	3	20-30	D	125.07		0.92	119.57	4.1
1727	445	426			1-2	3	20-30		33.06		0.31	26.2	2.85
330	446	442			2	3		C	100.8		0.15	94.79	2.74
1722	447	426			1-2	3	20-30		28.16		0.28	21.59	5.36
1742	447	428			1-2	3	20-30		37.16		0.34	33.88	2.74
1724	447	430			1-2	3	20-30		29.32		0.52	23.9	4.8
357	447	432			2	3	25-30	D	104.48		0.5	100.59	3.26
316	447	432		SE	2	3		D	83.4		0.71	79.61	1.87
1386	450	470			2	3		D	28.77		0.28	26.96	0.96
1720	454	434			1-2	3	20-30		13.52		0.62	10.13	2.69
1442	454	470			2	3	25-30	D	33.1		0.28	31.4	1.25
1434	454	470			2	3			87.31		0.48	83.42	2.9

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	Plant Wt.	Hickory		Acorn		Grape	Haw	Sumpweed	Bearsfoot	Blackgum	Weedy Legume	Pinecone	Bud	Gall
		Ct.	Wt.	Ct.	Wt.									
426	0.53													
1710	0.06						1		1					
1709	0.61													
1723	0.21	2	0											
1711	0.12													
1707	0.77						3					4		
380	0.36													
481	10.22													
1708	0.67													
1399	0.08					1								
1719	0.07													
598	0.37													
313	0.27													
1718	0.01													
1730	0.29												1	
1712	0.16													
1716	0.56													
1423	0.18													
1713	0.79													
346	0.99	4	0.07										1	
1727	0.41	2	0.05	10	0.05		1							
330	0.15													
1722	0.28													
1742	0.34													
1724	0.52													
357	0.5													
316	0.71													2
1386	0.79	32	0.51											
1720	0.62													
1442	0.28													
1434	0.48									1				

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	Unidable		Lithic	Ceramic
	Ct.	Wt.	Wt.	Wt.
426	1	0		
1710				
1709	3	0		
1723				
1711	1	0		
1707	3			
380				
481	6	0.05		2.8
1708	2	0		
1399	1	0		
1719				
598				
313				
1718				
1730				
1712				
1716				
1423	3	0		
1713				
346				
1727				3.49
330				2.79
1722				0.76
1742	5	0		
1724				
357	1	0		
316				1.08
1386				
1720				
1442	1	0.02		
1434	3	0		

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	N	E	Feature	Half	Zone	Level	Depth (cmbs)	Quad	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.
1717	456	432			1-2	3	20-30		19.19		0.55	14.97	3.59
727	456	434			1-2	3	20-30	D	44.95		0.35	43.05	1.44
386	442	442			2	4	30-40	D	140.15		0.81	134.37	4.55
357	443	432			2	4	30-33		94.41		0.3	90.15	3.76
632	444	442			2	4	30-40		113.19		0.29	109.88	2.85
1734	445	426			2	4	30-40		39.64		0.66	31.99	3.43
348	446	442			2	4			81.52		0.23	75.99	2.3
1735	447	426			2	4	30-40		24.1		0.15	18.87	5.04
1750	447	428			2	4	30-40		31.68		0.4	28.09	3.11
1732	447	430			2	4	30-40		36.44		0.35	30.78	5.21
338	447	432		SE corner	2	4			77.55		0.51	74.13	2.35
1400	450	470			2	4		D	27.05		0.52	25.45	0.69
1453	454	470			2	4	30-40	D	39.18		0.56	36.99	1.5
1721	456	432			2	4	30-40		13.3		0.35	8.64	3.98
739	456	434			2	4			62.96		0.37	59.71	2.63
403	442	442			2	5	40-50	D	79.94		0.32	75.16	4.31
373	443	432			2	5	48-50	C	99.65		0.37	95.55	3.65
1769	445	426			2	5	40-50		78.4		0.61	74.11	2.9
387	446	442			2	5	40-50	D	83.65		0.23	80.93	2.45
1743	447	426			2	5	40-50		36.45		0.29	32.98	3.1
1757	447	428			2	5	40-50		19.39		0.1	16.91	2.36
1749	447	430			2	5	40-50		30.06		0.31	24.51	5.04
358	447	432			2	5		D	77.51		0.61	73.7	2.63
1473	450	470			2	5	40-50	D	36.12		0.56	32.81	1.89
1733	454	434			2	5	40-50		30.88		0.35	24.76	5.71
1728	456	432			2	5	40-50		28.17		0.32	24.99	2.69
752	441	432			2	6	50-53	A	114.39		0.2	109.68	4.29
1771	445	426			2	6		D	46.8		0.36	43.88	2.49
839/432	446	442			2	6			113.01		0.33	108.03	3.42
1753	447	426			2	6	50-60	D	27.87		0.23	25.15	2.39
1781	447	428			2	6	50-60	D	37.79		0.19	34.22	3.28

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	Plant Wt.	Hickory		Acorn		Grape	Haw	Sumpweed	Bearsfoot	Blackgum	Weedy Legume	Pinecone	Bud	Gall
		Ct.	Wt.	Ct.	Wt.									
1717	0.55													
727	0.38	1	0.03											
386	0.93	7	0.12											
357	0.35	2	0.05											
632	0.35	3	0.06											
1734	0.76	4	0.1											
348	0.23													
1735	0.15													
1750	0.4													
1732	0.35													
338	0.76	14	0.25											
1400	0.52													
1453	0.59	1	0.03											
1721	0.35													
739	0.37													
403	0.35	3	0.03											
373	0.37							1						
1769	0.76	22	0.06	26	0.09									
387	0.23													
1743	0.29													
1757	0.1													
1749	0.42	8	0.11											
358	0.94	21	0.33											
1473	1.27	43	0.71											
1733	0.35													
1728	0.42	4	0.1											
752	0.28	5	0.08											
1771	0.36			1	0									
839/432	0.33													
1753	0.25	1	0.02											
1781	0.19													

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	Unidable		Lithic	Ceramic
	Ct.	Wt.	Wt.	Wt.
1717				
727				
386	2	0		
357				
632	1	0		
1734				3.31
348			2.84	
1735				
1750	1	0		
1732				
338				
1400				
1453	1	0		
1721				0.27
739	1	0		
403				
373				
1769				
387				
1743				
1757				
1749				
358	2	0.06		
1473				
1733				
1728				
752				
1771				
839/432				
1753				
1781				

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	N	E	Feature	Half	Zone	Level	Depth (cmbs)	Quad	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.
1770	447	430			2	6		D	49.24		0.05	43.35	5.79
385	447	432			2	6	50	D	95.88		0.63	88.98	5.39
1539	454	470			2	6	50-60	D	46.03		0.44	44.24	1.15
1401	455	459			2	6	50-60	A	26.23		0.22	24.45	1.47
1736	456	432			2	6	50-60		20.23		0.33	16.24	3.53
795	456	434			2	6		D	68.25		0.11	66.33	1.63
464	442	442			2	7		D	133.41		0.53	129.53	3.15
451	443	432			2	7	60-62	B	131.14		0.09	128.44	2.44
1816	445	426			2	7	60-70	D	29.74		0.09	26.86	2.58
728	445	432			2	7	60-70	C	119.8		0.13	115.84	3.41
1379	445	434			2	7	60-70	A	46.62		0.08	44.21	1.98
1446	445	459			2	7	60-70	A	27.3		0.19	24.43	2.64
440	446	442			2	7	60-90		54.89		0.03	53.47	1.38
1775	447	426			2	7	60-70	C	2.87		0.12	2.33	0.4
1809	447	428			2	7	60-70	D	27.99		0.1	24.83	2.99
1791	447	430			2	7	60-70		42.57		0.08	36.2	5.25
421	447	432			2	7		D	67.08		0.41	63.89	2.29
1536	453	461			2	7		C	29.63		0.39	27.48	1.32
524	454	432			2	7		D	23.75		0.1	22.86	0.74
1761	454	434			2	7	60-70		23.3		0.02	20.96	2.28
1765	456	432			2	7	60-70	A	16.91		0.31	15.09	1.46
805	456	434			2	7	60-70	D	43.58		0.18	41.56	1.68
737	439	437			2	8	70-80	D	216.49		0.37	205.65	9.19
471	443	432			2	8	70-72	C	121.26		0.29	117.23	3.54
744	444	442			2	8	80-90		61.45		0	58.17	3.13
1852	445	426			2	8	70-80	D	26.79		0.21	23.21	3.34
1402	445	434			2	8	70-80	A	31.26		0.24	29.26	1.33
467	446	442			2	8	70-80	D	58.97		0.01	56.6	2.28
1793	447	426			2	8	70-80	D	23.65		0.06	21.1	3.36
1840	447	428			2	8	70-80	D	51.26		0.11	39.3	11.78
1825	447	430			2	8	70-80	D	29.5		0.02	23.89	5.56

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	Plant Wt.	Hickory		Acorn		Grape	Haw	Sumpweed	Bearsfoot	Blackgum	Weedy Legume	Pinecone	Bud	Gall
		Ct.	Wt.	Ct.	Wt.									
1770	0.05													
385	1.36	54	0.73											
1539	0.56	7	0.12											
1401	0.22													
1736	0.39	3	0.06											
795	0.11	2	0											
464	0.53													
451	0.09													
1816	0.25	10	0.16											
728	0.13													
1379	0.35	16	0.27											
1446	0.19													
440	0.03													
1775	0.12													
1809	0.1													
1791	0.08													
421	0.85	23	0.44											
1536	0.39													
524	0.1										1			
1761	0.02													
1765	0.31													
805	0.26	4	0.08											
737	s.	10	0.11											
471	0.29													
744	0.07	7	0.07											
1852	0.21													
1402	0.55	14	0.31											
467	0.01													
1793	0.11	2	0.05											
1840	0.11													
1825	0.02													

