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Sifting Through The Sand: Adaptive Flexibility In The Middle Archaic Occupations Of The Sandhills Province Of South Carolina

Audrey Rachel Dawson
University of South Carolina

SIFTING THROUGH THE SAND: ADAPTIVE FLEXIBILITY IN THE MIDDLE ARCHAIC OCCUPATIONS OF THE SANDHILLS PROVINCE OF SOUTH CAROLINA

by

Audrey Rachel Dawson

Bachelor of Arts
West Virginia University, 2001

Master of Arts
University of South Carolina, 2004

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Accepted by:

Kenneth G. Kelly, Major Professor

Charles R. Cobb, Major Professor

Gail E. Wagner, Committee Member

Thomas Leatherman, Committee Member

Mark J. Brooks, Committee Member

Lacy Ford, Senior Vice Provost and Dean of Graduate Studies

DEDICATION

To Eleanor and Amelia, never give up on your dreams.

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ABSTRACT

Based on a sample of Coastal Plain Middle Archaic sites in addition to lithic debitage data from three Morrow Mountain (7,500-5,500 BP) occupation clusters at the Three Springs site (38RD837/841/842/844), Richland County, South Carolina, this dissertation explores the applicability of a model of Adaptive Flexibility to the Morrow Mountain occupations of the South Carolina Sandhills Province. The model of Adaptive Flexibility was developed to explain the redundant, low-density scatters of lithic debitage and generalized, expedient tools made of locally available raw materials that characterize the Middle Archaic, specifically Morrow Mountain, archaeological record of the South Carolina Piedmont. Multiple lines of lithic debitage analysis (i.e., mass analysis, aggregate trend analysis, and individual attribute analysis) were employed to understand the technological strategies, economy, and mobility of the Morrow Mountain peoples in the Sandhills Province through the organization of technology concept. These analyses suggest that within the Sandhills Province the key characteristics of Adaptive Flexibility—a reliable resource base, high levels of residential mobility, generalized and unspecialized expedient toolkits, and equal access to lithic raw materials—were present during the Morrow Mountain cultural horizon. Moving beyond Adaptive Flexibility, this dissertation speculates that an expedient tool technology and use of readily-available, local lithic raw materials would have provided the Morrow Mountain peoples free time for the deliberate modification of the Sandhills vegetation.

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CHAPTER 1
ADAPTIVE FLEXIBLITY IN THE
SANDHILLS PROVINCE

Previous research into the Middle Archaic (circa 8,000-5,000 BP or 8,900-5,800 cal BP) occupations of the Coastal Plain of South Carolina resulted in the well-accepted conclusion that this region saw limited use during this cultural period, mainly because few Middle Archaic sites had been archaeologically identified (Anderson 1996:174; Anderson et al. 1979; Clement and Wilson 2004; Elliott 2006; McMakin and Poplin 1997:37; Sassaman 1983, 1991; Sassaman et al. 1990). However, archaeological work in the last two decades shows more of a Middle Archaic presence in the area between the Piedmont and the coast than formerly recognized (Cable and Cantley 1998; Cantley et al. 2002; Clement and Dawson 2009; Dawson et al. 2007; Gunn and Foss 1992; McMakin and Poplin 1997).

This dissertation explores the Middle Archaic, specifically Morrow Mountain, occupations of the Sandhills Province. As a starting point for understanding the Sandhills Morrow Mountain, I test the applicability of Dr. Kenneth Sassaman's model of Adaptive Flexibility (Sassaman 1991) to the Morrow Mountains occupations in the Sandhills Province of the South Atlantic Slope (Figure 1.1). Adaptive Flexibility had been proposed to explain the Middle Archaic—specifically the Morrow Mountain cultural horizon circa 7,500-5,500 BP (Blanton 1983, 1984; Gunn and Foss 1992:9; Sassaman 1991)—use of the Piedmont region (Sassaman 1983:15). High residential mobility, shared knowledge, and a reliable resource base allowed group members a great deal

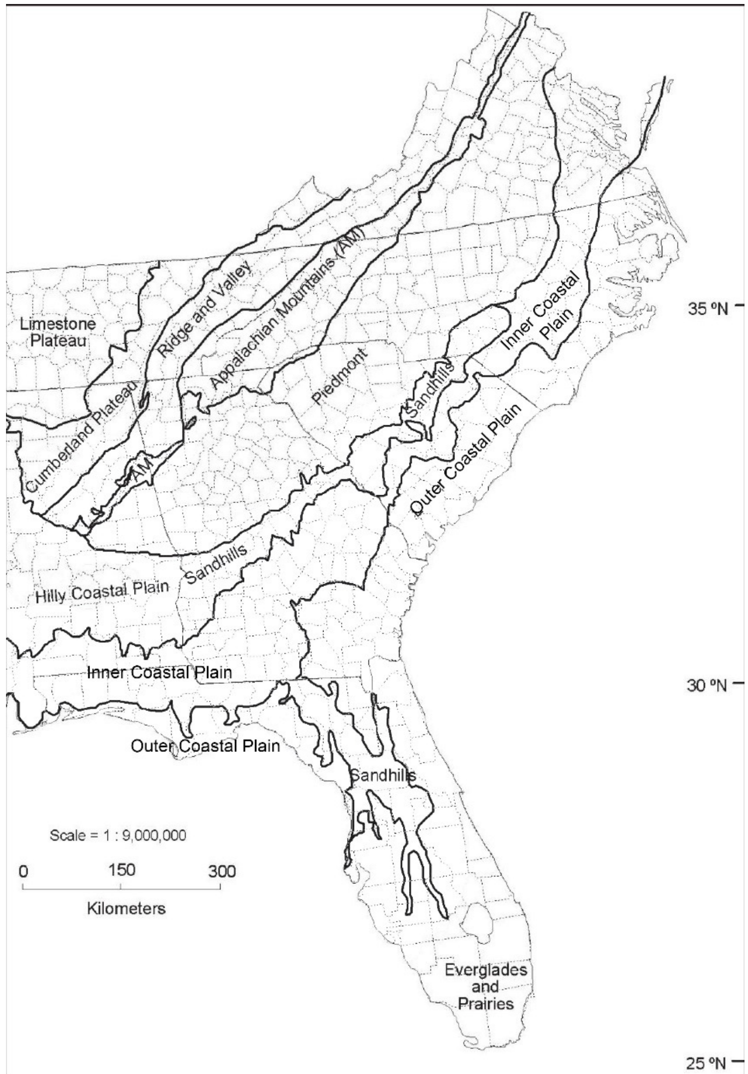

Figure 1.1. Physiographic Regions of the South Atlantic Slope (Brockway et al. 2006), modified by author.

of flexibility when it came to individual behavioral responses in terms of the accrual of social debt and social organization such as group membership and co-residence size. This flexibility resulted in an egalitarian society that existed for nearly a thousand years (Blanton 1983, 1984; Sassaman 1983:101, 1991:35).

Archaeological excavations on the United States Army Garrison of Fort Jackson, Richland County, in central South Carolina, provide one view of the Middle Archaic occupations of the Inner Coastal Plain. On Fort Jackson—a 52,000+ acre training facility in the Sandhills Province—120 sites contain artifacts from the Archaic period. Of this total number, Early Archaic components have been identified at 21 sites; Middle Archaic components are present at 40 sites; and Late Archaic components have been identified at 59 sites (Clement and Dawson 2009:12-16). Based on this very small sample, no evidence exists of a decrease in the use of the Inner Coastal Plain of South Carolina during the Middle Archaic period.

This chapter serves as an introduction to the study area, the time period under study, the case study site, and the problem that this dissertation addresses. Beginning with an overview of the geography of the major physiographical provinces of the South Atlantic Slope, Chapter One then provides a brief overview of the Archaic period and discusses the variation noted in Middle Archaic populations across the greater Southeast. This variation highlights the fact that Middle Archaic manifestations in the Piedmont and Coastal Plain of the South Atlantic Slope differ from their counterparts throughout the rest of the southeastern United States.

In the following section, I present Sassaman's (1991) settlement model for the Middle Archaic, and specifically the Morrow Mountain cultural horizon, of the South Carolina Piedmont. In order to argue that this model could be applied to the Sandhills Province, five testable hypotheses are presented. Next, I introduce the Three Springs site (38RD837/841/842/844), the case study site on Fort Jackson used to test the hypotheses. Chapter One concludes with an overview of the topics covered in the rest of this dissertation.

Geography of the South Atlantic Slope

The South Atlantic Slope is a region in the southeastern United States bounded to the west by the Appalachian Mountains and to the east by the Atlantic Ocean. The north and south boundaries are not as clear, but extend from the southern part of Virginia into Georgia. The South Atlantic Slope region is comprised of two main physiographic divisions, the Piedmont and the Coastal Plain. The following section provides an introduction to these major physiographical regions and a detailed description of the Sandhills Province, the location of the Three Springs site.

Piedmont

The Piedmont encompasses most of the western part of South Carolina and refers to the land between the Blue Ridge Mountains to the west and the Fall Line to the east (Figure 1.1.). Topography within the Piedmont region includes broad uplands of rolling hills ranging in elevation from 61 to 152 m (200-500 ft) above sea level at the Fall Zone to elevations from 213 to 457 m (700-1,500 ft) above sea level at the Blue Ridge Mountains (Trimble 1974:8). The uplands are dissected by long, northwest-to-southeast trending rivers with many tributaries. River valleys are steep-sided near the Blue Ridge Mountains but spread out to wider, more gently sloped banks as one moves eastward toward the Coastal Plain (Kovacik and Winberry 1987:16-17; Trimble 1974:8-9).

Geologically, development of the Piedmont took millions of years as the processes of plate tectonics and continental drift merged landmasses to form the Blue Ridge Mountains and, thus, the Piedmont. These processes coincided with volcanic activity that pushed magma into the cracks and joints of the overlying bedrock. Rock types in the

Piedmont include many metamorphic types such as gneisses, granite, schists, slates and quartz (Kovacik and Winberry 1987:16).

Vegetation in the Piedmont has changed dramatically through time. At the end of the Pleistocene, the Piedmont was covered in forest dominated by pine. As temperatures warmed during the early Holocene, pine was replaced by an oak/mixed hardwood forest. The oak/mixed hardwood forest changed little, if any, during the middle Holocene (Delcourt and Delcourt 1984), which corresponds to the Middle Archaic period of culture history. Explorers and European settlers in the eighteenth century encountered a mature forest of oak, hickory, and short leaf pine trees that had been created and maintained by the Native American burning and agricultural land use (Abrams and Nowacki 2008; Nowacki and Abrams 2008; Stewart 2002, Trimble 1974; Wagner 2003).

Deforestation, cash crop (predominantly cotton) production, and the subsequent abandonment of agricultural land as soil productivity was depleted led to extensive erosion in the Piedmont. Floodplains and streams became inundated with erosional debris and soil from the uplands. The uplands, in turn, became incised with deep gullies while top soil washed away to expose the underlying saprolite sub-soil (Trimble 1974). The erosion of much, if not all, of the topsoil from the upland landforms of the Piedmont due to the intensive cash crop agriculture of this region undoubtedly impacted the archaeological resources of this region. Without intact soils, how accurate are our interpretations of the quartz lithic scatters in the interriverine Piedmont?

As cropland became abandoned during the mid-twentieth century, native vegetation began to slowly return to the area. The regrowth of the eighteenth century mature oak-hickory forest, however, could take centuries (Kovacik and Winberry 1987:42-43). The extensive erosion in the Piedmont undoubtedly damaged buried archaeological deposits and contributed to the conflated and mixed assemblages noted throughout the uplands/interriverine areas of the Piedmont (Goodyear et al. 1979; House and Wogaman 1978).

Fall Zone

The Piedmont and Coastal Plain are separated by the Fall Line, or Fall Zone. The Fall Zone corresponds to the point at which "the fast-moving rivers of the Piedmont meet the softer sediments of the Coastal Plain" (Murphy 1995:9). The Fall Zone is marked by rapids within the rivers and can be up to 2.4 km (1.5 miles) wide in places (Murphy 1995:9). Within the Fall Zone, the crystalline rocks of the Piedmont meet the sedimentary, more easily eroded rocks of the Coastal Plain. Erosional differences between these rock types result in rock outcrops as well as rapids along some of the rivers within this zone (Kovacik and Winberry 1987:18). A variety of knappable and unique, lithic raw materials are present in the Fall Zone (Tommy Charles, personal communication 2014).

Coastal Plain

The Coastal Plain is the largest physiographic province in South Carolina consisting of the area between the Atlantic Ocean and the Fall Zone (Figure 1.1.). Topographic variation ranges from stretches of flat land to rolling hills. Geologically, the sedimentary rocks of the Coastal Plain—shales, sandstones, conglomerates, and coquinas—were formed when the underlying muds, silts, sands, and marine debris were compacted over the millennia (Kovacik and Winberry 1987:19-20). Knappable lithic material native to this region consists of outcrops of Black Mingo and Coastal Plain/Allendale cherts, as well as orthoquartzite. Quartz and Piedmont silicate originating in the Fall Zone can be collected as cobbles and pebbles from the streams of the Inner Coastal Plain (Goodyear and Charles 1984).

Due to its size, the Coastal Plain is often discussed in sections: upper, middle, and lower (e.g., South Carolina Institute of Archaeology and Anthropology 1985:5-6) or Inner and Outer Coastal Plain (Kovacik and Winberry 1987:15). For the purposes of this dissertation, I follow the division provided by Kovacik and Winberry (1987). The Inner and Outer Coastal Plains are separated by a terrace known as the Citronelle Escarpment or the Orangeburg Scarp. The Citronelle Escarpment is the remnant of a temporary shoreline at this location 20-30 million years ago.

To the east/southeast of the Citronelle Escarpment is the Outer Coastal Plain. Topography of the Outer Coastal Plain is flat and, if not for the numerous terraces created by the rising and falling sea levels/glaciation during the Pleistocene Epoch (approximately 1.9 million years ago to 10,000 years ago), it would be featureless. The Inner Coastal Plain is located to the west/northwest of the Citronelle Escarpment and east/southeast of the Fall Zone. The Sandhills Province is located along the western edge of the Inner Coastal Plain to the east of the Fall Zone. It is difficult to distinguish the Inner Coastal Plain geologically from the Sandhills because both regions have hilly and rolling topography (Kovacik and Winberry 1987:20-21); however, vegetation and soils differentiate the two regions.

Vegetation on the Coastal Plain is divided into two main types: Coastal Plain forests and coastal zone vegetation. Coastal zone vegetation refers to the vegetation found in the freshwater and salt marshes, maritime forests, and sand dunes specific to the eastern part of the Outer Coastal Plain. The Coastal Plain forests refer to the vegetation of the Inner Coastal Plain and of the western part of the Outer Coastal Plain. On areas of higher ground, such as the bluffs overlooking the large Inner Coastal Plain rivers, is a pine-hardwood forest that includes loblolly pine, hickory, post oak and southern red oak. White and willow oak as well as sweet gum and black gum can be found at lower elevations and in wetter areas. Sweet gum, laurel and overcup oak, water hickory, cypress, and tupelo are present in the floodplains. Savannas—open grasslands dominated by a variety of grasses and long leaf pines—are interspersed throughout the pine-hardwood forests in areas with higher water tables (Kovacik and Winberry 1986:45).

Carolina bays are distinctive landform features found throughout the Coastal Plain. Carolina bays are not confined to the Carolinas as their name would suggest: they are present throughout the Coastal Plain of the South Atlantic Slope. These landscape features are also not bays, but the 'bay' in their name refers to bay trees found along their edges. Carolina bays are oval- or elliptically-shaped depressions trending northwest-southeast. Sandy ridges form along the southeastern rims of these depressions. The bays range in size, both in the area covered and in their depth (Kovacik and Winberry 1987:21). Although the origin of these bays is heavily debated, research suggests that these elliptically-shaped depressions were formed through eolian (wind) processes (Brooks et al. 1996:482; Brooks et al. 2010). Cultural remains spanning from the PaleoIndian to the historic period have been recovered from the sand ridges skirting the eastern/southeastern edges of Carolina bays throughout the South Carolina Coastal Plain (Brooks et al. 1996; Brooks et al. 2010; Moore et al. 2010).

Sandhills Province

The Sandhills Province, or Sandhills, is the remains of the Eocene beach (the Eocene Epoch lasted from 55.8 to 33.9 million years ago [Polly et al. 1994]) when ocean levels were higher and the South Atlantic Coastal Plain was covered in water (Kovacik and Winberry 1987:18). The remains of this ancient beach form a narrow, discontinuous band trending southwest to northeast and ranging in width from 8 to 24 km (5-15 miles) in the southeastern United States. The Sandhills form a unique geological region between the Piedmont and the Coastal Plain even though they are geologically considered part of the Coastal Plain. The Sandhills would have provided the highly mobile foraging groups within the Morrow Mountain cultural horizon easy access to the resources of the Piedmont, Inner Coastal Plain, and Fall Zone.

Within South Carolina, the Sandhills are encountered in Aiken, Lexington, Richland, Kershaw, Sumter, and Chesterfield counties. The Sandhills Province extends beyond the state lines into North Carolina and Virginia as well as into Georgia, Alabama, and Florida. Typical Sandhills topography consists of gently rolling to rolling hills ranging in elevation from 76 to 152 m (250-500 ft) above sea level. The hills are cut by streams originating from the numerous springs within this region. The streams start as narrow channels but then gradually widen. Tributary streams in the Sandhills are longer and straighter than their Piedmont counterparts (Van Duyne 1918, in Smith 1933:25-26).

Soils in the Sandhills generally are deep and sandy, ranging from loamy sand to sand with areas of shallower fine sand soils overlaying clayey subsoil (Kovacik and Winberry 1987:41; Leigh 1998:310). The sandy nature of the soils promotes good surface drainage and rapid leaching of plant nutrients and organic material in the uplands. Historically, the Sandhills Province has held little agricultural value (Kovacik and Winberry 1987:41).

The sandy soils have posed challenges in terms of understanding archaeological site formation processes and site occupation due to the lack of distinct soils layers and a lack of the soil stains that normally mark archaeological features (e.g., Cantley and Cable 2002a; Clement and Dawson 2009; Clement et al. 2005; Dawson et al. 2007). Specifically, high soil porosity and rapid percolation of water through the soil column creates a situation where standard recognition of archaeological features through the identification of soil stains is not possible for Archaic period features because the organic material in the soils has leached out (Cantley and Cable 2002a; Clement and Dawson 2009; Clement et al. 2005). Instead, features are indicated by localized occurrences of high artifact density, particularly in situations where additional artifacts are absent elsewhere in the same excavation level but occur immediately above (Clement et al. 2005).

The interpretation of archaeological deposits is further complicated on Fort Jackson, specifically, and the Sandhills, in general, by the episodic aggradation or deflation of landforms on a periodic basis (Clement et al. 2005; Gunn and Foss 1992; Leigh 1998). When site occupations occur on either side of an episodic aggradation, standard stratigraphic excavation techniques will allow for differentiating the site occupations. Conversely, when deflation has occurred or when multiple occupations occurred during periods of landform stability, evidence for individual site occupations can be difficult to isolate archaeologically due to the jumbled nature of the deposits (Clement et al. 2005; Dawson et al. 2007).

The Sandhills support a diverse flora. In upland areas, a xerophytic community dominated by shrubs is present. The vegetation is classified as a broken canopy due to the "dispersed distribution of plants, and expanses of bare soil" (Kovacik and Winberry 1987:44). Longleaf pine dominates the overstory of this open pine woods forest; turkey oak is the most common tree in the understory. Hardwoods, like the turkey oak, are less common when wildfires are more frequent. Without the understory of scrubby oaks, shrubs and non-woody plants are also more common. Among these plants are sparkleberry, wild rosemary, wooden goldenrod, sand myrtle, and wiregrass (Kovacik and Winberry 1987:44-45). Barry (1980) notes additional trees found within the Sandhills region include black gum, persimmon, and the occasional black cherry. Turkey oak is replaced by bluejack oak, blackjack oak, and sand post or Margaret's oak in areas with clay subsoil. Abundant water coupled with the clay subsoil is favorable for the growth of southern red oaks. Persimmon, sassafras, and black gum are also found in areas with clay subsoil.

At the natural springheads and seeps found throughout the Sandhills, vegetation is more varied. Characteristically, common alder and poison sumac are common in these wet areas. In swampy areas adjacent to the major streams and creeks, the vegetation is also more varied. The mixed hardwood overstory of these swampy areas can include red bay, sweet bay, loblolly bay, bald cypress, Atlantic white cedar, tulip poplar, red maple, and pond pine. The understory of these swampy areas is just as diverse. Honey cup, fetterbush, holly, sweet pepperbush, sheepkill or sheep laurel, Virginia willow, highbush blueberry, myrtle, swamp azalea, muscadine, summer grape, and greenbrier constitute the understory in the swampy areas of the Sandhills (Barry 1980).