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	Unidable		Lithic	Ceramic
	Ct.	Wt.	Wt.	Wt.
1770				
385	2	0		
1539				
1401				
1736				
795				
464				
451				
1816	1	0		
728				
1379				
1446				
440				
1775				
1809				
1791				
421				
1536				
524				
1761				
1765				
805				
737				
471				
744				
1852				
1402				
467				
1793				
1840				
1825				

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	N	E	Feature	Half	Zone	Level	Depth (cmbs)	Quad	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.
429	447	432			2	8		D	103.59		0.83	98.15	4.11
1403	447	440			2	8	70-80	B	44.31		0.06	42.79	1.43
1549	453	461			2	8		C	19.69		0.23	18.49	0.64
552	454	432			2	8		D	63.21		0.07	61.85	1.21
1794	454	434			2	8	70-80	A	12.16		0.21	9.73	2.17
1651	454	470			2	8	70-80	D	80.85		0.31	78.19	2.19
1468	455	459			2	8	70-80	A	32.24		0.23	30.37	1.52
1801	456	432			2	8	70-80		8		0.04	6.77	0.98
821	456	434			2	8			60.26		0.04	58.76	1.3
539	442	442			3	9	80-90	C	88.14		0.26	83.96	3.82
521	443	432			3	9	80-83		150.4		0.02	144.29	5.9
792	445	432			3	9	80-90	D	86.47		0.05	81.65	4.66
1436	445	434			3	9	80-90	A	36.54		0.04	34.57	1.53
486	446	442			3	9	80-90		55.39		0.01	52.6	2.7
1814	447	426			3	9	80-90	C	20.1		0.06	16.96	3.04
1848	447	430			3	9	80-90	D	28.82		0.03	24.45	4.28
446	447	432			3	9	80	D	64.45		0.14	61.87	2.27
1445	447	440			3	9	80-90	A	33.2		0.01	31.67	1.48
566	454	432			3	9		D	72.93		0.05	70.99	1.75
1833	454	434			3	9	80-90		13.25		0.02	10.86	2.34
1673	454	470			3	9	80-90	D	54.68		0.11	53.12	1.35
1479	455	459			3	9	80-90	B	17.8		0	17.09	0.66
18296	456	432			3	9	80-90		8.31		0.05	6.87	1.38
820	456	434			3	9			33.81		0.06	31.9	1.81
818	441	432			3	10	90-100	A	128.64		0.01	123.96	4.55
539	442	442			3	10	90-100	B	84.47		0.03	80.95	3.41
541	443	432			3	10	90-93	B	89.47		0	86.05	3.35
816	445	432			3	10	90-100	D	113.62		0	110.87	2.66
482	447	432			3	10	90-100	D	63.52		0.04	61.4	1.97
1397	447	436	13			10	~92	C	423.5	242.2	16.49	216.48	6.93
1472	447	440			3	10	90-100	A	26.98		0.01	25.71	1.23

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	Plant Wt.	Hickory		Acorn		Grape	Haw	Sumpweed	Bearsfoot	Blackgum	Weedy Legume	Pinecone	Bud	Gall
		Ct.	Wt.	Ct.	Wt.									
429	1.16	14	0.33											1
1403	0.06													
1549	0.51	15	0.28											
552	0.07													
1794	0.21													
1651	0.36	5	0.05											
1468	0.27	4	0.04											
1801	0.18	5	0.14											
821	0.06	3	0.02											
539	0.26													
521	0.02													
792	0.05													
1436	0.37	18	0.33											
486	0.01													
1814	0.06													
1848	0.03													
446	0.24	9	0.1											
1445	0.01													
566	0.05													
1833	0.02													
1673	0.11	2	0											
1479	0	1	0											
18296	0.05													
820	0.06													
818	0.01													
539	0.03													
541	0													
816	0													
482	0.05	1	0.01											
1397	16.54	3	0.05											
1472	0.01													

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	Unidable		Lithic	Ceramic
	Ct.	Wt.	Wt.	Wt.
429				
1403				
1549				
552				
1794	2	0.03		
1651				
1468	1	0		
1801				
821				
539				
521	1	0		
792				
1436				
486				
1814				
1848	1	0		
446				
1445				
566				
1833				
1673				
1479				
18296				
820				
818				
539				
541				
816				
482				
1397	1	0		
1472				

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	N	E	Feature	Half	Zone	Level	Depth (cmbs)	Quad	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.
592	454	432			3	10	90-100	D	50.18		0.04	48.87	1.22
1853	454	434			3	10	90-100	A	13.46		0.01	11.28	2.13
828	456	434			3	10	90-100		49.5		0	48.24	1.2
550	443	432			3	11	100-103		82.01		0	80.07	1.86
823	445	432			3	11	100-110	D	149.01		0	145.74	3.11
1521	445	434			3	11	100-110	A	58.18		0	56.19	1.93
838/513	446	442			3	11	100-110	C	59.83		0	58.23	1.52
1412	447	436			3	11	100-110	A	78.23		0.01	77.25	0.89
630	454	432			3	11	100-110		57.57		0	56.37	1.14
1518	445	434			3	12	110-120	A	37.39		0	36.54	0.8
1443	447	436			3	12	110-120	A	92.46		0	91.94	0.44
1661	453	461			3	12	110-120	D	48.89		0.01	47.03	1.79
1484	447	436			3	13	120-130	A	175.82		0.01	173.76	1.86
1504	447	440			3	13	120-130	A	73.49		0	71.77	1.71
1674	453	461			3	13		A	24.52		0.01	22.93	1.54
1562	445	434			3	14	130-140	A	69.29		0.01	68.26	0.99
1555	445	443			3	14	130-140	A	56.2		0.01	55.41	0.76
1553	447	440			3	14	130-140		76.4		0.02	75.02	1.29
1545	455	461			3	14	130-140	B	2.33		0	0.57	1.76
1648	455	459			3	15		D	5.69		0	5.39	0.3
1652	455	489			3	16	150-160	B	22.62		0	20.11	2.45
1610	445	434			3	17	160-170	A	220.47		0	209.94	10.45
1655	455	459			3	17	160-170	B	18.24		0	17.25	0.94
1649	455	434			3	18	170-180	A	139.93		0	131.17	8.75
1671	455	459			3	18	170-180		5.25		0	5.02	0.19
1630	455	461			3	18		B	8.66		0	8.19	0.47
1669	445	434			3	19	180-190	A	274.62		0	258.8	15.75
1725	454	434							16.7		0.42	13.48	2.69

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	Plant Wt.	Hickory		Acorn		Grape	Haw	Sumpweed	Bearsfoot	Blackgum	Weedy Legume	Pinecone	Bud	Gall
		Ct.	Wt.	Ct.	Wt.									
592	0.04													
1853	0.01													
828	0													
550	0													
823	0													
1521	0													
838/513	0													
1412	0.01													
630	0													
1518	0													
1443	0													
1661	0.01													
1484	0.01													
1504	0													
1674	0.01													
1562	0.01													
1555	0.01													
1553	0.02													
1545	0													
1648	0													
1652	0													
1610	0													
1655	0													
1649	0													
1671	0													
1630	0													
1669	0													
1725	0.44	1	0.02											

Table A.1 (continued). Detailed Summary of Flotation Samples from Barber Creek (31PT259).

FS	Unidable		Lithic	Ceramic
	Ct.	Wt.	Wt.	Wt.
592				
1853				
828				
550				
823				
1521				
838/513				
1412				
630				
1518				
1443				
1661				
1484				
1504				
1674				
1562				
1555				
1553				
1545				
1648				
1652				
1610				
1655				
1649				
1671				
1630				
1669				
1725	1	0		

Table A.2. Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.
1029	C	EU 54 Lv. 1	B	N	12.43		3.38	6.25	2.72	3.38
1031		EU 57	C		14.48		3.8	6.29	4.24	3.8
697			EU 4 Lv. 1		0.27		0	0	0	0.27
224		4	10	N	2.47		0.4	1.27	0.75	0.43
200		4	14	N	1.27		0.34	0.7	0.24	0.34
201		4	14	S Lv. 2	0.41		0.05	0.09	0.27	0.05
219		4	14	Lv. 2	0.3		0.08	0.16	0.06	0.08
221		4	19	NE	14.59		3.29	7.63	3.62	3.29
220		4	19	SW	9.15		2.05	4.96	2.12	2.05
164		4	19	SW	4.82		0.74	3.06	0.99	0.74
222		4	19	NE	7.51		1.41	3.76	2.31	1.41
106		4	21	E	0.8		0.41	0.11	0.28	0.41
88		1	92	N	2.26		0.46	0.48	1.31	0.46
87		1	92	S	3.81		0.56	1.07	2.01	0.66
9		1	93	N	2.49		0.31	0.15	1.96	0.35
2		1	93	S	0.61		0.06	0.09	0.45	0.06
183		1	101	S	1.57		0.55	0.44	0.58	0.55
69		5	131	E	1.68		0.42	0.35	0.83	0.42
51		5	131	W	4.99		0.28	3.57	1.09	0.28
49		5	132/133	W	6.06		0.8	2.86	2.39	0.8
56		5	132/133	E	5.7		0.39	1.6	3.68	0.39
21		5	132/133	W	6.48		0.65	3.87	1.94	0.65
137		5	139	N	0.4		0.05	0.22	0.14	0.05
37		5	140	E	4.28		0.44	0.81	3.01	0.44
90		5	140	E	1.91		0.33	0.57	1	0.33
61		5	145	S	5.49		1.02	0.37	3.56	1.52
391			146	W	2.23		0.12	1.88	0.23	0.12
60			146	E	0.52		0.16	0.06	0.29	0.16
112		5	153	W	0.95		0.09	0.1	0.75	0.09

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Hickory		cf. Acorn meat		Blackgum	Dogwood	American Holly	Palmetto	Goosegrass	cf. Wax Myrtle
		Ct.	Wt.	Ct.	Wt.						
1029	B										
1031	C						2				
697	EU 4 Lv. 1	7	0.27								
224	10	5	0.03								
200	14										
201	14										
219	14										
221	19										
220	19										
164	19										
222	19										
106	21										
88	92										
87	92	7	0.1								
9	93	3	0.04								
2	93										
183	101										
69	131	1	0								
51	131								1		
49	132/133										
56	132/133										
21	132/133										
137	139										
37	140										
90	140										
61	145	19	0.5								
391	146										
60	146										
112	153										

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Persimmon	Weedy Legume	Pinecone	Bud	Unid.		Unidable	
						Ct.	Wt.	Ct.	Wt.
1029	B								
1031	C		1					4	0
697	EU 4 Lv. 1								
224	10								
200	14							1	0
201	14								
219	14								
221	19								
220	19								
164	19								
222	19					2	0		
106	21								
88	92							1	0
87	92					3	0.03		
9	93								
2	93								
183	101								
69	131								
51	131							1	0
49	132/133					1	0	1	0
56	132/133					1	0		
21	132/133								
137	139								
37	140								
90	140								
61	145					1	0.01		
391	146								
60	146								
112	153								

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.
302		5	153	E	129.69		0.28	6.81	122.19	0.28
70		5	157	SE	0.37		0.1	0.03	0.24	0.1
94		4	158	S	0.33		0.02	0.18	0.1	0.05
95		4	158	N	0.36		0	0.15	0.17	0.03
169		3	171		5.34		0.21	2.45	1.34	0.27
197		3	171	NE	1		0.07	0.54	0.28	0.17
163		3	171	SW	2.42		0.3	1.33	0.59	0.49
260		3	174	E	6.45		0.74	3.27	2.41	0.77
161		3	176	N	2.78		0.45	1.81	0.51	0.45
190		3	176	S	4.12		0.52	2.37	1.16	0.57
241		3	181	N	0.61		0.06	0.21	0.31	0.06
244		3	181	S	0.23		0.05	0	0.17	0.05
86		6	194	E	1.3		0.1	0.39	0.8	0.1
117		6	216	E	78.01		70.5	6.22	0.03	70.5
119		6	216	E Feature Fill	463.18	232.48	170.42	24.49	13.73	170.42
145		6	216	E Bottom	263.56		200.85	19.8	4.51	200.85
143		6	216	E Top	60.43		38.82	15.13	4.57	38.82
144		6	217	W	442.71	108.35	82.95	12.06	6.21	83.25
146		6	217	W	1.29		0.53	0.15	0.58	0.56
8			220	E	0.84		0.11	0.19	0.45	0.2
121			220	W	2.67		0.26	0.26	1.19	1.2
82		11	240	W	12.98		2.81	4.34	5.82	2.81
3		11	240	E	3.81		0.92	1.79	1.09	0.92
33		10	248	S	1.44		0.28	0.11	1.06	0.28
390		10	248	N	1.52		0.12	1.12	0.25	0.12
20		10	249	W	8.62		0.7	4.22	3.68	0.7
152		10	249	E	2.62		0.39	0.17	2.11	0.39
79			257	E	4.43		0.85	0.25	3.06	0.85
83		11	258	S	16.58		1.63	2.38	12.51	1.63

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Hickory		cf. Acorn meat		Blackgum	Dogwood	American Holly	Palmetto	Goosegrass	cf. Wax Myrtle
		Ct.	Wt.	Ct.	Wt.						
302	153										
70	157										
94	158	4	0.03								
95	158	4	0.03								
169	171	7	0.06								
197	171	6	0.1								
163	171	18	0.19								
260	174	2	0.03								
161	176										
190	176	4	0.05								
241	181										
244	181										
86	194										
117	216										
119	216						1				
145	216										
143	216										
144	217	6	0.3								
146	217	5	0.03								
8	220	13	0.09								
121	220	41	0.94								
82	240										
3	240										
33	248										
390	248										
20	249										
152	249										
79	257										
83	258										

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Persimmon	Weedy Legume	Pinecone	Bud	Unid.		Unidable	
						Ct.	Wt.	Ct.	Wt.
302	153								
70	157								
94	158								
95	158							6	0.02
169	171								
197	171							1	0
163	171								
260	174								
161	176							3	0
190	176								
241	181					2	0		
244	181								
86	194								
117	216								
119	216							12	0.15
145	216							4	0.03
143	216					6	0.03		
144	217					2	0.01		
146	217								
8	220								
121	220								
82	240								
3	240								
33	248								
390	248							2	0
20	249								
152	249					1	0		
79	257							4	0.25
83	258							2	0

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.
10		11	258	N	4.11		0.53	1.94	1.63	0.53
255		4	267	SW	1.1		0.21	0.6	0.28	0.21
208		4	267	NE	0.75		0.07	0.04	0.65	0.07
450	A		308	N	4.13		0.96	2.28	0.87	0.96
591	A		308	S	1.62		0.57	0.15	0.87	0.59
585	A		312	W	2.99		1.39	0.08	1.48	1.41
619			330	W	4.88		0.42	4.1	0.33	0.42
618			335	N	6.45		0.79	4.49	1.01	0.79
620			338	N	3.23		0.94	1.35	0.94	0.94
499			338	S	1		0	0	1	0
609			339/340	N	5.47		1.49	2.88	1.08	1.49
610			339/340	N	5.81		1.14	3.18	1.46	1.14
433	A		344	S	1011.37	134.73	99.28	8.62	19.15	99.45
434	A		344	S	532.48	170.51	131.59	16.46	18.26	131.68
616	A		344	N	45.13		10.79	25.7	4.4	10.79
602	A		345	S	5.28		0.33	2.46	2.46	0.33
515	A		347	S	0.11		0.1	0.01	0	0.1
439	A		350	S	4.86		0.45	3.1	1.29	0.45
466	A		350	N	4.64		3.21	1.39	0.01	3.21
561			353	N	0.28		0.27	0.02	0	0.27
471	A		351	S	0.32		0.21	0.1	0	0.21
459	A		355	S	3.98		0.31	2.52	1.12	0.31
448	A		360	S	2.51		0.94	0.84	0.73	0.94
473	A		366	N	0.35		0.27	0.07	0.03	0.27
449	A		366	S	2.19		0.81	0.87	0.52	0.81
483	A		370	S	0.41		0.39	0.02	0	0.39
600	A		371	W	272		0.3	1.81	0.59	0.3
622	A		374	N	1.34		0.4	0.46	0.48	0.4
436	A		382/383	N	1.23		0.2	0.57	0.46	0.2

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Hickory		cf. Acorn meat		Blackgum	Dogwood	American Holly	Palmetto	Goosegrass	cf. Wax Myrtle
		Ct.	Wt.	Ct.	Wt.						
10	258										
255	267										
208	267										
450	308										
591	308	1	0.02								
585	312	1	0.02								
619	330										
618	335										
620	338										
499	338										
609	339/340										
610	339/340										
433	344	5	0.17			1	2				
434	344			3	0.09	4	3				1
616	344										
602	345										
515	347										
439	350										
466	350										
561	353										
471	351										
459	355										
448	360										
473	366										
449	366										
483	370										
600	371										
622	374										
436	382/383										

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Persimmon	Weedy Legume	Pinecone	Bud	Unid.		Unidable	
						Ct.	Wt.	Ct.	Wt.
10	258							1	0
255	267								
208	267								
450	308								
591	308								
585	312								
619	330								
618	335							3	0.06
620	338								
499	338								
609	339/340							2	0
610	339/340								
433	344					1	0	13	0.17
434	344	1				30	0.76		
616	344					15	0.04		
602	345								
515	347								
439	350								
466	350								
561	353								
471	351								
459	355								
448	360								
473	366								
449	366								
483	370								
600	371								
622	374								
436	382/383								

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.
482	A		382/383	S	0.14		0.07	0.05	0.03	0.07
438			416	N	1.12		0.32	0.61	0.19	0.32
506			416	N 0-25	5.67		1.45	0.51	3.69	1.45
518			416	N 0-20	0.13		0.02	0.04	0.06	0.02
541			433		2.14		0.73	0.08	1.29	0.76
422			439	0-20	6.89		0.85	3.41	2.58	0.85
423			440		0.73		0.15	0.28	0.3	0.15
427			445		1.7		0.53	0.24	0.95	0.53
429			447		1.34		0.29	0.57	0.47	0.29
430			448		1.23		0.26	0.48	0.5	0.26
520	A		460	S	4.17		0.57	0.27	3.33	0.57
510	A		462	NE	0.72		0.31	0.05	0.37	0.31
531	A		463	S	0.86		0.18	0.04	0.62	0.18
543	A		481	N	0.43		0.41	0	0	0.41
617	A		482	N	1.02		0.09	0.71	0.2	0.09
647	A		484	N	2.39		0.38	1.36	0.63	0.38
649	A		487	N	4.6		1.08	2.37	1.11	1.08
633	A		487	N	0.53		0.52	0	0	0.52
621	A		494	N	1.8		0.2	0.77	0.83	0.2
498	A		522	N	0.25		0.19	0.06	0	0.19
415	A		522	N	1.79		0.2	0.52	1.07	0.2
603	A		527	S	1.78		0.2	1.19	0.4	0.2
626	A		543	N	75.93		61.52	10.49	0.28	61.52
614	A		545	N	2.31		0.36	1.26	0.66	0.36
607	A		578	NE	6.65		0.24	0.69	0.71	0.24
615	A		587	N	3.14		0.28	1.71	0.83	0.59
654	A		613	S	8.45		0.19	7.32	0.88	0.19
443	A		641	N	4.14		0.88	2.24	1	0.88
502	A		641	S	2.87		1.48	0.18	1.17	1.48