The diverse vegetation of the Sandhills has supported a wide variety of animals both historically and today. In the lowlying, wet areas such as the swamps adjacent to the major watercourses and at springheads and seeps, vegetation supports white-tailed deer, black bear, wild turkey, squirrel, raccoon, gray fox, opossum, skunk, and bobcat. Historically, elk and bison inhabited the South Carolina Sandhills (Lawson 1967; Moore et al. 2016). The rivers provide a variety of edible wildlife. Many species of fish, freshwater clams, mussels, and turtles are encountered in the Inner Coastal Plain.

The Archaic Period on the South Atlantic Slope

The Archaic period of prehistory for the South Atlantic Slope spans from circa 10,000 to 3,000 BP or, stated another way, 11,500 to 3,200 cal BP (Anderson and Sassaman 2012:66). Between 11,000 and 10,000 BP, the earth entered the Holocene epoch. This epoch, which continues today, was marked by receding glaciers and warmer climates than the previous geological epoch, the Pleistocene (Kirch 2005:410). The first two millennia of this cultural period are known as the Early Archaic period (circa 10,000-8,000 BP or 11,500-8,900 cal BP), which corresponds to the Early Holocene. Early Archaic populations in the southeastern United States consisted of highly mobile bands of egalitarian hunters and gatherers who utilized high quality lithic raw materials in lieu of lesser quality, readily available local lithic raw materials such as quartz. According to Daniel (1994, 1996, 1998, 2001), the high quality lithic raw materials for the Carolinas include Uwharrie rhyolite (from Morrow Mountain in the Uwharrie Mountains of south-central North Carolina) and Coastal Plain/Allendale chert (from the quarries along the Savannah River in Allendale County, South Carolina).

From these high quality raw materials, Early Archaic people made projectile points/knives with corner-notched (e.g., Palmer, Kirk), side-notched (e.g., Hardaway-Dalton, Hardaway, Taylor), bifurcated (e.g., St. Albans, MacCorkle), and distinctive, deeply concave, parallel-sided, stem-like (e.g., Dalton), hafting elements/bases. In addition, Early Archaic populations made and utilized a variety of lithic tools such as hafted end-scrapers, drills, and awls. Their lithic toolkits and mobile lifestyle supported a generalist foraging strategy that allowed the Early Archaic people of the southeastern United States to exploit the game (e.g., deer, bison) and new floral communities of the warmer Holocene epoch (Anderson and Sassaman 2012:72; Moore et al. 2016).

Anderson and Sassaman's (2012) recent work on historicizing the Archaic period has highlighted the fact that during the Middle Archaic, which roughly corresponds to the middle Holocene, cultures across the Southeast showed much variety. Major earthworks in the form of mounds such as Watson Brake (Saunders et al. 2005; Saunders et al. 1997), Poverty Point (Ford and Webb 1956; Gibson 2000, 2007; Ortmann 2010), and Lower Jackson Mound (Saunders et al. 2001) were built in the Lower Mississippi Valley. Shell rings were created on the coast, while shell mounds were built along inland rivers in the mid-South and Florida (Claassen 1986; Russo 2004, 2010; Russo and Saunders 1999; Sanger and Thomas 2010; Saunders 2002, 2004; Saunders and Russo 2011).

Evidence of cultural contact in the form of long-distance trade networks existed throughout the southeastern United States (Anderson and Sassaman 2012:74). Middle Archaic trade networks are known to have linked sub-regions outside of the Carolinas and Georgia. In the mid-South, the Benton Interaction Sphere linked lithic raw material sources from the middle Tennessee River Valley to the Coastal Plain of the Gulf Coast, as shown in the distribution of Benton bifaces and mortuary practices (Johnson and Brookes 1989; McNutt 2008; Meeks 1999, 2000). Beads and effigy beads were exchanged between Poverty Point in northeastern Louisiana and groups within the Yazoo River Valley of Mississippi (Connaway 1977, 1981; Crawford 2003; McGahey 2005). Additional trade networks throughout the greater Southeast included the trade of bone pins in central Kentucky (Jefferies 1996, 2004, 2009) and bannerstones, fish hooks, and plummets in the Lower Ohio River Valley (Burdin 2004; Goldstein 2004; Moore 2010).

When comparing the Middle Archaic occupations of the South Atlantic Slope, specifically in the Carolinas and Georgia, to the Middle Archaic occupations of Florida and the mid-South region (Mississippi, Alabama, and Tennessee) of the southeastern United States, it is apparent that something unique was occurring on the South Atlantic Slope. The Middle Archaic period along the South Atlantic Slope is characterized by drastically different lithic toolkits from elsewhere in the Southeast. By roughly 8,000 years ago, populations along the South Atlantic Slope began to favor locally available lithic raw materials over the high quality materials that had been used by their ancestors (Blanton 1983, 1984).

The preference for local stone, regardless of quality, led researchers to conclude that the territory utilized by these Middle Archaic groups of highly mobile hunters and gatherers had decreased so that many groups no longer had access to the sources of high quality lithic material (Blanton and Sassaman 1989; Clement and Dawson 2009; Goodyear et al. 1979). The decrease in group territory could have been the result of war or, more likely, increasing population pressure (Anderson and Sassaman 2012:74). Even with a decrease in group territory, could groups still not obtain high quality lithic raw materials through trade? The lack of these high quality stones suggested a halt in the trade/macroband gatherings that had previously existed during the Early Archaic (Anderson and Hanson 1988; Bridgman Sweeney 2013).

In addition to a change in material type, the variety of lithic tools changed. The well-made projectile points/knives and the variety of tool types in the Early Archaic toolkit were replaced by a tapered stemmed (Morrow Mountain) projectile point/knife and, later, a lanceolate and/or stemmed (Guilford) projectile point/knife. Both of these point types are associated with a drastic increase in expedient flake tools. Research (Anderson 1996; Claggett and Cable 1982) within the Carolina Piedmont of the South Atlantic Slope suggested that all of these changes in Middle Archaic material culture were the result of environmental instability and resultant cultural change due to changing precipitation patterns and the warming climate of the Middle Holocene (Taylor et al. 2011; Watts 1980).

Another lithic artifact unique to the Middle and Late Archaic periods in the eastern United States is the atlatl bannerstone, a perforated ground stone artifact produced from circa 6,500 to 3,000 BP (Kinsella 2013:24). Within South Carolina Middle Archaic populations, bannerstones are often made of lithic raw materials such as argillite that are locally available in the Carolina Slate Belt (Figure 1.2) (Tommy Charles, personal communication 2015). The Carolina Slate Belt is an area skirting the eastern edge of the Piedmont, to the west of the Sandhills Province, throughout the South Atlantic Slope. Rocks and sediments from the Piedmont were deposited in this location millennia ago through volcanic eruption and sedimentation, then metamorphosed into a slaty lithic material, some of which is suitable for manufacturing lithic tools (Rogers 2006:10).

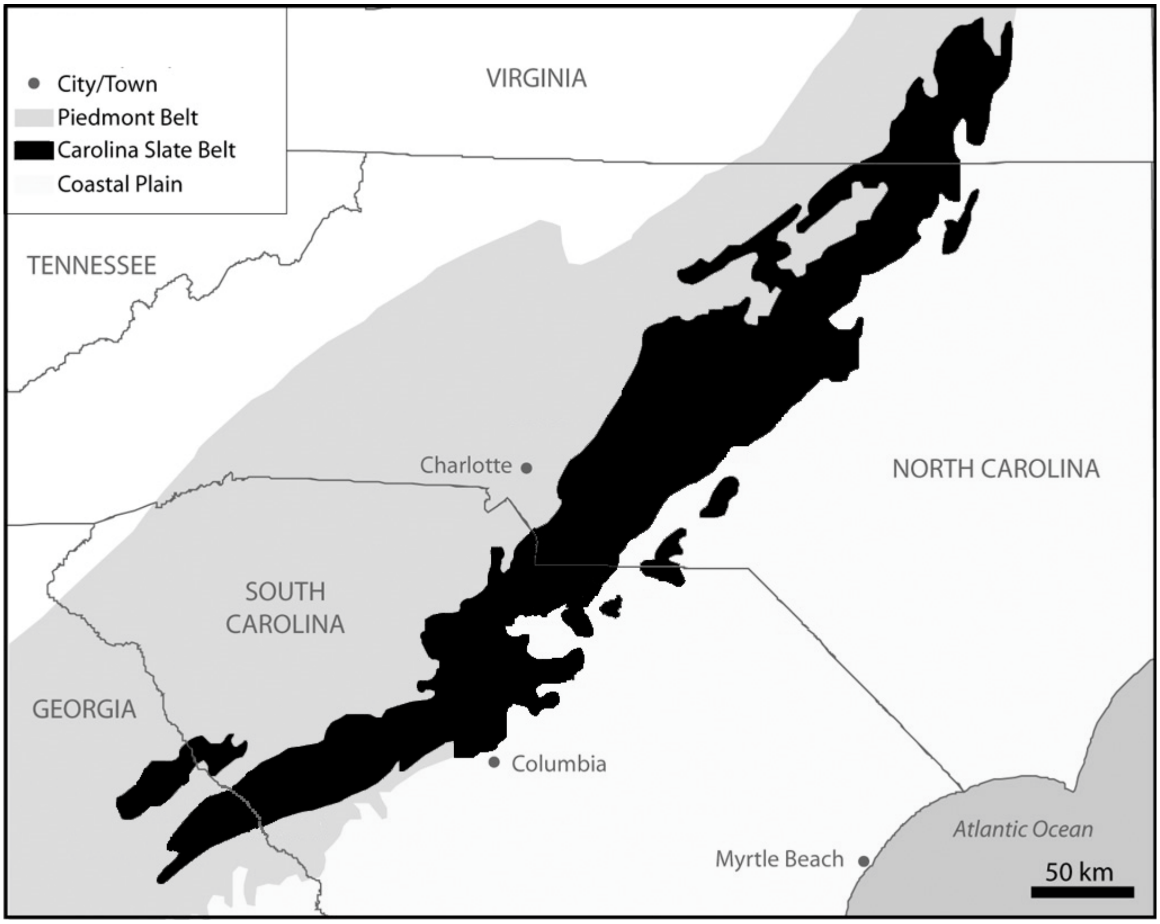

Figure 1.2. Carolina Slate Belt (Strongbox Exploration, Inc. 2011), modified by author.).

Anderson and Sassaman's (2012) recent work is important in synthesizing the massive amount of Archaic period data for the entire southeastern region of the United States. Their ideas are forcing the archaeological community to question our imposed and outdated division of the Archaic period into Early, Middle, and Late, and instead Anderson and Sassaman (2012) highlight the regional and sub-regional trends within this cultural period. Their work provides a glimpse at the strikingly different experience occurring in the lives of the Middle Archaic peoples inhabiting the Piedmont region of the Carolinas and Georgia compared to elsewhere in the Southeast. Why does the Piedmont lack the cultural complexity noted in other areas of the Southeast? Does the environment play some role in these differences? Why were Middle Archaic peoples in the Piedmont minimizing the time and energy spent on collecting lithic raw materials and manufacturing tools by using locally available stone and an expedient tool technology: how did they use the time and energy saved from tool manufacture?

Modelling Middle Archaic Settlement on the Inner Coastal Plain

I believe that the changes noted between lithic assemblages of the Early and Middle Archaic populations of the southeastern United States are not just in response to climate change, or increased population pressure, or war—although the former two factors undoubtedly greatly influenced life in this period. I see the Middle Archaic as a transitional period when people were beginning to realize that their manipulations favorably changed the vegetation within their environment to serve them. I think populations consciously decreased their territories because they were beginning to invest in smaller territories that they wanted to protect. Controlled burns to clear underbrush and make a favorable location for wild game, disturbing weedy plant patches or opening up forests, and selectively spreading seeds throughout their territory—among other small actions—were creating a favorable environment for wildlife and promoting change in the gene pool of weedy plants (Delcourt and Delcourt 2004; Delcourt et al. 1998; Gardner 1997; Gremillion 1998, 2004; Moore and Dekle 2010; Munson 1986; Wagner 2003, 2005). These actions are difficult to prove with the current data available for the Sandhills Province.

I see the simplification of lithic toolkits and the use of locally available raw materials as a way to save time, which could then be used to improve and modify the local vegetation. Although full-blown agriculture was still millennia away, I see the Middle

Archaic as the time when people began the transition from unintentionally to intentionally modifying their resource bases (Abrams and Nowacki 2008; Nassaney and Cobb 1991:288-292; Wagner 2003). Researchers have noted that controlled burns and the intentional or unintentional modification of forested areas facilitated the development of the Eastern Agricultural Complex (Delcourt et al. 1998; Moore and Dekle 2010); however, the question remains whether modification actually started during the Middle Archaic period on the South Atlantic Slope. The accumulation of efforts toward modifying nature can be seen in the evolution of pottery—of which the oldest examples come from the Savannah River Valley and Georgia Coastal Plain (Sassaman 1998)—and the domestication of plants by the Late Archaic period (Fritz 1990).

Building on the settlement model developed as part of his Master's thesis research, archaeologist Kenneth Sassaman proposed the model of Adaptive Flexibility to explain the behavior of Middle Archaic populations, and specifically those dating to the Morrow Mountain cultural horizon in the South Carolina Piedmont (Sassaman 1983, 1991). The artifact assemblages from these occupations consist of low-density, redundant lithic scatters with a generalized, expedient lithic toolkit made of locally available raw materials (Blanton and Sassaman 1989; Sassaman 1983, 1991). Sassaman argued that the homogeneous resource structure—both in terms of biota and lithic raw materials—of the Piedmont region during the early and middle Holocene created the ideal setting for highly mobile foraging groups (Sassaman 1983, 1991:35). Groups practicing a foraging settlement strategy, as defined by Binford (1980), move from one resource patch to another when resources become scarce in the first patch.

Living in an area where the knowledge and raw materials to create the generalized lithic toolkits were readily available to all members of the group, resulted in responses on both individual behavior and cultural-societal levels. Sassaman (1983:101, 1991:35) proposed that a great deal of flexibility in terms of individual behavioral responses (e.g., group membership and social organization) had to have been permissible in order to create and maintain the egalitarian nature of Morrow Mountain society. Sassaman (1991:35) sees this flexibility as "generalized or non-specialized strategies of adaptation".

In addition, Sassaman argued that high residential mobility of his Adaptive Flexibility model was possible within the South Carolina Piedmont due the homogenous resource structure where the both upland (interriverine) and riverine forests provided fairly similar resources (Sassaman 1991:35). I would argue the opposite: high residential mobility fundamental to Sassaman's model of Adaptive Flexibility was possible because of a heterogeneous resource structure. Ethnographical research has noted that foraging-based economies are better suited to areas where resources are scattered or scarce. Logistic-based economies are better suited for areas with a reliable, homogenous resource structure (Phillips 1987:175; Stein Mandryk 1993).

Theoretically, when foragers do inhabit areas with stable or consistent resource structures, they will tend to become specialized, meaning that individuals within the society will begin to differentiate themselves from others in the society by specializing in one specific task or skill (Sassaman 1991:35)**.** Sassaman's model of Adaptive Flexibility argues that the foraging groups of the Morrow Mountain cultural horizon in the South Carolina Piedmont did not begin to specialize their behavior despite the stable resource structure of the region. This generalist practice existed because of societal or cultural processes that enabled high residential mobility to work as a leveling mechanism in order to avoid the accrual of social debt in obtaining resources (although the exact type of resources they are accruing debt while obtaining is unclear) (Sassaman 1991:36).

Sassaman (1991:36) views the social debt accrued during the acquisition of resources as something to be avoided, however he notes within the same paragraph that "food sharing and informal exchange" would have been used to offset individual- or household-level production disparities. How is the social debt associated with obtaining "resources" different from the indebtedness associated with a social act like food sharing? Food sharing and reciprocity, which are forms of social debt, serve both as leveling mechanisms within society and as a method of holding hunter and gatherer society together. The creation of social ties has been shown through ethnographic research to be an important mechanism in establishing and maintaining larger regional social networks and "safety nets' (Whallon 2006:260), especially in areas within uncertain environments (Jochim 1998; Kelly 1995). I think the acquisition of social debt in addition to social actions like food sharing, reciprocity, and informal exchange is present within Morrow Mountain society even if it isn't visible in the current archaeological record of the South Carolina Piedmont and Coastal Plain.

Within Sassaman's model of Adaptive Flexibility, processes such as group fission-fusion, food sharing, and reciprocity are viewed as leveling mechanisms (Woodburn 1982). Leveling mechanisms work to disengage the people from the property, which in turn eliminates the potential for specialization, dependency, and, ultimately, conflict. High residential mobility is proposed as the main leveling mechanism among Morrow Mountain society (Sassaman 1991:35-36). Small group size, coupled with continual movement from resource patch to resource patch, eliminated the need for increased food production methods and decreased the need for individual ownership of property, or resources, which helped this egalitarian society to last, unchanged, for centuries in the South Carolina Piedmont (Sassaman 1991:36). However, I propose instead that a seasonally mobile lifestyle does not preclude a mentality of developing group ownership of selected resources and property. Middle Archaic mobile groups may have collectively engaged in processes such as burning underbrush, clearing paths, and disturbing weedy patches, which improved the resource bases by promoting acorn production or improving browse for deer. Such group modifications to particular locales lay the groundwork for the domestication of plants by the Late Archaic period Delcourt et al. 1998; Fritz 1990; Moore and Dekle 2010).

Sassaman (1991:36) argued that Middle Archaic occupations of the Coastal Plain, and by extension the Sandhills, fell outside of the scope of his model of Adaptive Flexibility. The paucity of Morrow Mountain sites in the Coastal Plain and the limited movement of lithic raw materials as shown in Charles' (1981, 1983, 1986) collector survey data suggested to Sassaman that Morrow Mountain occupations in the Coastal Plain had a decreased settlement range, short-lived occupations, and/or a very small population compared to populations in the Piedmont (Sassaman 1991:36). A second observation by Sassaman was that Coastal Plain sites dating to the Morrow Mountain cultural horizon have higher levels of interassemblage variability—specifically increased levels of Coastal Plain chert and additional diagnostic projectile points/knives known as Brier Creek lanceolates and Allendale/Middle-Archaic-Late-Archaic (MALA) points (Michie 1968; Sassaman 1985; Whatley 2002)—which Sassaman correlates to lowered residential mobility (Sassaman 1991:36). Lowered residential mobility removes the key leveling mechanism from the model of Adaptive Flexibility, thus making the model inapplicable for the Coastal Plain.

Sassaman's comments concerning the Coastal Plain Morrow Mountain/Middle Archaic were derived from the research available at the time of his Master's thesis (Anderson et al. 1982; Anderson et al. 1979; Fish 1976; Mathis et al. 1979; Stoltman 1974), which showed limited use of the Coastal Plain by Middle Archaic populations and far greater use during the Late Archaic period (Sassaman 1983:54-61). The distribution of lithic raw materials shown in the South Carolina Collector's Survey at the time (Charles 1981, 1983, 1986) suggested limited mobility or a decreased settlement range (Sassaman 1991:36). Data from the Savannah River Site in Aiken County, South Carolina (Hanson and Brooks 1978; Hanson et al. 1981; Hanson et al. 1978), also suggested limited use of the area by Middle Archaic groups (Sassaman 1983:62-64). He concluded that more work needed to be undertaken in the Coastal Plain to fully understand what was occurring there during the Middle Archaic period (Sassaman 1991:37-38).

Utilizing the now-larger data base of Coastal Plain Middle Archaic sites, I argue in this dissertation that Sassaman's model of Adaptive Flexibility originally proposed for the South Carolina Piedmont is also applicable to Middle Archaic populations—specifically those dating to the Morrow Mountain cultural horizon—of the Sandhills Province of the Inner Coastal Plain. Study after study has shown that variability is more prevalent than pattern in hunter-and-gatherer society (e.g., Kent 1996; Price 2002:416).

Thus, Sassaman's settlement model is expected to differ somewhat when applied to the Coastal Plain.

However, in order to test the applicability of the Adaptive Flexibility model to the Sandhills and the adjacent Inner Coastal Plain, the occupations need to meet the characteristics important to Sassaman's model. The main characteristics of Sassaman's Adaptive Flexibility model are (1) high residential mobility; (2) generalized, unspecialized, expedient toolkits (i.e., a lack of curated materials/artifacts); and (3) equal, individual access to resources such as locally available lithic raw materials. Based on these three characteristics, I offer five testable hypotheses.

1) If the Morrow Mountain occupations in the Sandhills result from frequent residential mobility, then the environment needs to be reliable.
2) If Morrow Mountain sites in the Sandhills are the remains of highly mobile groups of foragers, then the lithic artifact assemblages should show a reliance on expedient tools instead of specialized tools.
3) If the Middle Archaic occupations of the Inner Coastal Plain are part of a forager-based economy with high residential mobility, then the large Middle Archaic sites in the Coastal Plain will reflect a highly mobile lifestyle and any large site size should reflect repeated visits by small groups to the same location rather than one large group staying at a large, residential base.

4) If members of these highly mobile groups of foragers had equal, individual access to resources, then we would expect to see an even distribution of lithic raw materials.
5) If the model of Adaptive Flexibility explains Middle Archaic uses of the Coastal Plain, then the interassemblage variability noted by Sassaman (1991:36-37) between Middle Archaic artifact assemblages in the Piedmont versus Coastal Plain needs to be further examined.

Sassaman's model utilized Lewis Binford's ethnoarchaeological research concerning foraging and collecting settlement strategies. At one extreme along a continuum of hunter-and-gatherer settlement systems are highly mobile groups (foragers) who frequently relocate residential bases to map on to resource patches. At the other end of the continuum are collectors who maintain a relatively permanent residential base but dispatch work parties to logistically gather resources and return to base (Binford 1980). Archaeologically, Binford (1980) argues that a foraging settlement system will create two site types: the small residential base and the resource-harvesting location. Groups working within a collecting system will create a multitude of site types: the large residential base and several types of specialized extraction sites such as field camps, stations, and caches.

Binford (1980) notes that these settlement strategies are influenced by climate and environmental changes, and that both systems are often practiced by the same group. Settlement systems may change seasonally, with high residential mobility occurring in the summer and during the growing season, but reduced residential mobility and increased logistical mobility practiced during the winter months (Binford 1980:18-19).

The fact that foraging and collecting are intermittently utilized by the same group throughout the year (and that multiple groups may use the same territory) means that identifying foraging versus collecting sites in the archaeological record is a difficult task, especially when groups utilize the same locations throughout time and space. Quoting Binford, "[t]he point here is that logistical [collecting] and residential variability [foraging] are not to be viewed as opposing principles…but as organizational alternatives which may be employed in varying mixes in different settings" (Binford 1980:19).

Binford's foraging and collecting settlement systems were widely accepted by the archaeological community and applied to hunter-and-gatherer studies throughout the world (e.g., Anderson and Hanson 1988; Grøn 1987; Sassaman 1983; Straus 1986). Indeed, Binford's work is still used (e.g., Fitzhugh and Habu 2002; Sequchi 2014). However, a large number of the studies employing Binford's forager/collector continuum take an either/or approach to applying this model to the archaeological record. Binford (1980:18-19; 1983) noted that ethnographic analysis showed groups employed either strategy depending on the season, other environmental factors, or just the perceived need of using the alterative strategy. Furthermore, such changes were difficult to identify in the archaeological record. A notable example from the southeastern United States that incorporates Binford's foraging/collecting continuum as evolving and changing based on the season and geographical setting of the group is Anderson and Hanson's Band-Macroband model (1988) discussed in Chapter Two. In this dissertation, I follow Binford's original concept of the foraging/collecting continuum. Foraging and collecting were frequently used and interchanged based on the perceived needs of the group in terms of climatic, environmental, and even social changes or pressures.

The Three Springs Site

In the following section, I introduce site 38RD837/841/842/844—henceforth known as the Three Springs site—by providing an overview of the archaeological excavations at the site. Research at the Three Springs site started in the early 1990s with the initial reconnaissance survey. Since then, additional excavations have occurred here as part of Fort Jackson's commitment to understanding and managing their cultural resources.

Survey

In 1991, Gulf Engineers and Consultants of Baton Rouge, Louisiana, and Southeastern Archaeological Services, Inc. of Athens, Georgia, conducted a cultural resource survey of selected timber harvesting areas. This survey recorded four separate sites: 38RD837, 38RD841, 38RD842, and 38RD844 (Steen and Braley 1993). The descriptions of these sites from this reconnaissance survey on the United States Army Garrison of Fort Jackson are presented below.

38RD837. Site 38RD837 is situated on a ridge toe immediately southeast of Boyden Arbor Pond. It was identified as a heavily disturbed, dense, and diverse lithic scatter located at the intersection of two dirt roads southwest of site 38RD844 (Figure 1.3). The survey recorded a site area of roughly 2,400 m² (20 m x 120 m) for site 38RD837.

The artifact assemblage recovered from the shovel test pits at site 38RD837 consisted of nineteen pieces of quartz debitage, one piece of chert debitage, and one piece of metavolcanic debitage. Artifacts were recovered from eight of the twelve shovel test pits excavated to define the site's boundary. Additional artifacts were collected from the surface of the site, mainly the road cuts. The surface finds included ninety-three pieces of quartz debitage, six non-diagnostic quartz biface fragments, three pieces of

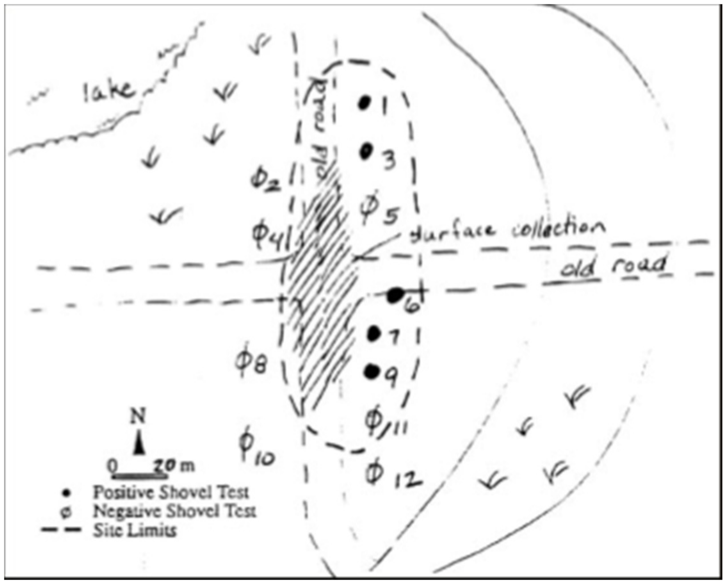

Figure 1.3. Original Survey Site Map, 38RD837 (Steen and Braley 1993:341).

metavolcanic debitage, one non-diagnostic metavolcanic biface fragment, one piece of chert debitage, and one piece of oyster shell (Steen and Braley 1993:341-342). The recovery of oyster shell in the Sandhills is unusual, but no additional information was provided concerning its origin or relation to the prehistoric, historic, or military uses of this area.

38RD841. Site 38RD841 is a prehistoric lithic and ceramic scatter on a gentle slope adjacent to a small spring-fed drainage (Figure 1.4). It is the southeasternmost site of the four sites discussed here. Sixteen shovel test pits were excavated linearly down the ridge slope on to the saddle separating site 38RD841 from site 38RD842 to the west. The site area was estimated at 140 m x 100 m, or roughly 14,000 m².

Cultural material was recovered from thirteen of these shovel tests. Although no diagnostic lithic artifacts were recovered from the site, the lithic assemblage was nonetheless diverse: raw materials included quartz, greenstone, and a metavolcanic

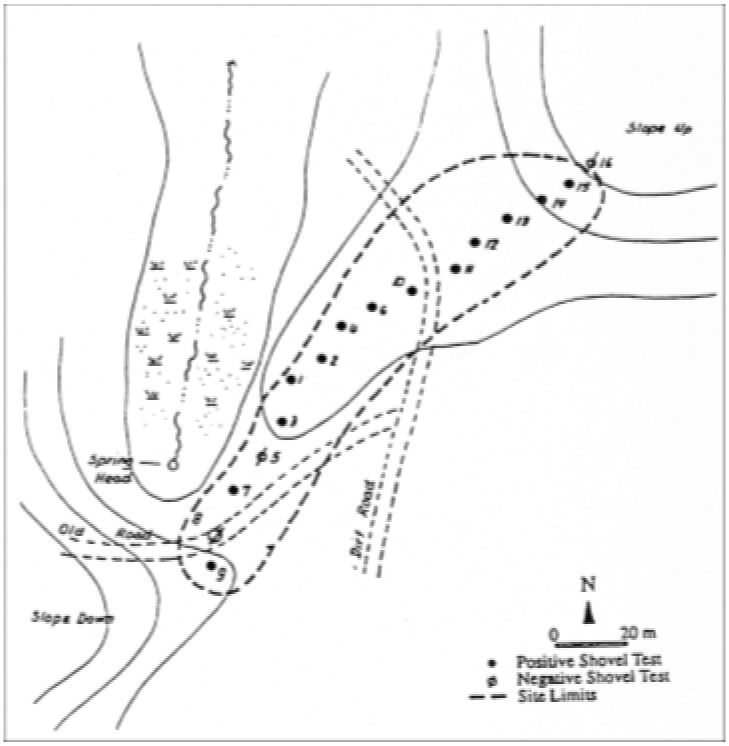

Figure 1.4. Original Survey Map of Site 38RD841 (Steen and Braley 1993:332).

material. In fact, "the site produced impressive numbers of quartz flakes, some quite large (primary reduction)" (Steen and Braley 1993:332). "A few chert...artifacts" are mentioned in the description of the site; however, no chert artifacts are enumerated in the artifact catalog (Steen and Braley 1993:332-333). The presence of linear check stamped and plain pottery sherds suggest site 38RD841 was utilized during the Middle Woodland period. The recovery of lithic debitage as deep as 85 cmbs strongly suggests an earlier, pre-ceramic occupation(s) (Steen and Braley 1993:332-333).

38RD842. Site 38RD842 is a relatively large prehistoric lithic and ceramic scatter with a small historic component on a ridge-top knoll west/northwest of site 38RD841 (Figure 1.5). From the ridge-top knoll, 38RD841 is to the east/southeast. Two swampy spring-fed streams that skirt the landform to the north and east are depicted on the site's

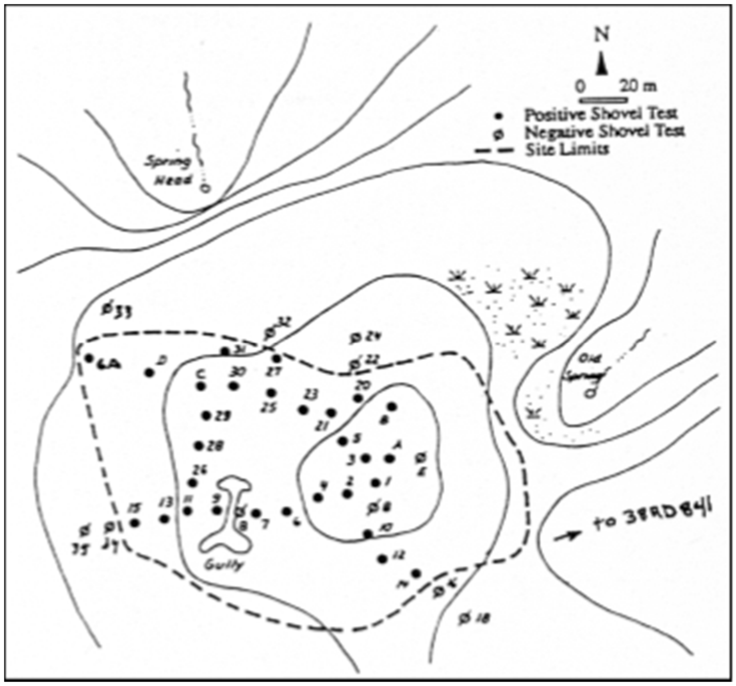

Figure 1.5. Original Survey Map for Site 38RD842 (Steen and Braley 1993:335).

sketch map (Steen and Braley 1993:335). The relatively inactive springhead to the east borders site 38RD841. A larger, active springhead is located to the north of 38RD842; water from this northern springhead drains northward into the creek that separates site 38RD844 on the west from 38RD843 on the east (another site on Fort Jackson located to the north of site 38RD842).

Forty shovel test pits were excavated at varying intervals (most appear to be at 10-m intervals with a few 15-m and/or 20-m interval shovel tests) across the top of the knoll. Site area was calculated at 120 m x 120 m, or approximately 14,400 m². Cultural material was recovered from twenty-nine shovel tests and the surface of the site. The artifact assemblage included prehistoric lithic and ceramic artifacts in addition to historic hotel wares and bottle glass. Prehistoric artifacts from site 38RD842 include quartz, chert, orthoquartzite, and metavolcanic debitage; quartz and chert biface preforms; non-diagnostic quartz biface fragments; and a quartz hammerstone. In addition to numerous surface finds, prehistoric artifacts were recovered as deep as 70 cmbs. The prehistoric ceramics were eroded; however, their presence suggests an ephemeral Woodland period occupation. Oyster shell was also recovered from the surface of the site. The presence of some large pieces of quartz debitage and the recovery of cortical quartz debitage suggest that early stage reduction activities occurred on this ridge knoll (Steen and Braley 1993:335).

38RD844. Site 38RD844 is a lithic debitage scatter dating to the Middle and Late Archaic periods. The site is located west/northwest of 38RD842 on the western side of a spring-fed, unnamed tributary of Gills Creek. The site is situated on a ridge line running parallel to this unnamed tributary (Figure 1.6). Site area was recorded as 70 m x 110 m or roughly 7,700 m^2.

Sixteen shovel tests were excavated along the spine of this ridge line at what appears to be 10-m intervals. Cultural material was recovered from eleven of the shovel tests and the surface of an old road cut bisecting the site. The only two diagnostic artifacts, a Morrow Mountain point and a Savannah River stem fragment, were recovered from the road surface. The remaining artifact assemblage consists of quartz, metavolcanic, and chert debitage; one utilized chert flake; one piece of fire-cracked rock; and one non-diagnostic quartz biface fragment. It was concluded the site had good horizontal integrity and research potential despite its shallow stratigraphy (Steen and Braley 1993:342).

Testing: 38RD837/841/842/844

Sites 38RD841, 38RD842, and 38RD844, three of the four sites discussed above, were included in the 2002-2004 testing project conducted by the Applied Research

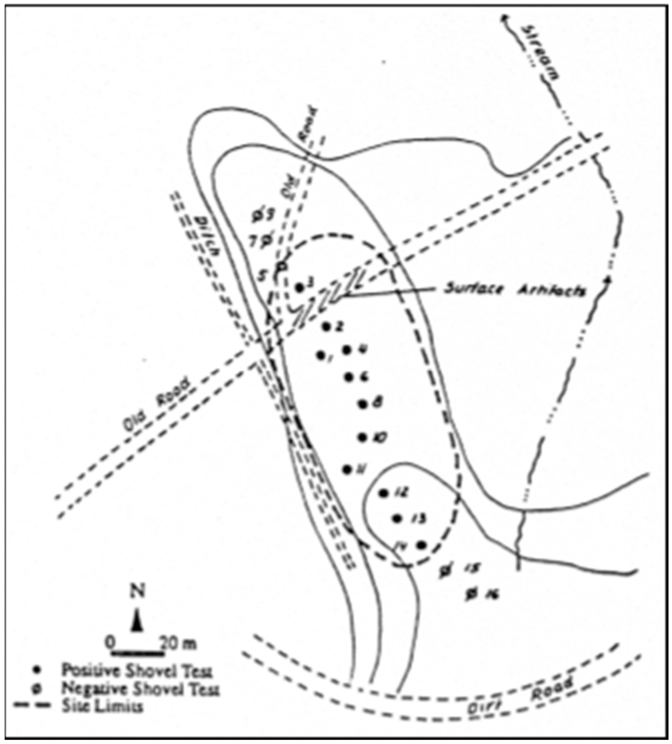

Figure 1.6. Original Survey Map of Site 38RD844 (Steen and Braley 1993:342).

Division of the South Carolina Institute of Archaeology and Anthropology (SCIAA-ARD) of the University of South Carolina (Dawson et al. 2007). Site 38RD837 had been originally recommended not eligible for inclusion on the National Register of Historic Places and, as such, required no additional archaeological work or protection.

The 2002-2004 testing project conducted additional archaeological excavations at sites 38RD841, 38RD842, and 38RD844, which were merged into a large, multicomponent site called 38RD841/842/844 (Figure 1.7). These excavations consisted of 5- and 10-m interval shovel tests pits laid out on a north/south grid to define the site's boundary. A sampling of 1 m x 1 m excavation units were excavated throughout to assess site stratigraphy. In 2013, the South Carolina State Site Files requested site 38RD837—located along the northwestern edge of site 38RD841/842/844—be added to

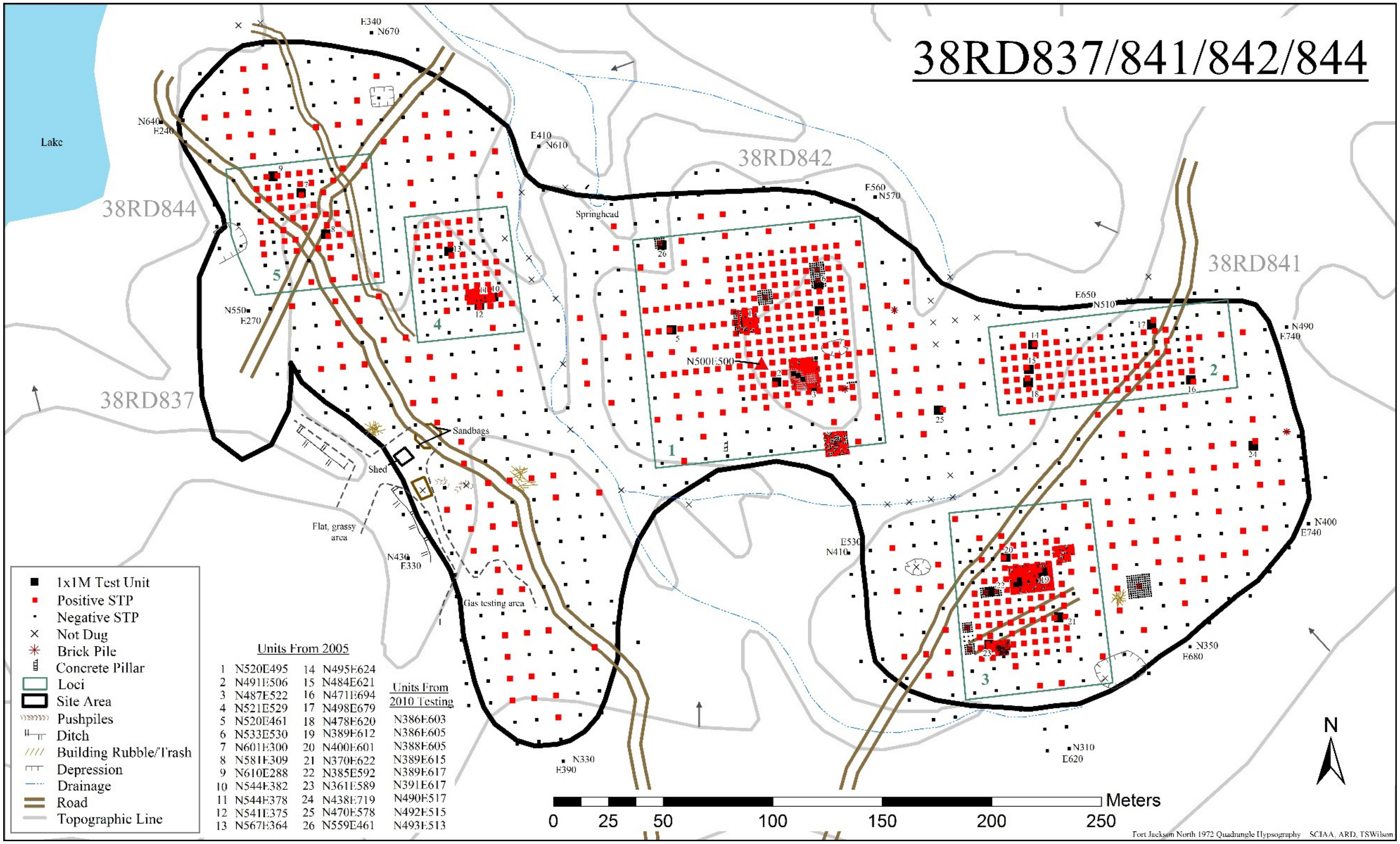

Figure 1.7. Site Map of 38RD837/841/842/844 (Dawson et al. 2013:12).

the site. This addition was requested because the State Site Files GIS layer showed the boundary of the larger site, 38RD841/842/844, intersecting with the boundary of site 38RD837 (Keith Derting, personal communication 2013). Shovel tests that inadvertently fell within the 38RD837 boundary during the 2002-2004 testing project were negative. Thus, at the time no additional work was conducted in this area—originally labelled site 38RD837—because it was not believed to be part of site 38RD841/842/844 while the testing project was underway. The site area for 38RD837/841/842/844 was calculated at 74,400 m^2 (Dawson et al. 2007:297). The site will be referred to as the Three Springs site throughout this dissertation.