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Hickory		cf. Acorn meat		Blackgum	Dogwood	American Holly	Palmetto	Goosegrass	cf. Wax Myrtle
		Ct.	Wt.	Ct.	Wt.						
482	382/383										
438	416										
506	416										
518	416										
541	433	1	0.03								
422	439										
423	440										
427	445										
429	447										
430	448										
520	460										
510	462										
531	463										
543	481										
617	482										
647	484										
649	487										
633	487										
621	494										
498	522										
415	522										
603	527										
626	543					1					
614	545										
607	578										
615	587	19	0.31								
654	613										
443	641										
502	641										

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Persimmon	Weedy Legume	Pinecone	Bud	Unid.		Unidable	
						Ct.	Wt.	Ct.	Wt.
482	382/383								
438	416							2	0
506	416					1	0		
518	416								
541	433								
422	439								
423	440								
427	445								
429	447								
430	448								
520	460								
510	462					1	0		
531	463								
543	481								
617	482								
647	484								
649	487								
633	487								
621	494								
498	522								
415	522								
603	527								
626	543								
614	545							1	0
607	578								
615	587					1	0		
654	613								
443	641								
502	641					2	0.02		

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.
456	A		644	W	3.37		0.92	1.8	0.64	0.92
501	A		644	E	1.5		0.36	0.09	0.93	0.47
451			657	N	0.54		0.11	0.31	0.12	0.11
567			657	N	1.43		0.8	0.06	0.56	0.8
455			664	SW 0-15	1.72		0.38	0.73	0.6	0.38
581			664	SW 0-15	0.48		0.17	0	0.3	0.17
461			664	NW 0-18	1.45		0.1	0.52	0.84	0.1
559			664	NW 0-18	0.37		0.27	0.01	0.04	0.27
653	A		690	S	6.61		0.72	5.17	0.39	1
799	A		714	S	5.29		0.31	3.64	1.32	0.31
646			754	E	14.84		4.3	8.51	1.83	4.3
650	A		770	W	1.3		0.51	0.5	0.3	0.51
645	A		771 A	E	61.02		34.96	21.16	3.79	34.96
778	A		771 A	W	75	37.06	25.31	6.47	4.39	25.46
643	A		771 B	E	3.91		0.25	3.18	0.43	0.25
648	A		771 C	E	2.54		0.11	2.01	0.4	0.11
757	A		890	N	0.04		0.02	0.01	0	0.02
608	A		896	S	4.5		0.69	2.07	1.71	0.69
804	B		932	N	9.89		0.11	8.67	1.09	0.11
683	B		972	E	101.76		80.82	9.95	5.96	84.08
661	B		972	W	28.27		16.15	10.72	0.78	16.26
659	B		979	W	4.3		0.38	2.94	0.95	0.38
794	C		1000	N	13.89		2.95	7.43	3.38	2.95
802	C		1061	E	7.31		0.23	4.05	2.99	0.23
816	C		1139	N	10.33		0.7	7.08	2.44	0.7
813	C		1140	N	5.27		0.77	2.46	2.02	0.77
815	C		1141	N	5.68		0.83	2.56	2.27	0.83
810			1233	N	10.72		0.75	8.56	1.38	0.75
808	C		1237	N	12.48		3.08	6.85	2.46	3.08

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Hickory		cf. Acorn meat		Blackgum	Dogwood	American Holly	Palmetto	Goosegrass	cf. Wax Myrtle
		Ct.	Wt.	Ct.	Wt.						
456	644										
501	644	6	0.11								
451	657										
567	657										
455	664										
581	664										
461	664										
559	664										
653	690	29	0.28								
799	714										
646	754										
650	770										
645	771 A										
778	771 A	2	0.15			4					
643	771 B										
648	771 C										
757	890										
608	896										
804	932										
683	972	128	3.26								
661	972	5	0.11								
659	979										
794	1000					5	1	2			
802	1061										
816	1139										
813	1140										
815	1141										
810	1233										
808	1237										

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Persimmon	Weedy Legume	Pinecone	Bud	Unid.		Unidable	
						Ct.	Wt.	Ct.	Wt.
456	644								
501	644								
451	657								
567	657								
455	664								
581	664								
461	664								
559	664								
653	690								
799	714					2	0.01		
646	754			1		5	0	6	0
650	770								
645	771 A							1	0
778	771 A							4	0
643	771 B								
648	771 C							1	0
757	890								
608	896								
804	932								
683	972					8	0.1		
661	972							4	0.06
659	979					1	0		
794	1000		1			2	0		
802	1061							1	0
816	1139					3	0.01		
813	1140								
815	1141								
810	1233								
808	1237							4	0.01

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.
809	C		1237	N	13.2		3.99	5.56	3.59	3.99
800	C		1251	N	182.12		52.71	46.74	80.33	52.71
798	C		1307	E	13.42		5.74	6.73	0.87	5.74
795	C		1324	S	7.05		0.49	3.26	3.26	0.49
796	C		1351	S	5.86		0.2	4.14	1.49	0.2
910	C		1390B	N	14.2		0.59	10.87	2.41	0.8
927	C		1397	N	6.38		0.1	5.44	0.73	0.1
922	C		1431	S	6.4		0.22	4.95	1.21	0.22
913	C		1435	N	3.55		0.77	2.08	0.64	0.82
918	C		1444	N	4.04		0.39	2.09	1.55	0.39
817	C		1462	N	5.94		0.59	3.61	1.71	0.59
1022	C		1478	E	4.53		0.19	2.33	2	0.19
889	C		1492	S	18.85		14.03	4.66	0.06	14.03
912	C		1492	N	696.64	187.92	83.83	12.82	3.64	83.83
905	C		1492	N	165.73	89.71	45.23	14.95	16.81	45.23
944	C		1520	N	7.78		0.55	5.51	1.65	0.55
933	C		1524	N	7.49		0.6	4.11	2.75	0.6
939	C		1542	N	4.38		0.5	2	1.5	0.71
920	C		1635	N	2.45		0.16	1.27	1	0.16
929	C		1651	E	7.39		0.38	3.28	3.69	0.38
923	C		1752	N	6.91		0.12	4.08	2.67	0.12
942	C		1780	E	5.52		1.18	2.9	1.31	1.25
935	C		1790	S	27.91		14.22	10.01	3.44	14.22
1026	C		1793	W	25.76		11.69	10.64	2.82	11.69
992	D		1797	N	11.77		0.28	7.67	2.97	1.07
996	D		1798	W	12.21		0.35	4.6	5.46	1.89
1057	D		1806	S	2.96		0.32	2.61		0.32
999	D		1806	N	43.66		30.54	9.02	3.22	30.63
1000	D		1815	N	3.71		0.56	1.85	1.28	0.56

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Hickory		cf. Acorn meat		Blackgum	Dogwood	American Holly	Palmetto	Goosegrass	cf. Wax Myrtle
		Ct.	Wt.	Ct.	Wt.						
809	1237										
800	1251						1				
798	1307										
795	1324										
796	1351										
910	1390B	13	0.21								
927	1397	1	0								
922	1431										
913	1435	2	0.05								
918	1444										
817	1462										
1022	1478										
889	1492										
912	1492										
905	1492										
944	1520										
933	1524										
939	1542	15	0.21								
920	1635										
929	1651										
923	1752										
942	1780	6	0.07								
935	1790										
1026	1793										
992	1797	30	0.79								
996	1798	67	1.54								
1057	1806										
999	1806	6	0.09								
1000	1815										

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Persimmon	Weedy Legume	Pinecone	Bud	Unid.		Unidable	
						Ct.	Wt.	Ct.	Wt.
809	1237								
800	1251							1	0
798	1307								
795	1324					3	0		
796	1351								
910	1390B								
927	1397								
922	1431								
913	1435					3	0		
918	1444								
817	1462								
1022	1478					1	0		
889	1492								
912	1492								
905	1492								
944	1520					2	0		
933	1524								
939	1542		1					4	0.13
920	1635								
929	1651								
923	1752								
942	1780					1	0		
935	1790							4	0
1026	1793		1	1		3	0.01		
992	1797								
996	1798							24	0.19
1057	1806								
999	1806								
1000	1815							1	0