Testing of the Three Springs site started with the excavation of 885 10-m interval shovel test pits on a north/south grid. In addition to defining the site's boundary, these shovel test pits identified special-interest areas with high artifact densities, unique raw materials, and/or diagnostic artifacts. The excavation of 5-m interval shovel tests was then undertaken in these special-interest areas. Five loci were identified based on areas of high artifact density. The 5-m interval shovel tests further examined the site's horizontal stratigraphy. The final step of the testing project was the excavation of twenty-six 1 m x 1 m test units throughout the site to examine the site's vertical stratigraphy. The following section will briefly review the results of this testing project by locus.

Locus 1. Locus 1 is located on the ridge knoll and side slope originally identified as site 38RD842. On the ridge knoll, deep, stratified deposits were encountered to 80 cmbs. Soils and cultural deposits became shallower as distance from the knoll increased, with the shallowest soils and cultural deposits in the northwest corner near the springhead.

Cultural material from Locus 1 included lithic, prehistoric ceramic, and historic artifacts. Diagnostic lithic artifacts date the occupations of this locus to the Archaic period. The Late Archaic period is represented by a Mack point. Use during the Middle Archaic period is evidenced by the recovery of Morrow Mountain points (n=7) and Guilford points (n=4). Two Early Archaic Side Notched points and a Kirk Corner Notched point date the site occupations to the Early Archaic period. Prehistoric ceramic sherds (n=30) were recovered throughout with no patterning or discrete concentrations noted. The prehistoric ceramic sherds show that Locus 1 was also occupied during the Early/Middle Woodland periods (based on the recovery of Deptford and Yadkin ceramics) and the Mississippian period (based on the recovery of a Mississippian Plain sherd). Historic artifacts were recovered from the upper levels of the excavation units on the top of the knoll in Locus 1; these artifacts span the nineteenth and into the early twentieth centuries (Dawson et al. 2007:299-313).

Locus 2. Locus 2 was delineated within the part of the site formerly known as 38RD841. This locus is situated adjacent to the spring-fed drainage and covers part of the saddle and gentle slope. Lithic artifacts and prehistoric ceramic sherds were recovered from Locus 2. The recovery of a Morrow Mountain point and an Early Archaic Palmer point suggest that this area was occupied during the Early and Middle Archaic periods. Prehistoric pottery sherds (n=26) were concentrated along the edge of the drainage. Thoms Creek ceramics (n=2) show this area was used during the Late Archaic period, whereas the Deptford and Yadkin sherds suggest occupations dating to the Early/Middle Woodland periods (Dawson et al. 2007:313).

Locus 3. Locus 3 corresponds to a section of the ridge slope in the southeastern part of the site with deep soils and deep, stratified cultural deposits extending to 110 cmbs. Lithic artifacts were the only artifact type recovered from this locus. The diagnostic lithic artifacts—two Morrow Mountain points, a Guilford point, and a Guilford Stemmed point—are representative of the Middle Archaic period (Dawson et al. 2007:313).

Locus 4. Locus 4 delineates a lithic concentration in the part of the site formerly identified as 38RD844. Located on a terrace adjacent to an unnamed tributary of Gills Creek, Locus 4 contained deep soils and deep, stratified cultural deposits to 80 cmbs. Diagnostic lithic artifacts from this locus dated the occupations to the Early and Middle Archaic periods. The Early Archaic was represented by a Kirk Corner Notched point and an Early Archaic Side Notched point. A Middle Archaic presence is noted based on the recovery of a Guilford point (Dawson et al. 2007:313-314).

Locus 5. Locus 5 refers to the northwesternmost artifact concentration of the site. Locus 5 contained a dense concentration of lithic artifacts dating to the Middle Archaic period as shown by the recovery of a Morrow Mountain point. Soils in this locus were very shallow, suggesting that this locus was heavily deflated (Dawson et al. 2007:314).

The testing project provided some much-needed diagnostic artifacts to help understand when the lithic artifacts were deposited at this site. The lithic concentrations span the Archaic period, prehistoric pottery indicates Woodland and Mississippian occupations, while historic artifacts date components of the site to the nineteenth and early twentieth century. The prehistoric ceramics were predominantly recovered from Loci 1 and 2; however, the small sample size (n=66) did not reveal any clusters or concentrations. The sparse Woodland and Mississippian components suggest that this area saw limited use during those periods. The same can be said of the Late Archaic component of the site. In addition to the Mack point, two sherds of Thoms Creek pottery were recovered from the site, suggesting short-term occupation of this site during the Late Archaic. A similar conclusion was reached concerning the historic nineteenth and twentieth century occupations. The sparse historic artifact assemblage (n=218) was isolated on the ridge knoll in Locus 1. The bulk of the diagnostic artifacts date the site to the Early and Middle Archaic periods. Deep soils and deep, stratified artifact deposits ranging from 80 to 110 cmbs were noted in Loci 1, 3, and 4. Soils in loci 2 and 5 were fairly shallow (Dawson et al. 2007:297-314).

Dissertation Organization

This dissertation is organized into six chapters. In this first chapter, I introduced the model of Adaptive Flexibility, the physiographical regions of the South Atlantic Slope, and a brief overview of the Archaic period uses of this region. In addition, this chapter presented a series of five testable hypotheses and the research history for the case study site, the Three Springs site situated in the Sandhills Province of central South Carolina.

The second chapter is the cultural context for the region. The chapter begins by providing a detailed culture history for the South Atlantic Slope. The cultural context primarily focuses on the Archaic period and provides information concerning the research on climate change and the known cultural horizons of the Early, Middle, and Late Archaic periods.

Chapter Three begins with a discussion of the organization of technology as a way for relating lithic artifact assemblages to human behavior and society. The second section of the chapter introduces the idea of an occupational cluster as presented by Cable and Cantley (1998, 2005, 2006) for their work in the sandy soils of the Inner Coastal Plain.

Chapter Four examines lithic analysis methods in order to operationalize the organization of technology concept. Beginning with an overview of the lithic terminology used herein, the chapter continues with a discussion of aggregate and individual attribute analyses. A detailed description of the methods used in the analysis of lithic artifacts from the Three Springs site is also provided (Dawson et al. 2013). Lastly, this chapter presents information on the lithic raw materials recovered from the Three Springs site.

In Chapter Five, I examine the site structure of the Middle Archaic occupation clusters of Area 1 of the Three Springs site. Geomorphological analysis and optically stimulated luminescence dating of the site's soils in addition to the vertical distribution of artifacts strong suggests an intact Morrow Mountain occupation. The second part of the chapter presents the results of the mass analysis and flake attribute analysis for three Middle Archaic Morrow Mountain occupation clusters at the Three Springs site in order to understand the types of lithic reduction strategies employed in each occupation cluster.

In the final chapter of this dissertation, Chapter Six, I summarize the results of the analysis presented in Chapter Five to argue that Middle Archaic scatters in the Sandhills Province were the remains of highly mobile foraging groups and that lithic raw materials were regionally available and evenly distributed among the Middle Archaic population in the South Carolina Sandhills. I return to the five hypotheses presented in Chapter One to suggest that Sassaman's Adaptive Flexibility (1991) could be applicable to the Sandhills Morrow Mountain populations; however, I argue that Adaptive Flexibility does not fully explain settlement and land use during the Morrow Mountain cultural horizon. Instead, I speculate that an expedient tool technology and the use of locally available raw materials provided the time necessary for the Morrow Mountain peoples in the Sandhills Province to deliberately modify vegetation to improve and concentrate resources.

CHAPTER 2
CULTURAL CONTEXT FOR THE ARCHAIC PERIOD ON THE SOUTH ATLANTIC SLOPE

This chapter is designed to provide a context for the Archaic period on the South Atlantic Slope—the Piedmont and Coastal Plain regions of the southeastern United States. Within this cultural context, information will be presented from various archaeological sites throughout the region in order to provide as detailed a history as possible for this period of prehistory. The goal of a cultural context is to highlight the known information—both archaeological and environmental—while also illuminating areas where more research is needed. Archaeologists will never fully know what was happening in this area some 3,000-10,000 years before present, but based on the data at hand, we can begin to understand life during this time long ago.

Cultural Context for the South Atlantic Slope

The following section provides a cultural overview of the South Atlantic Slope with a specific focus on the Archaic period of South Carolina. In order to identify changes and continuities within the Middle Archaic culture, it is necessary to review what was occurring before and after this period. The discussion begins with a brief overview of the peopling of the Americas and PaleoIndian period before diving into the Archaic period.

PaleoIndian

The PaleoIndian period is the time of human colonization and occupation of North American prior to the cultural period known as the Archaic (ca. 10,000 BP). The beginning of the PaleoIndian period is currently a topic of debate. Since the 1930s, archaeologists posited the Clovis-first model for the peopling of the Americas. They proposed that migrating groups of hunters and gatherers followed herds of megafauna across the Bering Strait land bridge (Beringia) from northeastern Asia—modern Siberia—into the northwesternmost point of North American in the area currently known as Alaska (Haynes 1982). After entering Alaska, these groups continued southward through an ice-free corridor, an opening between the Laurentide and Cordilleran Ice Sheets, which covered northern North America throughout the Pleistocene Epoch (Haynes 1982:397). The ice-free corridor was accessible throughout the Late Wisconsinan glaciation, from approximately 25,000-10,000 BP.

Via this non-glaciated corridor to the east of the Rocky Mountains, groups of hunters and gatherers entered the area of the present-day United States around 11,500 BP (Haynes 1964, 1970, 1980). These PaleoIndian hunters and gatherers rapidly spread throughout the country following the migrating herds of megafauna. Their occupation is marked by a large, fluted, lanceolate spear point known as a Clovis point (Haynes 1982:383-384; Hester 1966). Early radiocarbon dating of Clovis deposits suggests that the Clovis tradition dated from to 11,500-10,900 BP (Waters and Stafford 2007:1122-1123).

Within the last two decades, new dates for the Clovis cultural horizon (Waters and Stafford 2007) in addition to the identification of cultural deposits dating to before Clovis have led archaeologists to question the Clovis-first model (Bonnichsen et al. 2005). Waters and Stafford (2007:1123) provided new dates for the Clovis horizon showing it dated to circa 13,250-12,800 BP. Some of the putative pre-Clovis sites located within the United States include Meadowcroft Rockshelter, Pennsylvania (Adovasio et al. 1977;

Adovasio et al. 1990; Carlisle and Adovasio 1982); Saltville and Cactus Hill, Virginia (Feathers et al. 2006; McAvoy and McAvoy 1997; McDonald 2000); Topper, South Carolina (Goodyear 2005:103-112); and Page-Ladson, Florida (Anderson et al. 2013:185; Dunbar and Hemmings 2004). Additional pre-Clovis sites have been identified in South America (e.g., Monte Verde, Chile [Dillehay 1997, 1999; Meltzer 1997], and Pedra Furada, Brazil [Bahn 1993; Santos et al. 2003]). These early occupations are forcing archaeologists to reconsider the Clovis-first hypothesis of human settlement in the New World and to develop new models exploring all possible routes and earlier times of reaching North and South America, such as boating along the southern coastline of Beringia and the northern Pacific coast (Anderson 2010:328; Bradley and Stanford 2004).

Early Archaic Period

At roughly 10,000 BP (8,000 BC), the Archaic period of human prehistory began in the southeastern United States (Caldwell 1958; Cleland 1976). This cultural period spans 7,000 years, terminating in the Woodland period at 3,000 BP (1,000 BC). By the end of the Archaic period, human populations had made drastic changes in the ways they interacted with and utilized their environment as evidenced by increased sedentism and the rise of agriculture.

Environment and Diet. The beginning of the Archaic period corresponds to the beginning of the Holocene, the modern geological epoch marked by increasing temperatures, decreased glaciations, and rising sea levels. Pollen samples show that by 10,000 BP the South Atlantic Slope was dominated by a mixed hardwood forest of oak, maple, beech, basswood, elm, walnut, hemlock, and gum (Daniel 1998:197; Delcourt and Delcourt 1981:126). This mixed hardwood forest covered the Piedmont and Coastal

Plain from the northern half of Georgia through North Carolina. The southeastern half of Georgia and the southern tip of South Carolina were covered by an oak-hickory-southern pine forest (Delcourt and Delcourt 1981:126).

A more detailed picture of the vegetation in the early Holocene comes from analysis of pollen data collected at a small streamhead pocosin wetland adjacent to the archaeological site 38RD628 in the northeastern part of the United States Army Garrison of Fort Jackson in Richland County, central South Carolina. The early Holocene landscape of Fort Jackson, specifically, and the central South Carolina Sandhills in general, was not uniformly dominated by an oak-hardwood forest and the transition to an oak-hardwood forest from a pine forest did not occur until the early to middle Holocene transition, circa 8,000 BP or 6,000 BC (Taylor et al. 2011). These data suggest that micro-scale variation existed in the vegetation on the South Atlantic Slope at the Pleistocene/Holocene transition.

A generalized description of the early Holocene climate for this region is cool-temperate. The area had abundant precipitation and humidity during the spring and summer, and increased seasonality compared to the Pleistocene. Delcourt and Delcourt (1984:276-277, 280) argue that this climate was similar to that of today. The environment would have supported a variety of plant and animal species, allowing the Early Archaic groups to practice "broad spectrum" subsistence activities (Smith 1986:10) while utilizing lithic toolkits similar to their PaleoIndian predecessors (Claggett and Cable 1982; Meltzer and Smith 1986).

Continuing the PaleoIndian tradition of highly mobile groups of hunters and gatherers, populations during the Early Archaic (10,000-8,000 BP) began to exploit a variety of foodstuffs not available in the colder Pleistocene, such as varieties of fish, reptiles, birds, and smaller mammals. The exploitation of an increased variety of plant species most likely occurred, as well, on the South Atlantic Slope. Evidence from Dust Cave in the middle Tennessee River Valley of northwestern Alabama indicates that Late PaleoIndian and Early Archaic occupants of this limestone cave prepared and ate mammals, birds, fish, and, to a lesser extent, amphibians, in addition to hickory nuts, acorns, black walnuts, persimmons, and chenopod (Homsey et al. 2010:189). Some, if not all of these resources would have been available in the Piedmont and Coastal Plain of the South Atlantic Slope. Early Archaic assemblages from Dust Cave and other sites within the southeastern United States show that resources from both upland, closed canopy forests and river bottoms/valleys were exploited by early Holocene hunters and gatherers (Cable and Cantley 2006:20; Smith 1986:10). Similar subsistence modes resulted in similarities between the lithic toolkits of the PaleoIndian hunters and gatherers and their counterparts in the Early Archaic.

Similarities between the lithic toolkits of the Late PaleoIndian and Early Archaic populations led archaeologists to speculate that, culturally speaking, an "adaptive continuity" existed between the two periods (Meltzer and Smith 1986:18). Cable and Cantley (2006) note numerous attributes shared by both the PaleoIndian and Early Archaic lithic toolkits. Projectile points/knives continued to be stylistically formalized; similar re-sharpening strategies were employed in both periods; and hafted end scrapers continued to be used in the Early Archaic period. As well, the preference continued for choosing high-quality lithic raw materials—for this area, high-quality lithics are considered to be cherts, rhyolites, and tuffs—over locally available, poorer quality lithic materials such as quartz. One noticeable difference between the toolkits is the absence of large, fluted lanceolate points such as Clovis and Redstone in the Early Archaic period. The production and usefulness of these large projectile points/knives declined with the diminishing populations of megafauna in the final millennia of the Pleistocene (Cable and Cantley 2006:19; Daniel 1994, 1998, 2001).

History of Early Archaic Research. Initial research into the Early Archaic populations of the southeastern United States focused on developing a cultural chronology of Early Archaic projectile points (Daniel 1998:3; Rigtrup 2009:59; Ward and Davis 1999). Joffre Coe's excavations at the Hardaway and Doerschuk sites along the Yadkin River in the North Carolina Piedmont provided a cultural sequence for the Early and Middle Archaic occupations of the Southeast that is still in use today (Coe 1964). His excavations identified stratified deposits representing much of the prehistory of the North Carolina Piedmont. Additional excavations throughout the Southeast (discussed below) have enhanced Coe's original typology and expanded it to include the Piedmont regions of South Carolina and Georgia.

Chapman's (1977, 1978) and later Kimball's (1996) work with collections from the Little Tennessee River Valley in Tennessee, Broyles' (1971) work in West Virginia, and Collins' (1979) work at the Longworth-Gick site in Kentucky have confirmed the majority of Coe's (1964) cultural chronology and highlight its applicability outside of the South Atlantic Slope. However, this additional research has shown that regional variation among hafting elements is present in the projectile point assemblages from the Early Archaic across the Southeast (Kimball 1996:157-159). The recognized Early Archaic projectile point typology starts with Dalton—a small, lanceolate point (Figure

2.1). Daltons are replaced by a series of side- and corner-notched points, including the Hardaway Side-Notched, Bolen and Taylor points; and Palmer and Kirk Corner-Notched. The Early Archaic period ends with a series of points with a bifurcated base—MacCorkle, St. Albans, LeCroy, and Kanawha (Coe 1964; Daniel 1998:3).

A new wave of archaeological research in the southeastern United States started in the 1970s, as large-scale cultural resource management projects generated increased amounts of archaeological data. With this newly available, regional-scale data, researchers began to focus on understanding site function, settlement patterning, and land use of the Early Archaic period. Archaeological reconnaissance surveys associated with the construction of the interstate highway system and hydroelectric damming projects throughout the Southeast resulted in numerous, large-scale settlement studies for the Piedmont region of the South Atlantic Slope (Chapman 1975, 1977, 1978, 1979; Goodyear et al. 1979; House and Ballenger 1976; Taylor and Smith 1978). Results of these projects indicated an increased number of Early Archaic sites compared to PaleoIndian sites, suggesting increasing population during the Archaic period.

A number of models and interpretations about Early to Middle Archaic period lifestyles have arisen. Some focus on the types of economic strategies employed by the groups (e.g., foraging versus collecting), whereas others focused on territories, seasonal use of the landscape, and group-intergroup dynamics. Settlement studies suggested that Early Archaic populations employed a generalized foraging economy that utilized both riverine and non-riverine/interriverine/upland environments (Cable and Cantley 2006:20; Claggett and Cable 1982; Daniel 1994; Goodyear et al. 1979:105; O'Steen 1992; Sassaman 1996).

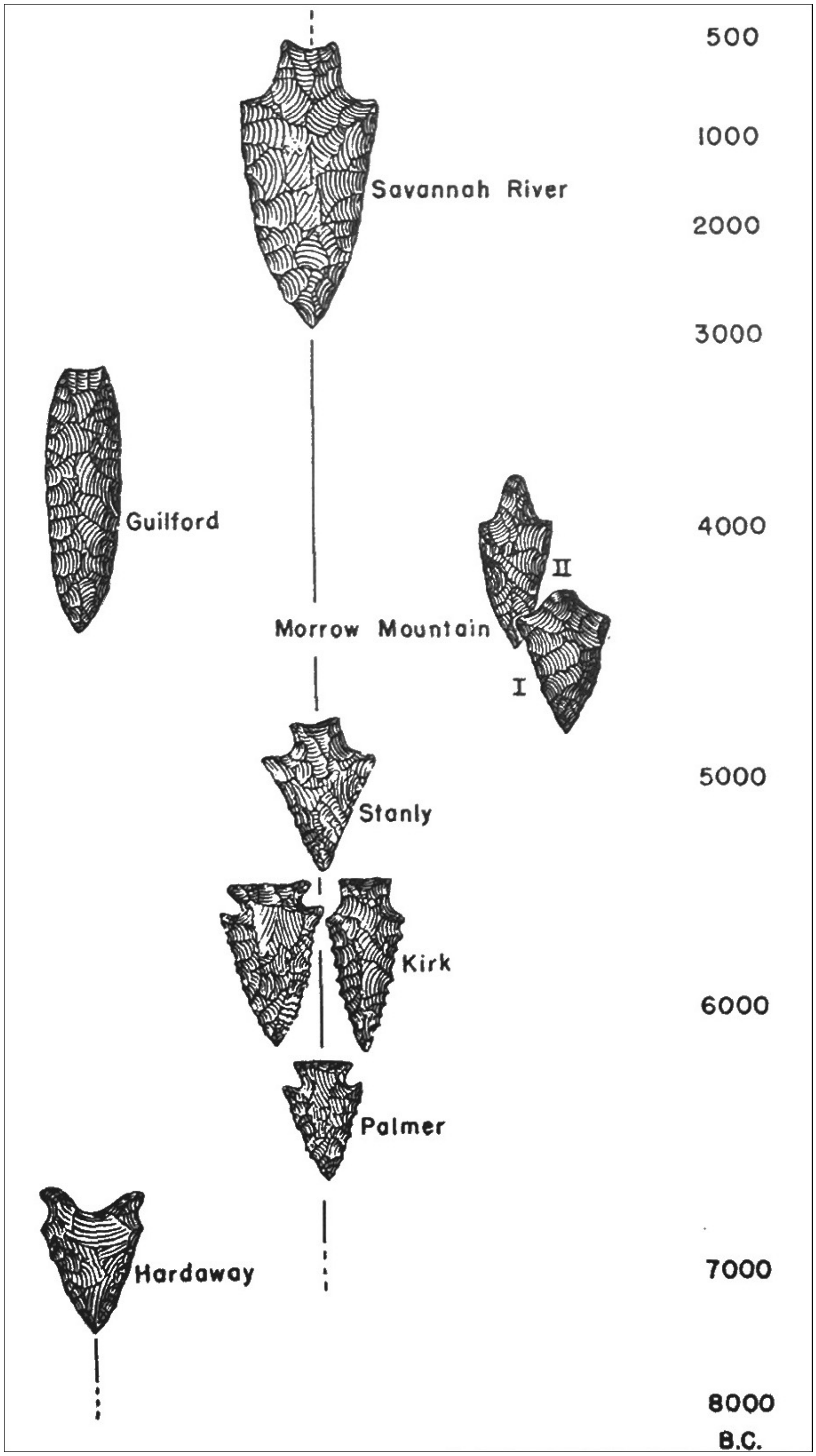

Figure 2.1. Archaic Period Hafted Bifaces (Coe 1964).