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.
1015	D		1817	N	9.25		1.23	6.15	1.37	1.68
995	D		1818	N	4.06		0.35	2.88	0.36	0.81
978	D		1831	N	2.52		0.42	1.32	0.71	0.42
1018	D		1840	E	3.9		0.92	2.08	0.57	0.92
1012	D		1846	N	6.98		0.75	4.84	0.88	1.21
974	D		1847	N	55		33.1	15.46	6.13	33.1
979	E		1957	E	1.87		0.16	1.34	0.35	0.19
982	E		1965	N	132.84		38.82	32.13	39.24	39.2
2074	E		1971	W	0.39		0	0.02	0.14	0.21
988	E		1971	W	5.71		1.3	2.84	1.49	1.36
1011	E		1973	S	1.76		0.03	1.72	0.01	0.03
2069	E		1973	N	0.13		0	0	0.07	0.06
997	E		1975	W	5.14		0.76	2.71	1.51	0.92
972	E		1987	N	3.82		0.24	2.47	1.05	0.3
986	E		1990	N	4.96		0.29	3.75	0.82	0.34
2050	E		2010	S	0.02		0	0	0	0
975	E		2025	E	4.31		0.52	2.89	0.88	0.52
1023	E		2107	N	3.43		0.34	2.46	0.58	0.38
998	E		2109	S	3.11		0.24	1.96	0.89	0.24
1013	E		2118	S	7.53		0.32	6.34	0.84	0.32
1069	E		2120	W	4.77		0.5	3.32	0.9	0.53
	E		2122	E	5.87		0.34	4.09	1.41	0.34
983	E		2137	N	3.4		0.49	2.04	0.77	0.53
1081	E		2149	W	4.18		0.23	2.57	1.36	0.23
1065	E		2169	N	5.69		0.46	3.37	1.77	0.46
1085	E		2176	S	5.07		0.64	2.86	1.52	0.64
1088	E		2183	N	6.01		0.24	3.44	2.31	0.24
1079	E		2199	W	5.04		0.74	3.02	1.04	0.96
1086			2238	S	5.71		0.64	1.76	3.37	0.64

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Hickory		cf. Acorn meat		Blackgum	Dogwood	American Holly	Palmetto	Goosegrass	cf. Wax Myrtle
		Ct.	Wt.	Ct.	Wt.						
1015	1817	35	0.45								
995	1818	39	0.46								
978	1831										
1018	1840										
1012	1846	26	0.46								
974	1847					3					
979	1957	3	0.03								
982	1965	24	0.38							2	
2074	1971	13	0.21								
988	1971	4	0.06								
1011	1973										
2069	1973	1	0.06								
997	1975	8	0.16								
972	1987	3	0.06								
986	1990	5	0.05								
2050	2010										
975	2025										
1023	2107	2	0.04								
998	2109	1	0								
1013	2118										
1069	2120	1	0.03								
	2122										
983	2137	2	0.04								
1081	2149										
1065	2169										
1085	2176										
1088	2183										
1079	2199	12	0.22								
1086	2238										

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Persimmon	Weedy Legume	Pinecone	Bud	Unid.		Unidable	
						Ct.	Wt.	Ct.	Wt.
1015	1817								
995	1818								
978	1831							7	0.05
1018	1840							10	0.27
1012	1846					2	0		
974	1847					2	0	15	0.28
979	1957					1	0		
982	1965							14	0.09
2074	1971								
988	1971					1	0		
1011	1973								
2069	1973								
997	1975								
972	1987		1						
986	1990					1	0		
2050	2010								
975	2025					2	0		
1023	2107								
998	2109							1	0
1013	2118								
1069	2120					1	0		
	2122								
983	2137					2	0.04		
1081	2149				1				
1065	2169					2	0.03		
1085	2176							2	0.02
1088	2183								
1079	2199					1	0		
1086	2238							6	0.03

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Area	Trench	Feat.	Half	Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.
2077	E		2276		6.25		0.2	4.15	1.76	0.3
1083			2308	W	6.96		0.73	3.79	2.29	0.81
2084	E		2484	N	2.74		0.43	1.49	0.79	0.43
2326	F		2542	S	2.84		0.26	1.26	1.32	0.26
			654	NW	1.25		0.56	2.71	0.33	0.56
			654	SE	6.2		1.46	3.15	1.54	1.46
			691	S	3.19		0.38	2.52	0.22	0.47
			1869	N	8.47		0.27	6.09	1.88	0.36
			576	N	7.82		1.78	3.08	2.85	1.78
			2010	N	2.54		0.62	1.37	0.52	0.62
			2367	N	5.57		1.3	2.71	1.52	1.3
			2277	E	93	46.06	27.26	16.5	1.93	27.26

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Hickory		cf. Acorn meat		Blackgum	Dogwood	American Holly	Palmetto	Goosegrass	cf. Wax Myrtle
		Ct.	Wt.	Ct.	Wt.						
2077	2276	6	0.1								
1083	2308	1	0.08								
2084	2484										
2326	2542										
	654										
	654										
	691	5	0.09								
	1869	3	0.09								
	576										
	2010										
	2367										
	2277										

Table A.2 (continued). Detailed Summary of Flotation Samples from the Windsor (31BR201/201**) Site.

Bag #	Feat.	Persimmon	Weedy Legume	Pinecone	Bud	Unid.		Unidable	
						Ct.	Wt.	Ct.	Wt.
2077	2276								
1083	2308								
2084	2484					3	0.02		
2326	2542								
	654							5	0.09
	654							3	0
	691							5	0.04
	1869							10	0.09
	576								
	2010								
	2367								
	2277					4	0	5	0.02

Table A.3. Detailed Summary of Flotation Samples from the Southside (31NH802) Site.

Bag #	Provenience	Level	Block	Wt.	Wood Wt.	Contaminant	Plant Wt.	Hickory		Wax Myrtle	Pinecone	Bone	Unidable
						Wt.		Ct.	Wt.				Ct.
15	EU 16	3	A	0.1	0.1		0.1						
89	EU 24	2	Block	0.11	0.11		0.11						
222	Fea 8		C	0.12			0.12	1	0.12				
576	EU 113	3	E	0.19	0.19		0.19						
643	EU 127	PP	C	0.01			0						1
649	EU 128	3	C	0.11			0.11	2	0.11				
797	EU 145	4	H	0.29	0.29		0.29						
808	EU 146	PP	H	0.16			0.16	1	0.16				
813	EU 147	3	H	0.38			0.38	2	0.38				
1008	EU 155	3	I	0.03	0.03		0.03						
1018	EU 156	2	I	0.26	0.26		0.26						
1035	TU 156B	2	I	1.52	0.55		1.52	6	0.97				
1081	EU 160	4	C	0.8	0.37		0.8	2	0.43				
1133	Fea 23		C	0.24	0.2	0.01	0.23	2	0.03				2
1134	Fea 19		F	0.08	0.08		0.08						
1135	Fea 14		C	0.46	0.22	0.05	0.38	3	0.16				5
1137	Fea 18/22		C	0.2	0.2		0.2						
1138	Fea 18/22		C	0.11	0.11		0.11						
1139	Fea 5		B	0.16	0.16		0.16						
1140	Fea 16B		E	0.04	0.01		0.01				1	0.02	
1141	Fea 17		C	0.26	0.24		0.24						5
1144	Fea 24		H	0.23	0.21	0.01	0.21			2			4
1145	Fea 25		C	0.07	0.05	0.01	0.05						2
1147	Fea 27		I	0.14	0.07	0.01	0.12	3	0.05				5
1136	Fea 27		I	0.23	0.1	0.01	0.23	3	0.13				

Table A.4. Detailed Summary of Flotation Samples from the Brooks Island (31DR32) Site.

Square	Level	Depth	Zone	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory	
										Ct.	Wt.
S-B	1	0-10	2	1664.78	239.3	0.05	68.61	170.23	0.05		
S-B	2	10-20	2	1065.19	236.53	0.07	78.8	157.3	0.11	1	0.04
S-B	3	20-30	2	1699.85	389.96	0.3	99.76	289.59	0.3		
S-B1	1	0-10	2	1526.16	211.23	0.11	43.47	167.52	0.11		
S-B1	2	10-20	2	2121.13	321.67	0.31	139.76	194.71	0.31		
S-B1	3	20-30	2	747.97	240.57	1.2	124.8	113.26	1.2		

Table A.5. Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Half	Zone	Level	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.
7	20			2	23.83		3.62	18.46	1.58
6	707	N		1	74.67		11.78	59.81	2.28
22	775	NW	A	0-22 cmbs	10.5		0.4	9.92	0.16
23	775	NW	B	22-42	5.45		0.04	5.38	0.02
39	800	N	A/B		13.82		0.08	12.96	0.73
168	826	W	A		26.13		9.96	15.84	0.2
169	826	W	B		13.33		4.12	9.03	0.1
257	858				231.02	73.76	19.35	45.54	8.15
142	866	N			99.84		5.32	79.27	14.81
128	875	NW	A		221.15	171.5	112.39	50.58	0.95
171	879	N			35.94		10.97	24.55	0.01
172	879	S			15.77		7.87	7.85	0.01
45	1337				18.58		12.4	2.82	3.24
299	1338	NW			229.42	48.78	24.34	23.52	0.69
74	1457	S			2.32		0.49	1.74	0.05
81	1457	N	A		8.01		6.98	0.97	0
82	1457	S	A		11.8		10.3	1.13	.
114	1457	N	B		2.71		1.91	0.03	
115	1457	N	A		67.92		30.56	33.97	0.24
116	1457	S			55.16		25.15	28.54	0.15
76	1618	E			103.31		2.08	41.42	59.54
50	1883				42.49		25.67	10.39	7.14
51	2432				185.23	146.87	38.58	96.59	10.85
103	2434	N			35.04		30.23	0.74	4.01
125	2788	N			25.89		0.61	24.41	0.79
102	3571				36.51		3.73	31.03	1.26
137	4278	W			45.23		7.47	37.18	0.82
188	4316	N	Str. V		13.46		0.28	12.53	0.62
296	5623				141.44	101.5	32.59	62.3	5.98