The Riverine-Interriverine model proposed that large base camps would be located near major waterways (riverine), whereas small, temporary extraction/processing sites would be located in the interriverine upland areas (Goodyear et al. 1979; House and Ballenger 1976; House and Wogaman 1978). Archaeological excavations at the multicomponent Tree House site (38LX531), a Fall Line site located along the Saluda River in Lexington County, South Carolina, identified an Early Archaic structure radiocarbon dated to circa 9500+/-60 BP (uncalibrated) (Nagle and Green 2010:264). The Tree House site was hypothesized to be the location of a fall/winter residential base within a collector-based economy during the Early Archaic period (Nagel and Green 2010:264-265). This interpretation fits nicely with the Riverine-Interriverine model of hunter and gatherer land use.

The Riverine-Interriverine model was expanded to include aggregate locations (Drucker and Davis 1998). According to the Aggregation-Dispersal model, groups utilized the riverine and interriverine regions as proposed in the original model. However, this new model postulated that groups periodically gathered at aggregation sites and/or major settlements located along rivers, especially along the Fall Zone (Drucker and Davis 1998).

Further collection of data concerning life in the Early Archaic led to the development of differing views about settlement and land use. During the middle to late 1980s, two main schools of thought emerged concerning Early Archaic settlement and land use of the South Atlantic Slope. Chapman (1985), Gardner (1974), Goodyear et al. (1979), and House and Wogaman (1978) argued that Early Archaic land use followed that of Binford and Binford's (1966) model, which divided sites into either base camps (relatively large sites occupied by large groups) and extraction sites (small, sometimes single-use resource procurement or processing locations). Researchers on the other side of the argument—Anderson and Schuldenrein (1983) and Claggett and Cable (1982)—proposed that Early Archaic peoples utilized a high degree of residential mobility and a foraging-based economy after Binford's (1980) later work (Anderson and Hanson 1988:263; Daniel 1998:3-7).

Binford's forager-collector model was used to explain late glacial-Early Archaic-Middle Archaic settlement of the North Carolina Piedmont using pollen data to estimate the effective temperature (ET)—a number calculated to measure a region's growing season (Binford 1980:13-18; Cable 1996; Claggett and Cable 1982). 5). A shift from a logistic (collector-based) to a residentially mobile (forager-based) economy occurred during the latter part of the Early Archaic, specifically between the Palmer horizon and the Kirk I/St. Albans horizon (Cable 1996:118). This shift was visible in the lithic artifact assemblage from the Haw River sites. The Dalton and Palmer occupations contained highly formalized tools such as hafted end scrapers, marginally retouched side scrapers, well-shaped adzes and axes, and highly curated projectile points. Later occupations showed a drastic decrease in curated tools (less retouch and formalized shaping and limited hafting technology) accompanied by an increase in expedient, wear-retouched flakes and expediently produced projectile points (Cable 1996:118-119).

Utilizing data from extensive archaeological research within the Savannah River Valley and the Savannah River Site Nuclear Reservation, Aiken County, South Carolina, Anderson and Hanson (1988) proposed a drainage-based settlement model known as the Band-Macroband model. This model combined aspects of both of the previous, opposing models of Early Archaic settlement and land use in order to explain settlement patterning of this period (Anderson and Hanson 1988:263). Within this model, individual, residentially mobile (foraging) bands of between 50 and 150 people rotated seasonally from the Piedmont in the summer and early fall to the coast in the spring within a macroband territory in one of eight major river drainages on the South Atlantic Slope. During the winter months, these bands became more logistically organized by over-wintering at large base camps in the Inner Coastal Plain, from where they sent specialized task groups to collect resources and return to base camp. Winter base camps in the Savannah River Valley were postulated to be close to the Coastal Plain chert quarries in Allendale County, South Carolina (Anderson and Hanson 1988). Prior to dispersing into the large winter camps, bands from adjacent drainages gathered into macrobands in order to exchange information and mates. These macroband aggregations were most likely held in the autumn at large sites identified in the Fall Zone (Anderson and Hanson 1988:270).

Support for Anderson and Hanson's Band-Macroband model has come from recent research in the Savannah River Valley (Rigtrup 2009). Analysis of lithic debitage from sites from the Aiken Plateau—an uplands Sandhills environment—and the alluvial terrace of the Savannah River at the Savannah River Site Nuclear Reservation, Aiken County, South Carolina, identified potential residential bases on the alluvial terraces (Rigtrup 2009:146). Coastal Plain chert is the dominant lithic raw material type on all sites, especially the alluvial terrace sites. Groups coming to the alluvial terrace sites had replenished their lithic stores at the nearby Coastal Plain chert quarries in Allendale County, South Carolina. Upland sites show a greater diversity in lithic raw material types because groups in the uplands had to rely more on locally available non-chert lithic resources when their chert stores were depleted (Rigtrup 2009:138).

Flake attribute analysis and mass analysis of the lithic debitage suggests that groups favored a curated tool technology consisting of bifacially reduced cores and hafted bifaces. In addition, tool manufacture was staged, with the initial preparation of cores occurring offsite (likely at the quarries). Thus, "tools and cores were entering the alluvial terrace zone in larger, partially cortical packages…and…tool [*sic*] were produced in the alluvial terrace zone, and used, and maintained in the upland zone" (Rigtrup 2009:140-141). Taken together, the results of Rigtrup's analysis suggest that the alluvial terrace sites functioned as residential base camps while the majority of the upland sites more likely functioned as resource extraction sites. However, the large lithic assemblages and tool diversity identified at four of the upland sites—38BR288, 38BR590, 38BR597, and 38BR607—suggest that they possibly served as residential bases instead of extraction sites.

Macroband territories were identified in the Coastal Plain of southern South Carolina, Georgia, and northern Florida through an examination of variation in Early Archaic Side Notched projectile point and uniface morphology (Bridgman Sweeney 2013). Early Archaic tools within a territory had similar, shared characteristics and, along the border of these territories, the characteristic hafting elements and basal shapes of the projectile points were more variable, reflecting interaction between neighboring territories. Three distinct macroband territories, each spanning at least two river drainages, were identified: Santee-Cooper/Savannah-Ogeechee, Flint/Chattahoochee, and Aucilla-Suwannee/Tampa Bay (Bridgman Sweeney 2013:295-297). An aggregation locale was identified in the

Ocmulgee River drainage boundary area—located between the Santee-Cooper/Savannah-Ogeechee to the northeast and the Chattahoochee and Aucilla-Suwannee/Tampa Bay territories to the west and south—based on the wide variety of material culture recovered from this drainage (Bridgman Sweeney 2013:295). The identification of macroband territories lends further support to the Band-Macroband (Anderson and Hanson 1988) model; however, Bridgman Sweeney's research suggests that macroband settlements could join together bands from more than one drainage.

An alternative model to the Band-Macroband model (Anderson and Hanson 1988) has been proposed based on the results of a functional and distributional analysis of Early Archaic lithic artifacts from the Hardaway site and collections from Early Archaic sites in the North Carolina Piedmont and Coastal Plain (Daniel 1994, 1998, 2001). The Uwharrie-Allendale model of Early Archaic settlement argues that Early Archaic adaptation was not tied to river valley territories, but instead was geographically focused around good sources of knappable stone, specifically the Uwharrie Mountains of south-central North Carolina for rhyolite and the Coastal Plain/Allendale chert from outcrops in the central Savannah River Valley of South Carolina (Daniel 1998:194).

Daniel (1998) postulated two large band ranges: a northern range focused around the Uwharrie Mountains, and a southern range centered around Allendale. The northern, Uwharrie range corresponds to the geographical distribution of Hardaway Side Notched points, whereas in the southern range the Hardaway points are replaced by Taylor Side Notched points (Daniel 1998:195). The area between the two band ranges is the aggregation range (the Congaree, Broad, and Saluda River valleys), which would have been exploited by groups that seasonally gathered along the Congaree, perhaps at the

Taylor site (38LX1) in Lexington County, South Carolina. The Taylor site is located equidistant from both the Uwharrie rhyolite quarries and the Allendale chert sources (Daniel 1998:200-201).

The recovery of high-quality lithic raw materials at Big Bay on Poinsett Electronic Combat Range of Shaw Air Force Base, Sumter County, South Carolina, lends support to the Uwharrie-Allendale model (Cantley and Cable 2002a, 2002b). Intensive excavations at sites located on Big Bay, one of the largest Carolina bays in the South Carolina Coastal Plain, recovered high-quality lithic raw materials—non-local cherts and rhyolite—in the later Early Archaic levels associated with the Palmer Complex. Cable and Cantley (2002a:xvii) suggest that by the end of the Early Archaic period, people who lived in larger groups of multi-residence occupations were utilizing large territories organized across drainages, not within them.

Middle Archaic Period

As noted earlier, the Holocene brought with it postglacial climatic warming and higher sea levels that resulted in a climate similar to today's (Delcourt and Delcourt 1984:276-277, 280). However, by the middle Holocene, at approximately 8,000 BP, pollen and sediment data suggest a rapid environmental change accompanied by vegetation changes (Anderson et al. 1979:110). Archaeologists refer to this period as the Middle Archaic.

Environment and Diet. Although the exact change is disputed, all agree that a middle Holocene warming called the Hypsithermal occurred (Cable and Cantley 2006:20; Clement and Dawson 2009; Clement and Wilson 2004; Gunn and Foss 1992; Gunn and Wilson 1993), although others refer to this climatic event as the Climatic Optimum (e.g., Ward and Davis 1999:63). During the middle Holocene, sea level rise slowed, allowing for the formation of coastal estuaries which, in turn, resulted in an increase of aquatic, marine resources (Brooks et al. 1989; Chapman 1977:116; Goodyear et al. 1979:110). In addition, increased sedimentation of the Coastal Plain and Piedmont rivers created floodplains by the Late Archaic period (Brooks et al. 1990). The disputed point of the middle Holocene environmental change is whether the Hypsithermal was accompanied by drier or wetter conditions.

Watts (1980) and others (e.g., Gunn and Foss 1992; Gunn and Wilson 1993) argue that the Hypsithermal brought warmer and drier conditions to the Southeast based on pollen samples collected from lakebed sediments at White Pond near Elgin, in central South Carolina. Archaeological and geomorphological work at Copperhead Hollow (38CT58), Chester County, in the Sandhills of central South Carolina, supports the argument that the middle Holocene was climatically warmer and drier than today (Gunn and Foss 1992). Gunn and Foss (1992) argue that for some parts of the middle Holocene, upland zones in the Inner Coastal Plain were denuded of woody vegetation, becoming attractive locations for Middle Archaic peoples because an area covered by open grasslands would have provided an attractive environment in which to hunt bison, elk, and/or white-tailed deer (Gunn and Foss 1992:14; Moore et al. 2016).

Others (e.g., Goman and Leigh 2004; Leigh and Feeney 1995; Taylor et al. 2011) argue that wetter conditions were associated with the middle Holocene Hypsithermal. Increased moisture in the southeastern United States resulted from a shift in the location of the Bermuda High to a more northerly position, a shift that would have redirected tropical storms and hurricanes toward the Atlantic seaboard instead of the Gulf of Mexico

(Goman and Leigh 2004:262). Pollen from a streamhead pocosin near site 38RD628 in the northeastern corner of Fort Jackson, Richland County, South Carolina, indicates a shift from drier to wetter conditions in the middle Holocene based on a rapid shift from oak to pine (Taylor et al. 2011:160). Alternatively, the shift from an oak-to-pine-dominated forest might instead reflect an intensified fire regime resulting from more frequent naturally occurring lightning strikes and/or resulting from human manipulations of fire (Taylor et al. 2011:162).

Early geomorphological work by Leigh and Feeney (1995:689) in the Ogeechee River Basin in southeastern Georgia suggests that the climate during the early to middle Holocene (circa 8,500-4,500 BP) was wetter than today. A peat core from the Little River of the Inner Coastal Plain of North Carolina also supports the idea that the middle Holocene (circa 9,000-6,100 BP) was wetter than today, resulting in fifteen large flooding events on the Little River (Goman and Leigh 2004:262).

One explanation for the discrepancies in interpretation of Hypsithermal rainfall from pollen cores is that pollen from lake basins "reflects the regional upland pollen record, masking subtle changes in available floodplain moisture" (Goman and Leigh 2004:257), whereas pollen data from smaller bodies of water such as streams in floodplains would show localized changes. Thus, the pollen from White Pond (Watts 1980) would have shown a gradual, regional shift from oak to pine that occurred earlier in the Holocene.

Whether the climate was wetter or drier during the middle Holocene Hypsithermal, researchers agree that environmental instability resulted in patchy and less predictable resources in the Coastal Plain and, in turn, caused changes in the subsistence strategies of Middle Archaic peoples (Cantley and Cable 2002a, 2002b; Claggett and Cable 1982;

Ward and Davis 1999:63). Subsistence and settlement pattern changes have been noted as the most likely causes of the marked changes in Middle Archaic lithic assemblages compared to those of the Early Archaic period.

Lithic Artifact Changes. Unlike the Early Archaic (and even PaleoIndian) lithic assemblages, Middle Archaic groups increasingly chose locally available raw materials in lieu of seeking out higher quality cherts and metavolcanics (Blanton 1983, 1984; Blanton and Sassaman 1989; Cable and Cantley 2006; Goodyear et al. 1979; House and Ballenger 1976; Sassaman 1983, 1991). Middle Archaic period assemblages from Fort Jackson, specifically, and South Carolina, in general, show a noticeable increase in the use of quartz. Alternative, not necessarily mutually exclusive explanations have been offered: the preference for locally available lithic raw materials was a result of decreased or limited access to the high-quality raw material sources (Clement and Dawson 2009:24); decreased mobility and increased sedentism during the Middle Archaic period resulted in decreased utilization of high-quality lithic material and the increased reliance on locally available, poorer quality material (Goodyear et al. 1979:111); or the increased use of locally available lithic raw materials and expedient tools correlates to a decrease in territory size during the Middle Archaic (Blanton and Sassaman 1989).

As with the Early Archaic period point typology, the key diagnostic points of the Middle Archaic period were initially identified at larger sites in North Carolina (Coe 1964). Additional excavations throughout South Carolina and Georgia confirmed the North Carolina sequence for the Middle Archaic, but added regional variations such as Brier Creek Lanceolates and MALA/Allendales in order to refine the typology. The

Middle Archaic period is marked by both a change in lithic raw material and a series of diagnostic point types morphologically different from their predecessors.

The notched and bifurcated points of the late Early Archaic morphed into stemmed points at the beginning of the Middle Archaic (Figure 2.1). Stanly Stemmed points were initially recognized by Coe at the Doerschuk site in North Carolina (Coe 1964; Ward and Davis 1999:59). Blanton and Sassaman (1989:54) place Stanly points at the beginning of the Middle Archaic and, based on absolute dates from Tennessee and Alabama, note that Stanly Stemmed points were in use for a fairly short period of time, roughly 450 years. Anderson and Sassaman (2004:94) attribute the Kirk Stemmed to the Middle Archaic as a predecessor of the Stanly Stemmed type.

Early stemmed points were followed by tapered stemmed points, Morrow Mountains Types I and II, which span the bulk of the Middle Archaic period, circa 7,500-5,500 BP (Blanton and Sassaman 1989:54; Gunn and Foss 1992). Morrow Mountain points are very common throughout the Southeast. Coe (1964:123) noted no local precedents for the Morrow Mountain and Guilford points in the Carolina Piedmont, and instead argued that this point type arrived in the Carolina Piedmont from the west. Sassaman (1995) echoes this idea of eastward movement of the Morrow Mountain tradition, due to the fissioning of groups in the Midsouth as mobility constraints and social strife forced groups eastward around 7,500 BP. This observation is still speculative and needs to be further researched.

A series of lanceolate points appear in the final centuries of the Middle Archaic period, including Guilfords, Guilford Stemmed, Brier Creek Lanceolates, and Allendale (originally named MALA—Middle Archaic/Late Archaic—points by Sassaman 1985)

(Blanton 1983, 1984; Blanton and Sassaman 1989; Chapman 1985; Claggett and Cable 1982; Coe 1964; Sassaman 1985; Whatley 2002). The origins of the lanceolate points have not thoroughly been explored: Guilford and Guilford Stemmed points (as noted above) are attributed by some researchers to have originated farther west (Coe 1964:123). Guilfords are common throughout the Carolina Piedmont and some parts of the Coastal Plain—specifically north of the Santee River Valley (Blanton and Sassaman 1989:58; Sassaman and Anderson 1995:26) and in the PeeDee River Valley (Charles, personal communication 2016). South of the Santee River Valley on the Coastal Plain, Brier Creek Lanceolates and Allendale/MALA points are more common (Charles, personal communication 2016; Sassaman and Anderson 1995:26; Whatley 2002).

Brier Creek Lanceolates were first identified by Michie (1968) in Aiken, Edgefield, Lexington, and Saluda counties, South Carolina, in addition to the Santee River drainage (Michie 1968:76). Data from the South Carolina Collector's Survey has expanded this area to include Allendale County, South Carolina, where the vast majority of Brier Creek Lanceolates have been recovered. Tommy Charles argues that these points resemble Conerly points identified by Cambron and Hulse (1975) in Burke County, Georgia. This correlation has extended the range of Brier Creek Lanceolates/Conerly points into central Georgia (Charles, personal communication 2016) and could suggest a southwestern origin.

These long, narrow points have a very thick cross-section, oblique parallel flaking, and exhibit a high degree of symmetry. Basal grinding is not present on the slightly incut base. Most examples have a slight shoulder. These points "are carefully, even beautifully made…[with]…considerable care…[given during] the making of this unusual point type” (Michie 1968:76). Brier Creek Lanceolates/Conerly points are made of high-quality materials, frequently thermally altered Coastal Plain chert among the examples recovered from the southwestern Coastal Plain and high-quality quartz or metavolcanics in the rare instance that they are recovered from the Piedmont (Charles, personal communication 2016; Sassaman and Anderson 1995:27).

Morphologically, they closely resemble the Guilford Stemmed points of the Carolina Piedmont—suggesting to some researchers that they are contemporaneous (Blanton and Sassaman 1989; Charles, personal communication 2016; Coe 1964; Wetmore and Goodyear 1986:20). Excavations at the Big Pine Tree site (38AL143) in Allendale County, South Carolina, recovered Brier Creek Lanceolates points between the Morrow Mountain II and Late Archaic period levels lending support to the idea that Brier Creek Lanceolates points coexisted with Guilford points in the late Middle Archaic period (Charles, personal communication 2016)

MALA points were initially identified as a stemmed or notched variety of projectile point/knife stratigraphically situated between the Morrow Mountain and Late Archaic horizons of the Pen Point site (38BR383) in Barnwell County, South Carolina (Sassaman 1985:1). Recent work by Whatley (2002) has resulted in a new name for these points types—Allendale points. No predecessors exist for these stemmed and notched points in the Middle Archaic Coastal Plain. In fact, Goodyear and Charles (1984:76, 59-90) note that many MALA/Allendale forms could easily be classified as Early Archaic Kirk Corner Notched points, especially when found at sites with poor stratigraphy. Goodyear and Charles (1984) view the MALA/Allendale points as morphologically similar to Halifax Side Notched points from the Late Archaic period (Coe 1964; Goodyear and

Charles 1984:89). After the initial identification by Sassaman (1985), more researchers (Whatley 2002) in South Carolina and Georgia began to incorporate MALA/Allendale into their typologies; however, this point type is still poorly understood.

Additional differences between the Middle Archaic lithic artifact assemblage and its predecessors include the disappearance of end scrapers (Claggett and Cable 1982; Cable and Cantley 2006; Kimball and Chapman 1977) and formalized tools, in general, in favor of expedient flake tools that were easy to manufacture, used for multiple tasks, and then discarded (Blanton 1983, 1984). These toolkit changes have been attributed to a less mobile lifestyle among the South Atlantic Slope Middle Archaic populations and a heightened dependence on local raw materials (Blanton 1983, 1984; Blanton and Sassaman 1989). The curation, or reuse, of artifacts (mainly bifaces and projectile points) from earlier cultural periods has been noted among Middle Archaic collections (Cable and Cantley 2006:21; Cantley 2000).

Some researchers attribute the appearance of atlatl bannerstones and increased use of ground stone tools to the Middle Archaic (Anderson and Sassaman 2004:97; Wetmore 1987:10). However, in the southeastern United States ground stone tools were just as prevalent in the Early Archaic as in the Middle Archaic (Cable and Cantley 2006:21; Smith 1986:18-21). Atlatl bannerstones, on the other hand, have not been identified in contexts earlier than the Middle Archaic (Sassaman and Randall 2007:197). Kinsella (2013:24), researching bannerstones in the Midwest, dates these perforated ground stone artifacts to circa 6,500-3,000 BP. Sassaman and Randall's research (2007:201-207) suggests that bannerstones date from approximately 5,500 to 4,200 cal. BP for the Savannah River Valley.

History of Middle Archaic Research. As the 1970s cultural resources management boom was identifying an increasing number of archaeological sites, Middle Archaic research shifted from understanding this period's technology to studying the settlement patterns of Middle Archaic groups. Large-scale archaeological surveys conducted by the South Carolina Institute of Archaeology and Anthropology (SCIAA) on proposed highway right-of-ways provided a large body of data with which to examine settlement models and site functions at upland/interriverine and riverine sites in the South Carolina Piedmont (Cable et al. 1978; Cable et al. 1977; Goodyear et al. 1979; House and Ballenger 1976; Wogaman 1977). Overall, this work showed that "[n]early all of the upland areas of the Piedmont…appear to have been extensively, if not intensively, utilized and well over 90% of the sites are characterized by chipped stone material, much of which is attributable to the Archaic" (Goodyear et al. 1979:148). Due to limited diagnostic artifacts and the conflated nature of the lithic scatters, Goodyear et al. (1979) could not assign most of these upland lithic scatters to a specific period within the Archaic.

In addition to the data generated from highway surveys, researchers began to reanalyze the vast amount of data collected from the excavations associated with the construction of dams throughout the Southeast during the early twentieth century. Some of this work included Tellico Lake, Tennessee (Chapman 1975, 1977), Richard B. Russell Reservoir on the Savannah River (Tippitt 1996; Tippitt and Marquardt 1982), and Clarks Hill Lake on the Savannah River north of Augusta (Caldwell 1951, 1954; Elliott 1995). These data show an increase in the number of Piedmont Middle Archaic components compared to the number of Early Archaic components (Ferguson 1976; Goodyear et al. 1979:206; House and Ballenger 1976).

The small site size in the Piedmont and the increased number of Middle Archaic sites in the area coupled with the expedient, generalized toolkits recovered from these sites suggested that the Early Archaic lifestyle of small groups of hunters and gatherers frequently moving across the landscape continued into the Middle Archaic (Elliott 1995; Shah and Whitely 2009). All of these studies proposed that Middle Archaic settlement patterns looked the same as Early Archaic patterns. But if settlement patterns were the same, why did the lithic toolkits change? Were lithic toolkit changes the result of the known climate change? If so, why did settlement patterns not change?

Another example of the continuity in settlement patterning between the Early and Middle Archaic can be found in the work from the Nipper Creek site (38RD18) along the South Carolina Fall Line, to the west of Fort Jackson. Excavations at Nipper Creek (38RD18) revealed a diverse lithic assemblage that includes Morrow Mountain points, scrapers, gravers, spokeshaves, and various ground stone tools. Preserved hearths date to the Middle Archaic (Wetmore 1987; Wetmore and Goodyear 1986). The site could have been used as a habitation or base camp under Goodyear et al.'s (1979) Riverine-Interriverine settlement model, the same model Goodyear et al. (1979) used to explain Early Archaic occupations in the Piedmont.

Excavations at the multicomponent Tree House site (38LX531), along the Fall Line of central South Carolina, provide another potential Middle Archaic habitation/base camp for this region. Morrow Mountain points, Guilford points, and Brier Creek Lanceolates points were recovered from the site. In addition, archaeologists identified the first structure dating to the Middle Archaic period in South Carolina (Nagel and Green 2010:265). The structure, denoted as Structure 3, consisted of three or four post molds and a small pit. In total, nine features were identified in this Fall Line Middle Archaic component. Hickory/walnut shell and pine wood were recovered from some of the Middle Archaic period features. Use of this site intensified during the Middle Archaic period, suggesting that this site was a "repeatedly occupied semi-permanent base camp" (Nagel and Green 2010:265).

The Middle Archaic presence in the South Carolina Piedmont has been summarized to consist of highly redundant lithic artifact assemblages that sacrifice curation for expediency by utilizing readily available quartz over less abundant, higher quality lithic raw materials (Blanton 1983, 1984; Goodyear et al. 1979; House and Ballenger 1976; Sassaman 1983, 1991). Sassaman (1991) proposed the Adaptive Flexibility model to explain the Morrow Mountain Middle Archaic occupations of the South Carolina Piedmont. The expedient, unspecialized technology and high residential mobility of Morrow Mountain populations coupled with individual access to locally available raw materials created an immediate-return economy with limited social debt because everyone had access to raw materials and other resources in addition to a flexible social organization (Sassaman 1991). Three key traits—expedient and unspecialized technology, high mobility, and individual access to resources—created a homogenous or egalitarian society with a great deal of flexibility, allowing this type of society to continue through time since it could be easily adapted to any environment (Sassaman 1991:35-38).

The model of Adaptive Flexibility is rooted in Sassaman's (1983) Master's thesis research. Analysis of Middle versus Late Archaic lithic artifact scatters from the South Carolina Piedmont highlighted the differences both in terms of settlement organization and lithic toolkits between these two cultural periods. Middle Archaic, specifically Morrow Mountain, groups favored the interriverine uplands and an expedient tool technology made of locally available raw materials, whereas Late Archaic groups established larger habitation sites in the floodplains/riverine environments in addition to small, extraction sites in the upland; practiced a more curated tool technology; and selected for higher quality lithic raw materials (Sassaman 1983). Sassaman hypothesized that the lithic artifact assemblages of the Middle Archaic sites in the Piedmont would consist of lithic artifacts from all types and stages of lithic reduction, not just an expedient tool technology, because these lithic scatters would have been created in a location where people both lived and processed resources (Sassaman 1983). This correlation follows the divisions of site types identified by Binford (1980) as associated with a forager-based economy. Sassaman (1983) attempt to correlate the behaviors of highly mobile residential groups with the type of lithic reduction strategy should be commended because it is among the earliest examples of applying the organization of technology concept to mobility, even if it has been shown to be inaccurate (Andrefsky 1994; Parry and Kelly 1988).

But, this scenario does not resolve the question of why Middle Archaic peoples did not access sources of high-quality lithic raw materials when their lifestyles were so highly mobile. It also highlights the differences between the Middle Archaic Morrow Mountain cultural horizon versus the Late Archaic period. What happened during the later Middle Archaic period that resulted in such a drastic change in settlement patterns and technological organization? Future research for cultural horizons such as Guilford, Guilford Stemmed, Brier Creek Lanceolates, Allendale/MALAs is needed to more fully understand this transition.

Although the bulk of Middle Archaic settlement pattern research has focused on the Piedmont region of the South Atlantic Slope, researchers suggest that sites dating to the Middle Archaic period in the Coastal Plain occur less frequently than do their Piedmont counterparts (Anderson 1996:174; Elliott 2006; McMakin and Poplin 1997:37; Sassaman 1983, 1991; Sassaman et al. 1990). Unlike Piedmont sites, Middle Archaic sites in the Coastal Plain are usually larger and have greater variety within their lithic assemblages (Clement and Wilson 2004:13; Sassaman 1983, 1991). Middle Archaic Piedmont sites tend to be evenly distributed throughout both riverine and interriverine/uplands areas and throughout a variety of micro-environments (Sassaman 1983:284-285). Middle Archaic sites in the Inner Coastal Plain, and specifically in the Sandhills Province, favor the smaller tributaries in lieu of the floodplains of the larger rivers (Clement and Dawson 2009; McMakin and Poplin 1997). Middle Archaic occupations in both regions appear to be exploiting the same resources as their Early Archaic predecessors (McMakin and Poplin 1997; Sassaman 1983).

Cable and Cantley (2002a, 2002b) conclude that the large Coastal Plain sites are not large habitation sites, but rather palimpsests: clusters of small human occupation scatters—often less than five meters in diameter—resulting from repeated visits to the same location through time. Using the palimpsest concept, one could argue that Middle Archaic occupations of the Coastal Plain did not occur less frequently: it is just that the occupations occurred multiple types at the same locations through time. The palimpsest concept could also explain the larger site size of Middle Archaic Coastal Plain sites because overlapping occupation clusters through time would gradually expand a site boundary, such as in the case of site 38RD837/841/842/844 (Dawson et al. 2007).

Anderson (1996:174) attributes the higher site density in the Piedmont when compared to the Coastal Plain to the spread of the pine forests into the Coastal Plain, forcing the Middle Archaic groups in the region to move into the Piedmont in search of resources. Based on the palynological and sedimentological data from Goman and Leigh (2004), Shah and Whitley (2009:11-12) argue that wetter conditions coupled with the spread of the southern pine forest into the Coastal Plain resulted in unpredictable resource patterning in the Coastal Plain, whereas Piedmont resources would have remained fairly stable (Goman and Leigh 2004; Shah and Whitley 2009:11-12). But, with the limited amount of research conducted on the distribution of Archaic period sites in the Coastal Plain and the Sandhills, specifically, how can such arguments be substantiated?

Middle Archaic Research in the Fall Zone. A few examples of Middle Archaic period research in the Inner Coastal Plain/Fall Zone/Sandhills are presented below. Site 38LX5 is situated on the top and upper slopes of a sandy knoll in the South Carolina Sandhills overlooking the vast Congaree River floodplain. This site, which was extensively used during the Middle Archaic by people who made Morrow Mountain points, was interpreted to be the location of repeated, short-term visits focused on deer hunting and processing due to the large number of expedient tools recovered (Anderson 1979a:222-225).

The multicomponent 38LX64 site located within the floodplain on the margins of a swampy tributary of the Congaree River was used throughout the Archaic and Woodland periods. The Middle Archaic component—again consisting of diagnostic Morrow Mountain points—suggested to Anderson (1979a) that a variety of activities were occurring at this location. Possible activities included plant processing (as evidenced by pitted, abraded, and battered cobbles and a possible mortar and pestle); tool manufacturing and maintenance (as suggested by lithic debitage from all stages of reduction); and animal processing (based on the presence of retouched flakes in the lithic assemblage) (Anderson 1979a:231-232).

Research into Middle Archaic land use for the Inner Coastal Plain is limited. McMakin and Poplin (1997) undertook a study of settlement organization and raw material use for the area encompassed by the SC 151 highway widening project. No data are provided on the exact area covered in this settlement patterning analysis, but the project was located in western Chesterfield and northwestern Darlington counties, South Carolina, and falls within the Sandhills region. It is one of the very few projects focused on understanding the settlement patterning of sites in the Sandhills. The bulk of the sites recorded during this project with Middle Archaic components were found on tributaries and not on the larger river channels (McMakin and Poplin 1997). Specifically, Middle Archaic sites in the research area were located along the major tributaries of Lynches River and not on the river itself (McMakin and Poplin 1997:37). The distribution of Middle Archaic sites is similar to Early Archaic sites in that they both occupied many diverse settings (McMakin and Poplin 1997:37).

A similar distribution of Middle Archaic sites was found on Fort Jackson in the Sandhills Province in Richland County, South Carolina (Clement and Dawson 2009). Of the 30 sites with Middle Archaic components located in the Colonels Creek drainage, 23 were located along tributaries of Colonels Creek whereas only seven were situated on the main creek itself (Clement and Dawson 2009:14). Clement and Dawson (2009:24-25) postulated that Middle Archaic bands favored tributaries over Colonels Creek because increased flow and water level impeded the development of a floodplain ecotone on the latter. The tributaries were more attractive locations for settlement because of the resources they provided.

Summary. It is clear from this discussion that no one really knows why a sudden change in lithic raw material selection and use is accompanied by limited change in the settlement patterning of Middle Archaic sites in both the Piedmont and Inner Coastal Plain of South Carolina. One is left wondering whether the Middle Archaic populations are continuing to practice "broad spectrum" subsistence activities (Smith 1986), only with a different set of tools and a throw-away mentality—as opposed to curating tools like their Early Archaic predecessors. Or do we see the beginnings of group ties to specific territories whose vegetation was repeatedly managed (e.g., Wagner 2005)? Do the territories proposed by Anderson and Hanson (1988) and Daniel (1994, 1998) still exist during the Middle Archaic, if they actually existed at all? Why did macroband territories disappear and why did Middle Archaic peoples suddenly change their lithic raw material preference? Is something different occurring in the Sandhills, or are the Middle Archaic occupations of this region, in fact, similar in nature to their Piedmont counterparts? In this dissertation, I hope to address these questions.

Late Archaic Period

By the Late Archaic period (5,000-3,000 BP), climate stabilized and plant communities, streams, floodplains, and sea levels reached their current extent, providing a relatively predictable environment (Brooks et al. 1990). This period is often viewed as the time when prehistoric populations fully adapted to the Holocene environment. This success can be seen in population increase, decreased mobility/increased sedentism, technological innovations such as pottery production, and the exploitation of a wider resource base. Research in the South Appalachian Region to characterize the Late Archaic period has identified four broad themes that are applicable to the entire southeastern United States (Cable and Cantley 2006; Claassen 1996, 2010; Marquardt and Watson 2005; Smith 1986; Steponaitis 1986). These themes are (1) the production and use of soapstone and ceramic vessels; (2) broader exchange networks; (3) low-level plant cultivation; and (4) sites with dense middens, evidence of dwellings, and storage facilities that point to increased sedentism and population increase (Cable and Cantley 2006:23; Claassen 1996, 2010; Marquardt and Watson 2005; Smith 1986:28-42; Steponaitis 1986:313).

Late Archaic cultural material shows a shift back to a curated tool technology and the development of new types of material culture. Diagnostic artifacts and features of the Late Archaic include a series of large, broad points with square stems such as the Savannah River, Gary, and Otarre points (Figure 2.1); pottery; soapstone bowls; and shell rings and mounds. The earliest pottery in the southeastern United States, Stallings fiber-tempered pottery, has been recovered from Late Archaic sites in the Savannah River Valley and along the South Carolina and Georgia coasts (Sassaman 1993). A second

Late Archaic period pottery tradition, Thoms Creek, overlaps with the Stallings pottery tradition (Sassaman and Rudolphi 2001; Saunders 2002). Thoms Creek has been recovered from the Savannah River Valley (Phelps 1968), Fig Island shell ring (Saunders 2002), other coastal sites (Trinkley 1980), and the Inner Coastal Plain, Sandhills, and Fall Zone (Anderson et al. 1982; Dawson et al. 2007; Michie 1979; Widmer 1976). Soapstone (or steatite) ground stone containers are representative of the Late Archaic period.

Soapstone occurs naturally in outcrops within the Piedmont region. For this reason, soapstone bowls are most common at archaeological sites in the Piedmont. However, soapstone bowl fragments have been recovered from sites in the Sandhills (Cable and Cantley 2006; Clement and Dawson 2009). The presence of soapstone bowl fragments outside of the Piedmont suggests that vessels were moving into other regions either on a seasonal round or through trade.

Along the Sea Islands of South Carolina, Georgia, and northern Florida, large shell rings dating to the Late Archaic period or the latter part of the Middle Archaic have been identified. The presence of shell rings indicates that the organization of labor and communal feasting was occurring as early as the late Middle Archaic (Cable and Cantley 2006:23; Claassen 1986; Ledbetter 1991; Randall 2008; Russo 2008; Thompson 2007).

Although many technological advances occurred during the Late Archaic period, everyday lifeways among the prehistoric populations remained relatively the same, as small groups of hunters and gatherers traversed the area in search of resources. Settlement patterns in the Late Archaic appear to be seasonal. The margins of larger rivers were occupied during the spring and summer, most likely in order to avoid fall and winter freshets (Clement and Dawson 2009; Gunn and Wilson 1993; Sassaman 1983). The predictable environment that emerged with the Late Archaic facilitated a slight shift from a foraging to a collecting strategy (Sassaman 1983).

Summary

This chapter has provided a geographical and cultural context for the Inner Coastal Plain/Sandhills region of South Carolina. Geographically, the Sandhills Province is a unique environment located adjacent to and somewhat overlapping the Fall Zone to the east of the Piedmont and west of the Coastal Plain. The remnants of the ancient coastal line, these deep, sandy soils support a diverse ecosystem.

Archaeologically, the central South Atlantic Slope has been the site of human activity since the final millennia of the Pleistocene Epoch. Groups of hunters and gatherers traversed the Piedmont, Fall Zone, Sandhills, and Coastal Plain in order to exploit the plants and animals of this region. They left behind little more than their broken and lost projectile points/knives and the debitage produced through the manufacturing and maintenance of these stone tools. Based on lithic evidence (and, in some rare cases, flora, fauna, and post molds) archaeologists are beginning to understand how the Carolinas were utilized during the PaleoIndian and Archaic periods.

The Early Archaic period saw an increase in global temperatures and welcomed new plants and animals as the megafauna of the previous epoch entered extinction. Archaeologically, populations in the southeastern United States increased during this time as evidenced by an increased number and frequency of sites. Early Archaic toolkits are similar to their PaleoIndian predecessors in style and diversity. In addition, both groups exhibited a preference for high-quality lithic raw materials.

Researchers have proposed that Early Archaic groups exploited a wide range of resources and employed a foraging or collector strategy depending on the season (e.g., Anderson and Hanson 1988; Claggett and Cable 1982). Small bands of hunters and gatherers seasonally met in larger groups (macrobands) centered either between adjacent river drainages (Anderson and Hanson 1988; Bridgman Sweeney 2013) or around the sources of high-quality lithic raw materials (the Uwharrie Mountains of North Carolina and the Coastal Plain chert quarries of Allendale County, South Carolina) (Daniel 1998, 2001).

By the middle Holocene, temperatures in the southeastern United States had risen, resulting in environmental instability; raised sea levels; inlet, estuary, and floodplain formation; and vegetation changes (Brooks et al. 1989; Delcourt and Delcourt 1984; Goman and Leigh 2004; Gunn and Foss 1992; Taylor et al. 2011; Watts 1980). Toolkits of the Middle Archaic hunters and gatherers underwent substantial changes: high-quality lithic raw materials were replaced by locally available lithic materials regardless of the quality, and the focus on formalized tools of the Early Archaic was replaced by a focus on expedient tool technology primarily composed of flake tools. Well-made projectile points/knives of the Early Archaic made possible by the high-quality raw materials were replaced by chunky Morrow Mountain and Guilford points constrained in form by local, low-quality raw materials (Blanton 1983, 1984; Blanton and Sassaman 1989; Sassaman 1983, 1991).

Settlement and land use during this period can best be explained by Sassaman’s (1991) Adaptive Flexibility model, which proposes that during the Morrow Mountain phase in the South Carolina Piedmont a shift to a highly mobile lifestyle allowed individual members of a group to exert a certain amount of flexibility in terms of their behavioral responses to specific situations. This flexibility helped to maintain the egalitarian nature of Morrow Mountain society (Sassaman 1991).