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Plant Wt.	Cupules		Glumes		Kernel		Hickory		Acorn		Acorn meat	Walnut	
			Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.		Ct.	Wt.
7	20	3.62													
6	707	11.78													
22	775	0.4													
23	775	0.04													
39	800	0.08													
168	826	9.96													
169	826	4.12													
257	858	19.65	7	0.03	1	0	1		5	0.26	2	0.01			
142	866	5.43							8	0.11					
128	875	112.39													
171	879	10.97													
172	879	7.87													
45	1337	12.4													
299	1338	24.34													
74	1457	0.49													
81	1457	6.98													
82	1457	10.3													
114	1457	1.91													
115	1457	30.56													
116	1457	25.15													
76	1618	2.19							3	0.11					
50	1883	25.89							8	0.22					
51	2432	39.17							16	0.59					
103	2434	30.23													
125	2788	0.61													
102	3571	3.73													
137	4278	7.47													
188	4316	0.28													
296	5623	32.59													

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Nut Husk	Wax Myrtle	Bean	Dogwood	Hackberry	Chenopod	Cheno-am	Bedstraw	Knotweed	Bearsfoot	Palmetto
7	20											
6	707											
22	775											
23	775											
39	800											
168	826											
169	826											
257	858	3		2								
142	866											
128	875											
171	879											
172	879											
45	1337											
299	1338											
74	1457											
81	1457											
82	1457											
114	1457											
115	1457											
116	1457											
76	1618											
50	1883		1									
51	2432											
103	2434											
125	2788											
102	3571											
137	4278											
188	4316											
296	5623											

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	cf.Bramble	Spurge	cf. maygrass	Grass	Pine Cone		Gall	Unid		Unidable		Pitch
						Ct.	Wt.		Ct.	Wt.	Ct.	Wt.	Wt.
7	20							2			2		
6	707							2	4		58	0.37	
22	775							0					
23	775							0					
39	800							0	1	0			
168	826							0			4		
169	826							0					
257	858		1					0	2	0.02	12	0.03	
142	866							6			13	0.05	
128	875							0					1.5
171	879							0			9	0.3	
172	879							0					
45	1337							2			3	0	
299	1338							0					
74	1457							0			6	0.04	
81	1457							0					
82	1457							0					
114	1457							0					
115	1457							0			14	0.91	
116	1457							0					
76	1618							0			1	0	
50	1883							0			15	0.09	
51	2432							2			4	0.02	
103	2434							0	1				
125	2788							0					
102	3571							0			5	0	
137	4278							0					
188	4316							0					
296	5623							0			3	0.04	

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Half	Zone	Level	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.
157	6434	E			445.76	176.69	61.79	107.17	6.53
158	6434	W			108.19	51.62	21.81	29.38	0.15
160	6452	N			10.62		1.06	9.48	0.06
231	6661	N			13.23		2.13	10.93	0.01
232	6661	S	A		177.25	86.99	40.44	36.18	0.01
238	6661	S	B		0.39		0.09	0.29	0.01
366	7257	N	B	0-31 cmbs	137.74		0.54	86.28	50.86
262	7323	E	A	0-34 cmbs	20.54		1.84	18.15	0.49
263	7323		B	0-42 cmbs	5.74		0.39	5.25	0.08
264	7323		E	0-40 cmbs	10.69		0.16	10.13	0.36
244	7803	E			16.51		2.78	12.86	0.79
319	7881	S	A		3.19		1.34	1.51	0.32
320	7881	S	B		9.52		0.43	9.03	0.05
354	8006	N	B		30.76		4.4	23.28	2.96
355	8006	N	C		7.94		0.48	7.34	0.08
303	8198	N			210.72	127.24	24.19	96.41	5.7
304	8198	S			26.11		2.57	22.88	0.13
314A	8319	W	A		3.19		0.19	2.91	0.08
314B	8319	W	B		5.66		0.33	5.13	0.17
286	8321	NE	A		1.55		0.3	1.19	0.02
287	8321	SW	A		33.04		19.72	13.25	0.01
280	9681	N			34.28		5.02	29.01	0.46
281	9681	S			30.75		5.33	25.16	0.06
332	9700	E	B		47.25		16.5	26.04	4.59
333	9700	E	A		8.88		4.17	4.18	0.47
241	10506	NE			10.02		0.13	9.7	0.18
242	10506	NW			19.14		0.87	16.49	1.73
243	10506	N	below burial		25.12		1.16	21.96	1.85
273	10506	SW			6.6		0.3	6.11	0.12

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Plant Wt.	Cupules		Glumes		Kernel		Hickory		Acorn		Acorn meat	Walnut	
			Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.		Ct.	Wt.
157	6434	61.89	20	0.1	2	0									
158	6434	21.81	3	0											
160	6452	1.06													
231	6661	2.15	7	0.02	1										
232	6661	40.46	7	0.02	1	0									
238	6661	0.09													
366	7257	0.54													
262	7323	1.84	1	0			1	0							
263	7323	0.39													
264	7323	0.16													
244	7803	2.78													
319	7881	1.34													
320	7881	0.43													
354	8006	4.4									1				
355	8006	0.48													
303	8198	24.19	1	0											
304	8198	2.57													
314A	8319	0.19													
314B	8319	0.33													
286	8321	0.3													
287	8321	19.72													
280	9681	5.02													
281	9681	5.36					2	0.03							
332	9700	16.5	1	0											
333	9700	4.17													
241	10506	0.13													
242	10506	0.87	2	0											
243	10506	1.16	1	0											
273	10506	0.3													

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Nut Husk	Wax Myrtle	Bean	Dogwood	Hackberry	Chenopod	Cheno-am	Bedstraw	Knotweed	Bearsfoot	Palmetto
157	6434											
158	6434											
160	6452											
231	6661											
232	6661											
238	6661											
366	7257											
262	7323		9									
263	7323											
264	7323											
244	7803		1					1		1		
319	7881											
320	7881											
354	8006											
355	8006											
303	8198		61									
304	8198		109									
314A	8319											
314B	8319											
286	8321											
287	8321											
280	9681											
281	9681											
332	9700											
333	9700											
241	10506											
242	10506											
243	10506											
273	10506											

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	cf.Bramble	Spurge	cf. maygrass	Grass	Pine Cone		Gall	Unid		Unidable		Pitch
						Ct.	Wt.		Ct.	Wt.	Ct.	Wt.	Wt.
157	6434							0			1	0	
158	6434							0					
160	6452							1					
231	6661							0					
232	6661							0					
238	6661							0					
366	7257							0					
262	7323							0					
263	7323							0					
264	7323							0					
244	7803	1	6	1				1			3		
319	7881							0					
320	7881							0					
354	8006							0			1		
355	8006							0			2		
303	8198							0	44	0.11			
304	8198							0					
314A	8319							0					
314B	8319							0					
286	8321							0					
287	8321							0			3		
280	9681							0					
281	9681							0					
332	9700							1			2	0	
333	9700							1			1	0	
241	10506				1			0					
242	10506							0					
243	10506							1			2	0.03	
273	10506							0					

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Half	Zone	Level	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.
359	13424	S			12.22		4.15	7.27	0.72
360	13424	N	A		16.57		7.46	7.74	1.08
361	13424	NW	B		10.45		3.76	5.2	1.32
380	14340	W			5.5		2.78	2.28	0.38
345	14344	NW	A		4.87		3.34	0.55	0.88
409	15101	W	A		36.44		16.95	18.24	0.5
410	15101	W	B		91.27		22.84	66.74	0.92
411	15101	E	A		183.65	129.17	51.24	72.15	1.47
106	15355	W			7.21		1.46	3.79	1.8
401	15355	W			42.85		5.71	31.35	5.51
420	15359	SW	A		9.31		0.77	7.4	1.13
421	15359	SW			4.79		0.68	3.22	0.86
464	15544	NW			20.47		2.5	14.16	3.76
431	15561	S	B		7.58		0.26	6.27	0.95
456	15561	S			98.25	52.19	4.02	42.79	4.76
434	15610				8		1.85	5.6	0.53
418	15697				24.2		5.02	16.54	2.68
521	15720	E	A		330.17		0.17	3.94	326.02
479	15724	E			117.45		3.89	48.15	65.25
476	15762				177.44	94.71	34.21	54.34	1.11
602	16763	E			17.87		3.58	12.47	1.76
392	17659	N			31.11		11.6	14.25	5.09
471	17790	N	A		330.5	90.13	54.52	33.69	0.46
472	17790	S	A		249.01	63.95	34.62	27.32	0.78
502	17918	E	D		7.21		0.95	5.46	0.75
503	17918	E	A		12.2		1.41	9.01	1.72
504	17918	E	E		18.56		2.71	13.27	2.21
505	17918	E	B		34.95		2.42	27.32	4.95
506	17918	E	C		17.61		1.1	14.08	2.29

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Plant Wt.	Cupules		Glumes		Kernel		Hickory		Acorn		Acorn meat	Walnut	
			Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.		Ct.	Wt.
359	13424	4.18							1	0.03					
360	13424	7.61							3	0.15					
361	13424	3.86							5	0.1					
380	14340	2.78													
345	14344	3.41							4	0.07					
409	15101	16.95													
410	15101	22.84													
411	15101	51.24													
106	15355	1.59							7	0.13					
401	15355	5.79							4	0.08					
420	15359	0.77													
421	15359	0.68													
464	15544	2.5													
431	15561	0.26													
456	15561	4.03							1	0.01					
434	15610	1.86	3	0.01	2	0									
418	15697	5.02													
521	15720	0.17													
479	15724	3.89													
476	15762	36.78	357	2.43	38	0.14	3								
602	16763	3.58													
392	17659	11.6													
471	17790	55.14	82	0.62	3	0									
472	17790	35.22	61	0.56	11	0.03	1	0.01							
502	17918	0.95													
503	17918	1.41													
504	17918	2.93							2	0.22					
505	17918	2.42													
506	17918	1.1													