By the Late Archaic period, climate began to stabilize and become similar to that of today. As climate, water levels, drainage patterns, and vegetation became more predictable, populations continued to increase and occupy areas previously uninhabitable (e.g., formerly unstable floodplains). Late Archaic populations begin to establish more permanent settlements as evidenced by deep midden deposits at sites throughout the southeastern United States (Cable and Cantley 2006:23; Claassen 1996, 2010; Marquardt and Watson 2005; Smith 1986:28-42; Steponaitis 1986:313). Increased regional diversification becomes visible in the archaeological record based on the variety of large, stemmed projectile points/knives from this period, the development of pottery along the Savannah River area (Sassaman 1998), plant domestication, and the manufacture and spread of soapstone vessels from the South Carolina Piedmont (Cable and Cantley 2006:23; Claassen 1996, 2010; Marquardt and Watson 2005; Smith 1986:28-42; Steponaitis 1986:313).

From the previous overview of the Archaic period in South Carolina, it is clear that no single explanation suffices for how people lived and used the Piedmont and Coastal Plain regions of the South Atlantic Slope during the early and middle Holocene. Research concerning the Early Archaic has shown that these groups engaged in both foraging and collecting economic systems, preferred high-quality lithic raw materials, and were organized in some fashion (whether it be within river valleys, across river valleys, or around sources of high-quality stone). The middle Holocene brought changes to the environment which, in turn, caused changes in how people interacted with it. Based on the archaeological remains in the Piedmont, groups using Morrow Mountain technology adopted an expedient tool technology that enabled them to exploit a variety of micro-environmental niches. After Morrow Mountain, little is known concerning the groups who utilized Guilford, Guilford Stemmed, Brier Creek Lanceolates, and Allendale/MALA points. What is known is that following this period, Late Archaic populations introduced a new settlement pattern with residential bases located in riverine zones/floodplains, a curated tool technology, an organized labor to create coastal shell rings, the development of pottery, and the rise of agriculture.

CHAPTER 3
THE ORGANIZATION OF TECHNOLOGY AND THE STUDY OF ACTIVITY AREAS

Middle Archaic archaeological sites throughout the South Atlantic Slope contain vast lithic artifact assemblages and little else. Without other artifact types and features (e.g., fauna, burials, structures/post molds, flora, bone needles, beads), understanding the lifeways of the Middle Archaic peoples of this area relies heavily on interpreting the stone tool and knapping debris left behind. For this reason, this chapter begins with a discussion of the organization of technology, a theoretical perspective that considers the economic, social, and behavioral variables that influence the manufacture, use, transport, and discard of tools and materials (Nelson 1991:57). Next, I examine activity area research within archaeology, with a specific focus on the idea of occupation clusters as defined by Cable and Cantley (2005, 2006; Cantley and Cable 2002a). The theoretical discussions provided in this chapter lay the framework for the case study presented in Chapter Five.

The Organization of Technology

One of the fundamental goals of anthropology is to understand the learned and shared beliefs and behaviors of modern and past cultures. Within the sub-discipline of archaeology, the ability to realize this goal depends on the lines of evidence available for a specific site, location, or time period. Understanding culture from the remains of the past is difficult when the primary remains of this culture are chipped (flaked) stone tools and the debitage created through the production and maintenance of these tools. This is the case for the Middle Archaic occupations of the South Atlantic Slope.

In order to utilize the data from lithic artifacts, researchers needed a theoretical approach that places all aspects of lithic technology into a wider framework of human behavior. The organization of technology, or the organizational approach, was developed to meet this need (Nelson 1991; Shott 1986).

The organization of technology approach is defined as:

> the study of the selection and integration of strategies for making, using, transporting, and discarding tools and the materials needed for their manufacture and maintenance. Studies of the organization of technology consider economic and social variables that influence those strategies (Nelson 1991:57).

Although other researchers have provided definitions for this theoretical framework (Binford 1979; Kelly 1988; Koldehoff 1987), Nelson's (1991) definition most effectively describes this concept (Carr 1994a:1). Technology, when viewed organizationally, is dynamic. Lithic technology, specifically, changes as needed in order to allow prehistoric people to overcome obstacles in their physical and social environments (Carr 1994a:1). The goal of modern anthropological research is to utilize the lithic remains of past cultures to understand how technological changes may reflect behavioral changes in the past (Carr 1994a:1; Kelly 1988:717).

The ability of the organization of technology approach to relate the data collected from the lithic assemblages of prehistoric sites to larger areas of anthropological inquiry has been useful in understanding prehistoric mobility and settlement patterns (e.g., Andrefsky 1991; Carr 1994b; Kelly 1988; Magne 1985; Parry and Kelly 1987), social strategies (e.g., Arnold 1987; Clark 1987; Gero 1989; Morrow 1987), subsistence (Boldurian 1991), and risk (Torrence 1983, 1989).

Technological Strategies

Technological strategies "weigh social and economic concerns with respect to environmental conditions and are implemented through design and activity distribution" (Nelson 1991:57). The concept of a technological strategy refers to the conscious decision of preparing, or not, tools and toolkits to mitigate problems imposed by the environment on human activity (Nelson 1991:58). Nelson (1991) differentiates among three types of technological strategies: curated, expedient, and opportunistic. A technological strategy does not refer to a specific type of artifact, but rather to the "kinds of plans for facilitating human uses of the environment that can be carried out in a variety of ways and are responsive to a variety of conditions" (Nelson 1991:62). Curated and expedient strategies are not mutually exclusive. A stone tool that started out as part of a curated, planned hunting tool kit could end its use life as an expedient tool found on the ground surface and reused in a time of need when no other tool was available (Nelson 1991:62-63).

The following section discusses the two main technological strategies within the organization of technology approach to studying human behavior—curation and expediency—and provides an example of an opportunistic response. Researchers employ the organization of technology to understand group mobility; this topic is discussed in the next section and then followed by a critique of the organization of technology approach.

Curation. Curation is viewed as a planned action (Nelson 1991:62). Curation was first conceptualized by Binford (1973) while conducting ethnoarchaeological research among the Nunamiut. Binford (1973:273) applied the term curation to describe the movement of tools between sites, though he did not explicitly define the concept. Since then, researchers have defined and used the term in a number of ways. Many of the definitions follow Binford's (1973) idea by linking curation strategies to high residential mobility. Nelson (1991:62) defines curation as the "advanced manufacture, transport, reshaping, and caching or storage" of lithic tools and toolkits. These actions, or plans, were undertaken with the expectation that curation could mitigate adverse situations, such as a lack of raw materials (Bamforth 1986; Binford 1979; Keeley 1982; Parry and Kelly 1987; Sassaman 1983), a lack of time (Ebert 1986; Gamble 1986; Torrence 1983), or any other problem that could impede the ability to manufacture tools (Nelson 1991:62-63).

Formal tools, such as hafted bifaces, drills, and endscrapers, are considered a curated technology because the tool was conceptualized, planned, and prepared ahead of time (Johnson 1987). Time and energy were invested in the conceptualization, acquisition of raw material, and manufacture of formal tools and, for these reasons, formal tools were highly valued and rarely discarded prior to the end of their use life. Research has correlated the manufacture and use of formal tools with highly mobile foraging groups (Andrefsky 2009; Binford 1979, 1980; Kelly 1988; Nelson 1991; Parry and Kelly 1987; Torrence 1983). The advanced preparation (curation) of formal tools and prepared cores requires an initial investment of time and energy prior to a specific undertaking (such as a deer hunting expedition) to provide more time later to focus on the specific task (hunting deer) at hand (Nelson 1991:63; Torrence 1983). In other words, the initial cost of production is offset by the extended use life (including the ability to sharpen and reuse) of the formal tool (Binford 1977, 1979; Parry and Kelly 1987).

Prepared cores, such as bifacial and polyhedral blade cores, are also considered to be produced through a curated strategy (Johnson 1987:2). Prepared cores are shaped and maintained in order to allow for the consistent removal of similarly-shaped flakes due to a well-maintained, distinctive platform. The utility and long use life of a prepared core offset the initial investment of time and energy in the conceptualization and production of the core. Types of prepared cores include bifacial cores, polyhedral blade cores, and Levallois cores (Johnson 1987:2). The consistent size and shape of the flakes produced from a prepared core facilitated the production of specific, specialized tools, such as PaleoIndian endscrapers and blades (Johnson 1987; McNerney 1987). In other words, prepared cores "are part of a technological system which is focused on one major activity with specific tool requirements" (Johnson 1987:9).

Expediency. Expediency, the opposite of curation, assumes that lithic raw materials and time will be available at the location of the planned activity in order to create tools as needed. No prior preparation of toolkits occurs at known sources of lithic raw materials. Expediency "minimize[s] technological effort under conditions where time and place of use are highly predictable" (Nelson 1991:64). Three conditions have been identified to facilitate an expedient technological behavior: (1) raw material is available either through the stockpiling or caching of materials, or the placement of activity close to the raw material source (Bamforth 1986; Nelson 1991; Parry and Kelly 1987); (2) time is available to produce tools at the activity location (Nelson 1991; Torrence 1983); and (3) the ready availability of raw materials provides for long-term occupation or regular reuse of the location (Nelson 1991; Parry and Kelly 1987). Because of the need to easily access raw material from a cache or stockpile, expedient technological behaviors are often associated with increased sedentism (Nelson 1991; Parry and Kelly 1987). Tool types associated with an expedient technological strategy are utilized flakes, retouched flakes, and amorphous and bipolar cores (Casey 2000; Cobb and Webb 1994; Johnson 1987).

The costs and benefits of an expedient technological behavior are heavily debated. Bamforth (1986) views expediency with increased sedentism as inefficient, due to the high cost of transporting the raw materials for a stockpile or cache. Binford (1979) and Torrence (1983) argue that the collection of lithic raw materials was not cost prohibitive because it was associated with other activities: members of the group gathered lithic raw materials as part of their seasonal movement or during normal, everyday foraging/collecting activities (Binford 1979:258). Neither researcher considers the use of expediency when low-quality lithic raw materials are readily available and abundant, as is the situation in the South Carolina Piedmont and Sandhills Province.

Amorphous cores are the opposite of prepared cores. In comparison to a prepared core, amorphous cores do not require advanced preparation, do not have well-maintained platforms, do not produce consistent flakes of a similar shape and size, and do not conserve raw material (Johnson 1987:2). However, amorphous cores may provide more cutting edge and a variety of cutting angles from a smaller amount of raw material (Johnson 1987:9). Types of amorphous cores include bipolar and unpatterned cores. In amorphous core technologies, flakes are removed, utilized, discarded when no longer sharp or needed, and then replaced with another flake removed from the core. Due to the wastefulness of this technology, amorphous cores are common where lithic raw materials are readily available. Amorphous core types are most commonly associated with increased sedentism (Johnson 1987:10). Johnson (1987:11) notes that amorphous cores "are ideal for subsistence systems based on diversified resources in an area where raw material is abundant."

Bipolar cores are created through the process of bipolar reduction, where a pebble or cobble is placed on a stone anvil and then hit from above with a hard hammer or hammerstone. This reduction method causes the rock to shatter into a variety of sharp, useable pieces that do not resemble flakes. Bipolar technology requires minimal technological skill, quickly produces flakes and shatter with useable edges, and can use small rocks with rounded edges (Casey 2000; Cobb and Webb 1994:212).

Casey (2000) identifies two main artifact types commonly found in archaeological lithic assemblages resulting from bipolar lithic reduction: *pièces esquillées* and bipolar flakes. *Pièces esquillées* are wedge-shaped with multidirectional hinge scars on both margins. Bipolar flakes are heavily battered and exhibit bulbs of percussion and flake removal scars on opposing ends (Casey 2000:85). Exhausted quartz bipolar flakes from Fort Jackson have often been misclassified as unpatterned cores. The diagnostic characteristics of bipolar flakes include their long, irregular shape; a sheared cone of force; and a shattered platform (Cobb and Webb 1994:207). The conditions influencing the use of bipolar core technology vary. Parry and Kelly (1987) correlate it with reduced mobility and limited access to lithic raw materials, whereas others associate this technology with a high frequency of lithic raw materials in small cobble or pebble form (Custer 1987; Goodyear 1982).

Both of the expedient core technologies presented above were used to produce useable edges. Expedient tools go by numerous names in the archaeological literature, including informal tools, flake tools, utilized flakes, expedient tools, and/or basic tools (Casey 2000). For our purposes, informal, utilized flake tools will follow the Clark and Kleindienst (1974:84) definition of "an artifact…with no intentional trimming to produce modification but with minor fracturing, bruising and crushing, battering or nibbling damage to one or more edges or faces." Unmodified flake and shatter fragments provide sharper edges than formal, bifacially modified tools. In addition, they are quick and easy to produce, and can be used for many of the same functions as formal tools (Casey 1998, 2000; Hayden 1977). However, their sharp edges do not last long.

Casey (1998) notes that expedient tools are often overlooked in the analysis of lithic artifact assemblages or given lesser value than formalized, bifacial tools. When informal tools are identified in an assemblage, they are "couched in negative terms" and an explanation must be offered for why they are present at all (Casey 1998:84). Explanations often rely on an engendered division of labor, arguing that informal or basic tools were produced by women, using lesser quality raw materials or discarded debitage produced from the production of a formal tool by a male knapper (Casey 1998:84; Sassaman 1992).

Opportunistic Responses. Nelson (1991) differentiates opportunistic technological behavior from expediency because the former is an immediate response to an unexpected condition whereas the latter assumes that time and raw materials will be available at the site of the planned activity (Nelson 1991:65). The example she uses to highlight this concept comes from Binford's (1979) work among the Nunamiut. Binford (1979) recounted a situation when a Nunamiut hunter unexpectedly encountered some caribou while away from camp. The caribou were shot but the hunter discovered he had no knife to butcher the kill. In need of a tool, the hunter created a useable tool from some available stone, willow wood, and part of an old dog harness (Binford 1979:266). Curation and expediency both require some degree of planning, whereas opportunistic behavior is an unplanned and immediate response (Nelson 1991:65).

Technological Organization and Mobility

One of the main areas of anthropological inquiry that has benefited from the organization of technology approach is mobility studies. Kelly (1988) defines mobility as the "way in which hunter-gatherers move across a landscape during their seasonal round" (Kelly 1988:717). The location of foodstuffs, lithic raw materials, and other resources such as potable water and social factors are important factors influencing a group's mobility. However, these resources are often not found together in the same location; for example, food resources might not be near a good lithic source. Thus, the makers and users of stone tools must mitigate temporal and spatial differences while simultaneously meeting the needs of the tasks at hand (Kelly 1988:718) and societal or spiritual constraints.

Research concerning mobility and stone tools has frequently examined the amount of effort expended in stone tool technology (the acquisition of material, production of the tools, and transport). Such research has suggested that expedient or informal tools are most likely associated with sedentary populations—those with a reliable source or excess of lithic raw material. A curated or formal tool technology most likely corresponds to groups who practice high residential mobility (Andrefsky 1994; Custer 1987; Kelly 1988;

Parry and Kelly 1987). Highly mobile groups incorporate a visit to sources of high quality lithic raw materials into their seasonal rounds, where they spend the time and effort to make curated or formal tools to carry with them throughout the remainder of their rounds, or until another source of raw material is available (Torrence 1983).

Sassaman (1983) employed the organization of technology concept on lithic debitage scatters from the South Carolina Piedmont in order to argue that Morrow Mountain populations exercised higher rates of residential mobility than did the earlier Late Archaic groups in the region. Following Binford (1980, 1982), he postulated that within a mobile forager system, residential bases would exhibit evidence of all stages of lithic tool reduction because group members would be undertaking all of the tasks needed for survival at these locations. Extractive sites would be ephemeral and provide a very faint archaeological signature (Sassaman 1983). Duration of occupation at the residential base as well as sequential re-occupation, among other factors, would affect the size of the artifact assemblage. His analysis divided the lithic artifact assemblage into bifacial thinning flakes, chunks, other flakes, flake tools, unifaces, flake cores, points and point fragments, preforms and blanks, and other bifaces following a modified version of House and Ballenger (1976) and House and Wogaman (1978) (Sassaman 1983:180-181). Using the available data, Sassaman (1983) was able to show that Morrow Mountain residential bases contained artifacts representative of all stages of lithic tool reduction, including discarded points, confirming high residential mobility (Sassaman 1983:257).

Andrefsky (1994) notes that the relationship between mobility and stone tools is not as simple as that noted above, but that the availability of lithic raw material influences technological organization (Andrefsky 1994:21). Using the lithic assemblages from three archaeological sites in the western/northwestern United States, Andrefsky (1994) demonstrated that the availability of lithic raw materials significantly impacts stone tool technology regardless of a group's settlement system or level of mobility. In areas where lithic raw material is readily available, groups will not practice a curated, formal, organizational technology; instead, they employ an expedient tool technology. Andrefsky's (1994) research is highly applicable to the Sandhills of the South Atlantic Coastal Plain, a location with readily available, low-quality lithic raw materials. Formal tools, and thus a curated tool technology, are more commonly associated with high quality lithic raw materials, especially in areas where these materials are scarce or at a great distance. When high quality lithic raw materials are readily available, then both formal and informal tools are produced in almost equal amounts (Andrefsky 1994:31). Other researchers have mentioned the connection between raw material availability and the organization of a group's technology (Andrefsky 1991; Bamforth 1990; Parry and Kelly 1987), but Andrefsky (1994:22-23) was the first to provide data to support this hypothesis.

Andrefsky's (1994) work highlights the fact that a number of variables influence both mobility and the organization of technology. Other researchers have echoed Andrefsky's argument and identified further factors predicating the use of a curated or expedient technology. Some have argued that the type of tool technology employed depends on the task at hand. Tomka (2001) positions curated and expedient technologies at opposite ends of a continuum in which technology varies depending on the type of resource processing to be undertaken. Hayden (1998) similarly argues that the type of technological organization employed depends on which type (formal versus informal;

curated versus expedient) is most effective at performing a given task. Hayden (1998:6) highlights several factors influencing a strategy's effectiveness, including the time available to complete the task and the quantity of material available. Other researchers look to an engendered division of labor as an explanation for technological organization. Sassaman (1992) argues that woman were the main users and producers of expedient, informal tools, whereas men were the primary producers and users of formal, curated bifaces. As sedentism and a diversified economy increased, women's tasks (and their use of expedient tool technologies) increased (Sassaman 1992).

In other words, it is not easy to untangle which factors influenced the selection of a lithic technological strategy among prehistoric lithic tool users, and one group could have used all three strategies (curated, expedient, and opportunistic) at the same time and in the same location. Therefore, the organization of technology is a constantly evolving method of tool selection based on numerous factors that varied from raw material availability to the type of task at hand to the person performing the task, and beyond.

Activity Area Research and Occupation Clusters

The following section provides an overview of activity area research. The section begins with a discussion of site formation processes—the actions, both cultural and natural—that impact the archaeological record. From this discussion, the section examines how archaeologists identify activity areas from the results of archaeological excavations. Building on this information, the following section provides a brief overview of the archaeological literature concerning site structure and activity areas. Many archaeological interpretations of activity areas and spatial organization of hunter-and-gatherer sites use ethnographic analogy: this topic is discussed as part of the discussion of the archaeological literature. The final part of this section defines the concept of an occupation cluster, which is used in the analysis of the artifacts from the Three Springs site.

Activity area research, or the study of intrasite spatial organization, is one aspect of the much broader topic of settlement patterns. However, to identify activity areas in sandy soils, a good understanding of site formation processes is required. Site formation processes include the cultural and non-cultural processes that create the archaeological record (Schiffer 1972:156). Many archaeologists assume that the “spatial patterning of archaeological remains reflects the spatial patterning of past activities” and can be used to understand past behavior (Schiffer 1972:156). Cultural processes that form the archaeological record include chronological occupation of a location and the activities that occurred at the site. Schiffer (1972:157) defines an activity as a “transformation of energy” that creates an activity area. Viewed this way, the transformation of stone into lithic debitage and tools is the activity, and the location of this activity is the activity area (Krasinski 2005:5). Understanding the activities that occurred at a site will help elucidate the behavior of the site occupants. Non-cultural processes that affect site formation include bioturbation, erosion, gravity, cryoturbation, and any other natural process that move artifacts following deposition (Krasinski 2005; Michie 1990; Schiffer 1972).

Interpretation of the archaeological record to understand activity area organization, and thus past human behavior, relies on both quantitative and qualitative methods. Qualitative methods refer to visually identified artifact concentrations from the results of archaeological excavation through the creation of artifact distribution maps or by an examination of refit data (Bamforth et al. 2005:565). Quantitative methods are a suite of mathematical and statistical analyses including the *k*-means statistical procedure (e.g., Krasinski 2005; Simek 1987; Simek and Larick 1983), nearest-neighbor attribute analysis (e.g., Clark and Evans 1954; Kintigh 1990; Thompson 1956; Whallon 1974), dimensional analysis of variance (e.g., Carr 1984; Whallon 1973), density analysis (e.g., Kintigh 1990), and graph and lattice theory (e.g., Merrill and Read 2010). These quantitative methods usually require three-dimensional (northing, easting, and depth) piece-plot data for individual artifacts.