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Nut Husk	Wax Myrtle	Bean	Dogwood	Hackberry	Chenopod	Cheno-am	Bedstraw	Knotweed	Bearsfoot	Palmetto
359	13424											
360	13424											
361	13424											
380	14340											
345	14344											
409	15101											
410	15101											
411	15101											
106	15355											
401	15355											
420	15359											
421	15359											
464	15544											
431	15561											
456	15561				1							
434	15610											
418	15697											
521	15720											
479	15724											
476	15762											
602	16763											
392	17659											
471	17790											
472	17790											
502	17918					1						
503	17918											
504	17918						1					
505	17918					3						
506	17918											

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	cf.Bramble	Spurge	cf. maygrass	Grass	Pine Cone		Gall	Unid		Unidable		Pitch
						Ct.	Wt.		Ct.	Wt.	Ct.	Wt.	Wt.
359	13424							0					
360	13424							0			2	0.04	
361	13424							0					
380	14340							1			1	0	
345	14344							0					
409	15101					38	0.55	0			45	0.07	
410	15101					41	0.38	0			12	0.02	
411	15101					105	1.61	1			2	0	
106	15355							0			2	0	
401	15355							0			5	0.02	
420	15359							0					
421	15359							0			1	0	
464	15544							0					
431	15561							3			10	0.05	
456	15561							0			5	0.02	
434	15610							0					
418	15697							0			2		
521	15720							1					
479	15724							0			2	0	
476	15762							0					
602	16763							2					
392	17659							1			1		
471	17790							0			7	0	
472	17790							0			4	0	
502	17918							1					
503	17918							0			3	0.01	
504	17918							0	16	0.02	6	0.02	
505	17918							0	1		8	0.05	
506	17918							7			1	0	

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Half	Zone	Level	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.
563	17918	E	A		16.28		1.26	13.33	1.61
627	18128				102.71		12.99	74.27	13.55
467	18134		A		8.65		0.55	7.24	0.85
468	18134	N	B		33.31		3.15	19.37	10.59
511	18139	N	A		20.68		1.07	12.85	6.72
571	18140	E	A		7.98		2.8	4.25	0.63
541	19989	N	A		52.81	25.76	2.76	21.15	1.71
499	19991		A		43.2		4.19	32.83	1.24
500	19991		B		31.13		5.08	24.52	0.98
477	19997	E			47.87		11.99	30.49	4.84
550	19998	N	A		39.02		17.74	20.46	0.74
551	19998	N	B		61.13		7.39	39.97	11.58
536	20088	E			1527.02	279.02	1.28	154.17	123.03
558	21069	W	B		12.65		4.63	6.91	1.02
559	21069	W	A		63.68		5.83	52.06	5.5
611	21093	N	A		24.69		2.14	16.84	5.59
532	21811	E			74.05		3.29	36.88	33.67
649	22746	NW			7.19		0.43	5.17	1.59
?	23778	E			18.78		3.31	11.63	3.7
633	24570				19.57		2.46	13.7	3.33
625	24571				24.54		15.16	2.69	6.5
587	24572		surface		1.23		0.13	0.97	0.12
588	24572		disturbed area		5.55		1.21	4.05	0.27
589	24572				30.16		8.05	20.28	1.73
548	26383	S	A		79.15		5.1	39.28	34.5
316	11478A	N			7.77		0.28	6.7	0.74
318	11478A	N			129.79		0.32	62.99	66.39
317	11478B	N			1.21		0.01	1.09	0.09
413	14780B	N	AI		11.41		0.39	10.06	0.85

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Plant Wt.	Cupules		Glumes		Kernel		Hickory		Acorn		Acorn meat	Walnut	
			Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.		Ct.	Wt.
563	17918	1.26													
627	18128	13.04			2	0			1	0.05					
467	18134	0.55													
468	18134	3.27							5	0.12					
511	18139	1.07													
571	18140	3.08							12	0.28					
541	19989	2.76											1		
499	19991	4.19	1	0											
500	19991	5.08													
477	19997	12.28							10	0.29					
550	19998	17.74													
551	19998	7.68	1	0					7	0.2				2	0.09
536	20088	1.28													
558	21069	4.63													
559	21069	5.83	1	0											
611	21093	2.14													
532	21811	3.29													
649	22746	0.43													
?	23778	3.31													
633	24570	2.46													
625	24571	15.25							2	0.09					
587	24572	0.13													
588	24572	1.21													
589	24572	8.05													
548	26383	5.25							4	0.15					
316	11478A	0.28													
318	11478A	0.32													
317	11478B	0.01													
413	14780B	0.39													

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Nut Husk	Wax Myrtle	Bean	Dogwood	Hackberry	Chenopod	Cheno-am	Bedstraw	Knotweed	Bearsfoot	Palmetto
563	17918											
627	18128											
467	18134											
468	18134		1									
511	18139											
571	18140											
541	19989											1
499	19991											
500	19991											
477	19997											
550	19998										2	
551	19998											
536	20088											
558	21069											
559	21069											
611	21093											
532	21811		2									
649	22746											
?	23778											
633	24570											
625	24571											
587	24572											
588	24572											
589	24572											
548	26383								1			
316	11478A											
318	11478A											
317	11478B											
413	14780B											

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	cf.Bramble	Spurge	cf. maygrass	Grass	Pine Cone		Gall	Unid		Unidable		Pitch
						Ct.	Wt.		Ct.	Wt.	Ct.	Wt.	Wt.
563	17918				3			0			4	0.01	
627	18128							10			22	0.03	
467	18134							2			1		
468	18134							0			2	0	
511	18139							0					
571	18140							0			2	0.01	
541	19989							0			18		
499	19991							1			6	0.01	0.17
500	19991							2			10	0	
477	19997							7			9	0.03	
550	19998							0	3	0	6	0.01	
551	19998							1			11	0.11	
536	20088							0					
558	21069							0			7	0.05	
559	21069							0					
611	21093							1					
532	21811							0			4	0	
649	22746							0			1		
?	23778							0					
633	24570							0			4	0.02	
625	24571							0			7	0.06	
587	24572							0					
588	24572							0					
589	24572							0			2	0	
548	26383							0			1		
316	11478A							0					
318	11478A							0					
317	11478B							0					
413	14780B							0					

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Half	Zone	Level	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.
525	18152A	W			20.74		3.26	13.32	4.11
527	18152B	W			134.21		4.61	61.8	67.43
501	18157A	N		6	147.3		1.47	54	91.63
104	1951A	W	A		63.6	32	3.97	26.91	0.92
105	1951A	W	B		9.23		1.25	7.59	0.33
106	1951B	W	A		66.55	35.13	4.04	29.3	1.57
107	1951B	W	A		45.84	23.28	2.85	20.11	0.24
108	1951B	W	B		17.7		3.23	14.11	0.33

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Plant Wt.	Cupules		Glumes		Kernel		Hickory		Acorn		Acorn meat	Walnut	
			Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.		Ct.	Wt.
525	18152A	3.26													
527	18152B	4.8							4	0.19					
501	18157A	1.47													
104	1951A	4.04							2	0.07					
105	1951A	1.25													
106	1951B	4.11							3	0.07					
107	1951B	2.85													
108	1951B	3.23													

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	Nut Husk	Wax Myrtle	Bean	Dogwood	Hackberry	Chenopod	Cheno-am	Bedstraw	Knotweed	Bearsfoot	Palmetto
525	18152A											
527	18152B											
501	18157A											
104	1951A											
105	1951A											
106	1951B											
107	1951B											
108	1951B											

Table A.5 (continued). Detailed Summary of Flotation Samples from the Broad Reach (31CR218) Site.

Bag	Feature	cf.Bramble	Spurge	cf. maygrass	Grass	Pine Cone		Gall	Unid		Unidable		Pitch
						Ct.	Wt.		Ct.	Wt.	Ct.	Wt.	Wt.
525	18152A							0					
527	18152B							0					
501	18157A							3					
104	1951A							0					
105	1951A							1					
106	1951B							0			2		
107	1951B							2					
108	1951B							0					

Table A.6. Detailed Summary of Flotation Samples from 31ON1578.

Prov.	Block	Feature	Half	Zone	Vol.	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.
610.101	3	610	S		10	35.63		6.15	23.33	5.14	6.15
627.101	5	627			12	4.71		1.14	3.17	0.34	1.14
630.101	5	630	N		10	19.78		4.67	13.61	0.9	5
650.101	5	650	S		10	24.96		9.25	14.07	1.27	9.38
656.101	5	656	NE		10	14.97		3.07	10.14	1.29	3.13
661.101	5	661	S		10	55.41		3.1	29.07	22.85	3.12
667.101	5	667			49	86.08		12.23	58.99	13.08	12.61
668.101	5	668			15	6.81		1.99	3.24	1.4	1.99
676.101	5	676			55	76.16		14.96	53.26	7.75	15.01
691.101	5	691	N		?	11.19		2.3	8.26	0.47	2.3
698.101	5	698	S	1	10	23.71		5.49	15.07	2.88	5.54
698.201	5	698	S	2	10	44.47		15.89	24.2	1.58	17.78
698.301	5	698	S	3	10	18.69		4.77	10.41	3.21	4.92
714.101	5	714			6	7.34		1.48	3.83	1.83	1.48
729.101	5	729	SW		10	109.22	57.77	2.04	32.68	22.92	2.04
736.101	5	736			52	59.84		19.63	32.24	6.84	20.41
763.101	5	763	S		10	14.71		1.42	12.17	0.82	1.42
770.101	5	770	S		13	46.68		8.02	30.02	8.2	8.02
801.101	5	801			10	175.21	93.74	3	56.3	34.04	3
814.101	3	814			3	47.83		6.65	33.23	8.17	6.65
815.101	3	815	S		11	397.91	119.12	26.53	62.82	27.94	26.53
819.101	3	819	S	1	10	183.25	92.97	0.78	51.18	40.78	0.78
819.201	3	819	S	2	10	207.55		2.41	108.99	95.87	2.41
846.101	2	846	S		10	26.61		3.5	21.36	1.72	3.51
859.101	2	859/913		1	10	34.56		6.21	24.91	3.11	6.25
859.201	2	859/913		2	10	23.19		4.56	16.5	2.05	4.56
859.301	2	859/913	S	3	10	50.15		9.79	35.52	4.02	9.92
859.401	2	859/913	S	4	10	16.4		3.53	11.13	1.55	3.53
859.501	2	859/913		5	10	19.29		4.81	12.81	1.3	4.81

Table A.6 (continued). Detailed Summary of Flotation Samples from 31ON1578.

Prov.	Cupules		Glumes		Kernel		Hickory		Acorn		Squash	Wax Myrtle	Chenopod	Amaranth	Maypop
	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.					
610.101															
627.101													1		
630.101	1						40	0.33							
650.101							10	0.11	3	0.02				136	
656.101							3	0.06							
661.101	6	0.02													
667.101	6	0.02					17	0.36							
668.101															
676.101	10	0.02					3	0.03							
691.101	4	0													
698.101	10	0.05													
698.201	228	1.59	87	0.28			2	0.02	1	0					
698.301	31	0.15	4	0											
714.101															
729.101															
736.101	14	0.04					45	0.74							1
763.101	2										1				
770.101	3	0													
801.101															
814.101															
815.101															
819.101	1	0													
819.201												2			
846.101	1	0							2	0.01					
859.101							5	0.04							
859.201															
859.301							9	0.13							
859.401															
859.501															

Table A.6 (continued). Detailed Summary of Flotation Samples from 31ON1578.

Prov.	Prickly Pear	Spurge	Sedge	Bearsfoot	Pine Cone	Cf. Legume	Cf. Sedge	Gall	Unid		Unidable	
									Ct.	Wt.	Ct.	Wt.
610.101								3			3	0
627.101												
630.101											9	0.05
650.101								3			17	0.04
656.101											2	0.02
661.101											10	0.03
667.101								7			27	0.29
668.101											6	0.04
676.101		1						3			8	0.03
691.101											8	0.05
698.101											2	0.02
698.201								1			2	0
698.301												
714.101	1											
729.101									1		5	0
736.101								2			8	0.05
763.101								1			14	0.03
770.101											8	0.03
801.101											4	0.03
814.101								3			6	0.03
815.101												
819.101											4	0.01
819.201											6	0
846.101											7	0.06
859.101											7	0.01
859.201								2				
859.301						1	1		1		11	0.04
859.401								3			2	
859.501				1				3				

Table A.6 (continued). Detailed Summary of Flotation Samples from 31ON1578.

Prov.	Block	Feature	Half	Zone	Vol.	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.
860.101	2	860			5	72.41		14.52	41.16	1.43	26.31
861.101	2	861	W		54	144.85	73.55	13.03	49.82	9.1	13.17
862.101	2	862			10	32.43		6.33	23.63	1.97	6.38
862.101	2	862			10	31.36		6.46	22.47	1.59	6.52
862.201	2	862			10	35.93		4.27	29.61	1.36	4.27
862.201	2	862			10	44.61		3.75	34.66	4.59	3.75
867.101	2	867	S	1	9	33.45		5.93	23.68	3.03	6.06
867.201	2	867	S	2	9	34.27		5.02	25.04	3.87	5.02
867.301	2	867	S	3	9	51.6		2.73	37.87	10.5	2.73
870.101	2	870	S		16	107.79		47.36	52.7	2.12	47.36
871.101	2	871	S		11	153.06	78.23	4.26	48.2	25.54	4.26
911.101	2	911	S		10	145.75	77.34	1.51	48.51	26.99	1.51
923.101	2	923/924			11	82.61		8.04	44.48	29.2	8.31
926.201	2	926	N	2	10	41.56		5	30.01	5.74	5
926.301	2	926	N	3	10	13.51		1.15	10.19	1.91	1.15
926.401	2	926	N	2	10	30.8		3.31	22.5	4.37	3.31
940.201	1	940		2	10	35.98		5.38	26.03	4.19	5.38
940.301	1	940		3	10	25.2		3.36	18.32	3.08	3.36
Bag 247	5	794	W			6.1		1.12	3.71	1.13	1.15
Bag 445	5	794				13.57		0.48	11.1	1.9	0.48
Bag 453	5	794				8.13		0.07	6.93	1.02	0.07
Bag 454	5	794				8.53		1.01	6.17	1.21	1.01

Table A.6 (continued). Detailed Summary of Flotation Samples from 31ON1578.

Prov.	Cupules		Glumes		Kernel		Hickory		Acorn		Squash	Wax Myrtle	Chenopod	Amaranth	Maypop
	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.	Ct.	Wt.					
860.101	1623	9.18	870	2.5	13	0.11									
861.101							9	0.14							
862.101							5	0.05	1	0					
862.101							5	0.06							
862.201															
862.201															
867.101							13	0.13	1						
867.201															
867.301															
870.101					1	0									
871.101															
911.101															
923.101							12	0.27							
926.201															
926.301															
926.401															
940.201												1			
940.301															
Bag 247							5	0.03							
Bag 445	1	0													
Bag 453															
Bag 454															

Table A.6 (continued). Detailed Summary of Flotation Samples from 31ON1578.

Prov.	Prickly Pear	Spurge	Sedge	Bearsfoot	Pine Cone	Cf. Legume	Cf. Sedge	Gall	Unid		Unidable	
									Ct.	Wt.	Ct.	Wt.
860.101					68						14	0.03
861.101												
862.101											2	0.02
862.101											4	0.02
862.201											4	0.02
862.201									1	0.02	3	0.02
867.101									1		12	0.01
867.201						1		1			3	
867.301								1			7	0.04
870.101								1				
871.101											4	0.02
911.101											6	0.04
923.101								2			2	0
926.201								1			2	0
926.301								2			3	0
926.401											2	0
940.201								3				
940.301								2			3	0.01
Bag 247											4	0.02
Bag 445											3	0
Bag 453			1									
Bag 454											2	0

Table A.7. Detailed Summary of Samples from Jordan's Landing (31BR7).

Square	Plot Level	Depth	Feat.	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory		Unid.	
										Ct.	Wt.	Ct.	Wt.
Water-screened samples:													
-12L12	2	0-10	77	3525.88	184.55	0.29	56.39	127.2	0.45	14	0.16	1	0
-12L12	2		77	2196.84	151.09	0.24	58.85	91.48	0.28	4	0.04	2	0
-12L12	3		77	1481.25	180.1	0.34	76.86	102.43	0.34				
-12L12	4	30-40	77	2365.37	168.77	0.3	68	100.06	0.3				
12L12	3	20-30	77	548.25	124.73	0.2	60.72	53.19	0.2				
Flotation samples:													
22R68	1	0-10 from top of Zone II	82	60.88	60.88	0.25	27.92	28.98	0.49	7	0.24		
22R68	2		81	45.12	45.12	0.13	20.99	23.93	0.13				

Table A.8. Detailed Summary of Flotation Samples from the Cape Creek (31DR1) Site.

Square	Zone	Level	Depth	Feature	Sample Wt.	Subsample Wt.	Wood Wt.	Residue Wt.	Contaminant Wt.	Plant Wt.	Hickory	
											Ct.	Wt.
M-H1	III A	1	0-10		484.5	375.11	1.3	246.21	80.96	1.3		
M-H2	III A	2	10-20		945.11	435.24	2.41	251.77	174.35	2.41		
M-A7	III B	1	20-30		1189.69	520.21	13.86	138.17	323.07	13.86		
M-H	III B	1-4			10899.52	1581.04	25.57	399.02	1135.21	25.57		
M-H1	III B	1-3			3455.32	515.41	5.62	151.88	348.52	5.74	2	0.03
M-H2	III B	1, 3			3120.41	513.25	7.92	118.13	167.96	7.92		
M-A4		1	0-10	4	83.74		3.22	51.48	17.99	3.22		
M-A4		1	0-10	4	56.74		3.24	26.56	18.77	3.24		
M-H2		2	10-20		1418.46	175.2	1.76	57.54	112.91	1.76		
M-H2		2	10-20		1603.39	151.89	3.89	48.94	94.3	3.89		

Table A.8 (continued). Detailed Summary of Flotation Samples from the Cape Creek (31DR1) Site.

Square	Zone	Acorn		Acorn Meat	Bean	Chenopod	Cheno-am	Purslane	Morning Glory	Wax Myrtle	cf. Wild Plum/Cherry	Hackberry
		Ct.	Wt.									
M-H1	III A											
M-H2	III A					3						
M-A7	III B	2	0									
M-H	III B					3	4					2
M-H1	III B	49	0.09			3		1	1		1	
M-H2	III B	1	0	1	1	4				1		
M-A4												
M-A4						2						
M-H2							2					
M-H2							3					

Table A.8 (continued). Detailed Summary of Flotation Samples from the Cape Creek (31DR1) Site.

Square	Zone	Gall	Unid.		Unidable	
			Ct.	Wt.	Ct.	Wt.
M-H1	III A					
M-H2	III A					
M-A7	III B				2	0
M-H	III B		1	0	1	0
M-H1	III B	1				
M-H2	III B				2	0
M-A4		1				
M-A4						
M-H2					1	
M-H2						

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