Recent work by Bamforth et al. (2005) has shown that even without detailed point provenience data, analysis of intrasite spatial organization can be undertaken. For their research at the Allen site in Nebraska, Bamforth et al. (2005) used excavation data collected from excavation unit levels measuring 5 ft. x 5 ft. x 0.2 ft. The data were analyzed to examine the vertical and horizontal distribution of features and artifacts via distribution maps and the distribution of refit lithic debitage (Bamforth et al. 2005).

Experimental and ethnoarchaeological research for comparative analysis are helpful in identifying and understanding intrasite spatial organization (Krasinski 2005). Comparative analysis via ethnographic analogy has one major downfall in that it rarely takes into account the effects of natural, post-depositional processes on buried archaeological remains (Bamforth et al. 2005:562). Thus, ethnographic and ethnoarchaeological data should be used with caution.

The emphasis on site structure has a long tradition outside of the southeastern United States. Thus, the following discussion of site structure and spatial patterning of hunter-and-gatherer sites focuses primarily on research from Africa and Europe in addition to the few examples found in North America. Locally, a major contribution to activity area research is the work of Cable and Cantley (2005, 2006; Cantley and Cable 2002a). Cable and Cantley (2006:36) point out the bias inherent in archaeology and the archaeologists' identification of a 'site.' In addition, Cable and Cantley (2006) refocus the archaeologist's attention to the issue of scale. Large excavation intervals frequently miss hunter-and-gatherer occupation clusters because these clusters are often less than 5 m in diameter; smaller testing intervals are needed to locate smaller scale occupations.

The study of living hunter-and-gatherer populations in Africa has a long history, starting with a vast body of ethnographic literature collected during research among hunter-and-gatherer groups in the early to middle twentieth century. Cultural anthropologists living and working among the few surviving groups of hunters-and-gatherers recorded information concerning the layout and structure of camps; the activities conducted at camps; social organization, division of labor, gender roles, and kinship among the groups; and a variety of other social and cultural observations (e.g., Lee 2003; Sliberbaner 1981; Yellen 1977). Most of this research was collected from observations of the !Kung San/Dobe Ju/'hoansi groups of the Kalahari region of southern Africa (Cashdan 1983; Lee 2003; Yellen 1977). Archaeologists have used this data to form ethnographic analogies between twentieth century hunters-and-gatherers and prehistoric groups undertaking the same, or similar, subsistence strategies.

A recent resurgence of research within prehistoric archaeology is aimed at understanding the spatial patterning and site structure of hunter-and-gatherer sites using ethnographic data. Unlike a lot of the previous research in Africa, Mitchell et al. (2006:81) focused their efforts on understanding the organization of living space in prehistoric hunter-and-gatherer societies at an open-air, multiphase hunter-and-gatherer campsite on the banks of the Senqu River, Lesotho, southern Africa, instead of on rockshelter deposits. They uncovered four hearths arranged in a line, analogous to the linear campsite model identified among the Kalahari Bushman (Bartram et al. 1991; Hitchcock 1987; Yellen 1977). Artifact voids noted at the site were interpreted as the former location of huts or windbreaks. A less likely explanation of these artifacts voids is that they were pathways (Mitchell et al. 2006:89). Based on the artifacts, Mitchell et al. (2006) postulated their site was the location of a domestic residential area.

Using Sliberbaner's (1981), Cashdan's (1983), and Wiessner's (1977, 1982, 1983) ethnographic analyses of San (!Kung) aggregation sites, Wadley (1989) developed a model or list of characteristics that you would expect to find at a site if *hxaro*—the San tradition of making and exchanging gifts at aggregation sites—was occurring. Her conclusions are applicable for differentiating aggregation sites from resource extraction sites, which she refers to as 'dispersal phase camps'. Aggregation sites should be marked by high frequencies of standardized and curated (higher quality and better made) materials, whereas the dispersal phase camps should be characterized by expediently produced assemblages, a model that contradicts the principles of the organization of technology approach.

When the results of her archaeological investigations did not fully fit her proposed model, Wadley concluded that variability among Late Stone Age hunter-and-gatherer sites in the Gauteng province of South Africa might be attributed to changes in social relations. These changing social relations could include aggregation site dynamics and *hxaro* exchange, in addition to a multitude of other varying factors such as kinship and gender (Wadley 1987, 1989). Although her work had only vague conclusions, it was nonetheless an important step in using ethnographic analogy to understand the physical manifestations of past hunter-and-gatherer groups.

Lewis Binford has frequently relied on ethnographic analogy to understand the differences between site structure and spatial patterning of forager and collector subsistence activities. In illustrating his concepts of forager- and collector-based systems, Binford (1980:10) borrowed heavily from Sliberbaner's (1972) ethnographic work among the San Bushman and his own ethnoarchaeological work among the Nunamiut Eskimo. Binford (1987) conducted further analysis into the impact of subsistence mode on archaeological site structure by conducting ethnoarchaeological work with the Alyawara in the Central Desert region of Australia. Mapping the Alyawara's seasonal foraging camps and the subsequent analysis of faunal remains at their camps led Binford to conclude that climate had a greater impact on faunal archaeological remains than the mode of subsistence or any major cultural difference (Binford 1987:495). His realization contributes to our understanding that human behavior and how this behavior is manifested in site structure is conditioned by many factors.

Compared to research from Africa and parts of Europe, early and middle Holocene research from the southeastern United States and other parts of North America, excluding the Arctic (discussed above), noticeably lacks research into the use of space and campsite organization or patterning of hunter-and-gatherer sites. Recent settlement pattern studies within Africanist prehistoric archaeology focus on a small scale in order to understand the structure and spatial organization of campsites, as opposed to developing large, regional settlement models—a major focus of archaeology in the southeastern United

States (Kent 1987; Mitchell et al. 2006; Sisk and Shea 2008; Wadley 1989). Additional small-scale studies have been undertaken in order to examine the spatial organization of Paleolithic sites in Europe (Enloe 2006; Martínez-Moreno et al. 2004) and Inuit sites in the Arctic (Binford 1980).

Cable and Cantley (2006) argue that the goal of archaeology should be to study discrete occupations of a site and not the site itself, especially when a site is created from frequent revisits to the same location during numerous cultural periods. Thus, in order to examine the occupation of the large, reused sites of the Sandhills and Inner Coastal Plain, they employ the concept of an occupation cluster to refer to an "empirically defined spatial unit" (Cable and Cantley 2006:34). An occupation cluster "represents a discrete concentration of diagnostic artifacts of a particular culture historic phase" (Cable and Cantley 2006:34). The numerous occupation clusters that can be found within a single site component represent functional, temporal, or organizational aspects of the component.

Occupation clusters are identified through the creation of artifact density maps, which highlight clusters of functionally or chronologically related artifacts (Cable and Cantley 2006:34). The size of the sampling interval (e.g., the distance between shovel test pits in this instance) and the types of occupation clusters (e.g., Euro-American historic structures versus hunter-and-gatherer camps) affects the accuracy of the density maps and the identification of certain site components (Cable and Cantley 2006:34). Given that !Kung Bushman single or double household campsites were frequently less than 5 m in diameter (Yellen 1977), Cable and Cantley (2006) realized that large-interval testing would miss small occupation clusters. This realization prompted Cable and Cantley (2005, 2006;

Cantley and Cable 2002a) to incorporate micro-interval shovel test pits at 2.5 m, 1.25 m, and 0.625 m intervals in their site testing plans. The use of micro-interval shovel test pits has allowed for the identification, excavation, and analysis of a large sample of discrete occupation clusters heretofore missed using the more common shovel test pit interval of 5 m, 10 m, or even 15 m.

Using micro-interval shovel test pits and the concept of occupation clusters, Cable and Cantley (2006:44) determined that cluster size and cluster artifact density are the two most important characteristics of an occupation cluster for understanding the regional settlement pattern. Cluster size can be determined by using micro-interval shovel test pits to define discrete areas in terms of lithic raw material type, tool clusters, and the recovery of an occasional diagnostic point. Artifact density for the occupation cluster can be calculated for each shovel test pit based on the number of artifacts per volume of excavated dirt (Cable and Cantley 2006:44).

Using this method, Cable and Cantley (2006) were able to identify four types of Archaic period occupation clusters in the Inner Coastal Plain of North and South Carolina. Type 1 consists of debitage scatters of a single raw material type created from core or bifacial reduction. Type 2 is similar to Type 1 clusters, but with a higher ratio of tools to debitage and it may contain more diverse lithic raw materials. Type 3 clusters contain low-density debitage and tools scattered in a disorderly fashion. Type 4 clusters contain low-density debitage scatters from core reduction to produce tools; however, few tools are found in the cluster. This methodology has also been used to examine Woodland and historic period sites in the same region.

A problem encountered by both Cantley and Cable (2002a) and Clement et al. (2005) while working in the Sandhills and Inner Coastal Plain regions of North and South Carolina is the effect that the highly permeable, sandy soils of this region have on site formation and structure. High soil porosity and rapid percolation of water through the soil column creates a situation in which standard recognition of archaeological features through the identification of soil stains is problematic among old deposits. Lacking soil stains, features may instead by discerned by localized occurrences of higher artifact density, particularly in situations where additional artifacts are absent elsewhere in an excavation level but occur immediately above. Excavations at the Three Springs site (38RD837/841/842/844) were designed to isolate features in such soils.

Previous research at Fort Jackson, particularly the data recovery at 38RD628 (Clement et al. 2005) and a later testing project on the installation (Clement and Dawson 2009), addressed the lack of soil stains associated with prehistoric features through excavation strategies focused on very small, low-volume proveniences. For example, at 38RD628 all artifacts were recovered in 25 cm x 25 cm x 10 cm deep proveniences, allowing for the creation of very detailed artifact three-dimensional density contour maps. Density maps, coupled with grain-size analysis of the sand grains, allowed for the identification of individual occupation episodes within the site (Clement et al. 2005). Micro-interval shovel test pits (1-m or 2-m intervals) have also been used in an effort to isolate individual occupation clusters (Cable and Cantley 2005, 2006 on Fort Bragg; Clement and Dawson 2009 on Fort Jackson).

Complicating archaeological interpretation of sites on Fort Jackson is the fact that landforms in the Sandhills region undergo aggradation or deflation on a periodic basis, interspersed with long periods of landform stability. When site occupations occur on either side of an episodic aggradation, differentiating the archaeological remains of different occupations can be accomplished through standard stratigraphic excavation techniques because the occupations are separated by a fine layer of soil. When deflation has occurred or when multiple occupations occur during periods of stability, evidence for individual site reoccupations can be difficult to isolate archaeologically because these occupations are conflated into the same level (Clement et al. 2005). Geomorphological analysis of the soils from Area 1 of the Three Springs site on Fort Jackson, discussed in Chapter Five, was undertaken to identify levels of soil aggradation and stability in addition to examining the types of post-depositional processes occurring on the landform where Area 1 is located.

Summary

This chapter has presented a brief overview of the literature concerning two of the theoretical frameworks that have greatly influenced this research. The first framework, the organization of technology, is helpful in understanding the behaviors behind all aspects of lithic tool production, from the selection of raw materials to the types of tools produced and their location of discard. This theoretical framework has been frequently applied to the study of mobility and mobile foraging groups.

Within the organization of technology, the mindsets employed in the creation, or lack thereof, of formal tools and toolkits are referred to as technological strategies. The three technological strategies are curation, expediency, and opportunistic response. A curated tool technology has an up-front investment of time and energy to create a prepared and planned toolkits. Within this technological strategy, advanced preparation and planning are undertaken with the expectation to time, energy, and/or resources will not be available for a future action. Within an expedient tool technology, there is no initial investment of time and energy to create a planned toolkit because there is the belief that time, energy, and resources will be available at the site of a future action for the production of tools. An opportunistic response is situational and completely unplanned.

The second half of this chapter briefly touched on the idea of activity area research or intrasite spatial organization. Understanding how artifacts equate to the location of past human activities requires an understanding of how they relate to one another and the types of natural and cultural processes that have affected them since their deposition at a site. Additionally, the scale at which archaeological investigations are undertaken affects our ability to find and differentiate the remains of small-scale occupations. Ethnographic analogy is helping to inform the recovery strategies and interpretations of prehistoric small-scale occupations.

For work in the Sandhills region of South Carolina, the concept of an occupation cluster was employed to understand intrasite spatial organization of three Morrow Mountain occupation clusters. In addition, geomorphological analysis of the on-site soils were used to understand site formation and post-depositional processes. Due to the high porosity and leaching of the sandy soils in the Sandhills Province, a unique suite of excavation method designed to maintain tight horizontal and vertical controls will help in understanding spatial organization through the identification of features.

CHAPTER 4
METHODS OF LITHIC ANALYSIS

Continuing the discussion of lithics, this chapter presents the methods used to operationalize the organization of technology concept discussed in the previous chapter. In order to apply the organization of technology concept to the lithic artifacts from the Three Springs site—to be presented in the next chapter—both flake aggregate analysis and individual flake analysis were employed. The Three Springs site produced an extensive lithic assemblage from a Middle Archaic occupation on the United States Army Garrison of Fort Jackson, Richland County, South Carolina. The chapter begins with an overview of flake types and defines the terminology used throughout this chapter and the next. The literature concerning both individual flake analysis and flake aggregate analysis will then be presented, followed by an overview of the specific lithic analysis methods used on the lithic assemblage from the Three Springs site. The chapter will conclude with a discussion of the lithic raw material types recovered from the Three Springs site and, when available, their source locations will be identified.

Lithics: Basic Terminology

Prior to discussing analytical methods, analysis, and the results of analysis, the terms used to describe lithic reduction need to be defined. The process of creating chipped stone artifacts is collectively referred to as flintknapping or knapping (Whittaker 1994:11). Flintknapping detaches pieces of stone from larger objective pieces. Objective pieces are the pieces of stone that have been modified in some way (e.g., hit, flaked, or cracked); detached pieces are the ones removed from the objective piece during modification (Andrefsky 2005:12).

Flintknapping, by nature, is a reductive process (Ahler 1989; Andrefsky 2005; Shott 1994). Detached pieces (flakes, blades, shatter, and spalls) are removed from objective pieces via percussion with a hard or soft hammer, pressure flaking, or bipolar reduction. During percussion flaking, the objective piece is struck with another object, a percussor. During hard-hammer percussion, the percussor (hammerstone) is a cobble or pebble. In soft-hammer percussion, the objective piece is struck with a billet, a percussor not made of stone. The billet could be a piece of antler, wood, bone, or copper. Sometimes, lithic pieces will be detached from the objective piece through indirect percussion: the percussor or billet is used to strike a punch placed on the objective piece (Andrefsky 2005).

Pressure flaking removes very small flakes (pressure flakes) through the direct application of pressure via a small billet. The objective piece is not struck during pressure flaking; rather, force is applied by pressing the billet against the edge of the objective piece. The small billet (called a pressure flaker) is usually a piece of antler or sharpened bone (Andrefsky 2005).

Percussion and pressure flaking differ in terms of accuracy and the amount of pressure/force generated. Pressure flaking is the most accurate because the force is directed exactly where the knapper wants it to go, but it generates less force. Pressure flaking is generally used to shape or finish a biface, or to sharpen an edge. Percussion flaking is less accurate because sometimes the strike misses the intended location and causes the objective piece to shatter. However, percussion flaking produces a stronger force (Andrefsky 2005:12-13).

Bipolar reduction uses a hammer-and-anvil technique to break apart the objective piece, which is either too small to knap by hard-hammer or soft-hammer percussion or lacks an angular edge necessary for hammer percussion (i.e., it is rounded). The objective piece is placed on a rock and then hit from above with another rock. This method causes the objective piece to shatter into an unpredictable variety of sharp, useable pieces that do not resemble conchoidal flakes (Andrefsky 2005:123; Casey 2000; Cobb and Webb 1994:212).

The act of removing the detached pieces from the objective pieces is generally referred to as lithic reduction or the lithic reduction process. A lithic reduction strategy describes the process, such as core/freehand core reduction, bipolar core reduction, bifacial reduction, bifacial edge reduction, or unifacial tool reduction. The mode of reduction refers to how the objective piece was produced, such as through the use of hard-hammer percussion, soft-hammer percussion, bipolar percussion, and so on (Andrefsky 2005; Bradbury and Carr 2004; Johnson 1987; Shott 1994).

When an objective piece is struck by a percussor or billet, the energy from the percussor travels through the stone. Lithic raw material types will fracture differently due to differences in cryptocrystalline structure (Cotterell and Kamminga 1987). Most percussion flaking techniques result in a conchoidal fracture. This type of fracture produces a detached piece with a slightly concave interior surface. The flake scars—marks left from the removal of earlier flakes—on the objective piece will appear slightly concave (Andrefsky 2005:16-17). Detached pieces include flakes, blades, flake fragments, and shatter.

Most detached pieces are classified as flakes. A blade possesses the same characteristics as a flake; however, it will be at least twice as long as it is wide (Andrefsky 2005). The recovery of a large number of blades and prepared, pyramidal blade cores represents a specific lithic technology. When pyramidal blade cores are not recovered or the number of blades is small, then the term blade-like flake is employed. This term shows that the artifact is shaped like a blade, but not part of a blade industry. Complete conchoidal flakes and blades exhibit some key characteristics (Figure 4.1). The structure of a flake includes a platform, dorsal surface, ventral surface, and termination. The edges of the flake are referred to as margins. The platform is the

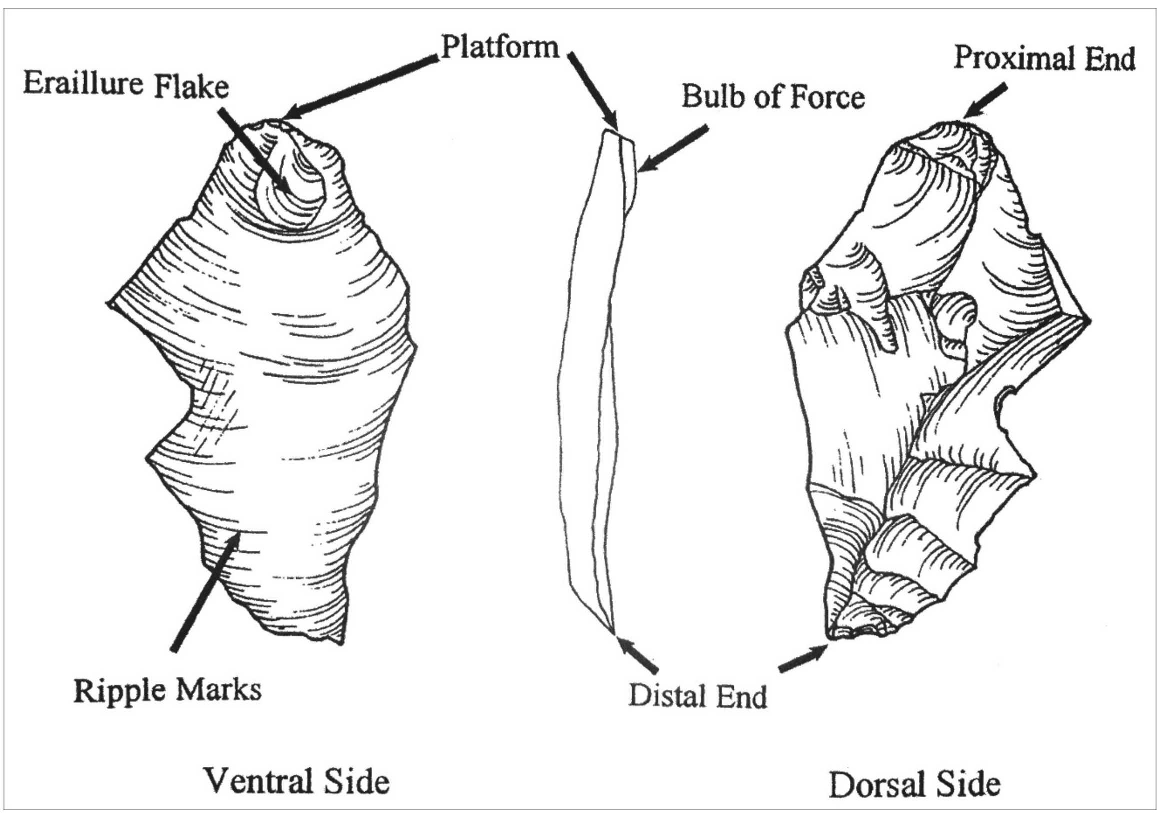

Figure 4.1. Conchoidal Flake Characteristics (Andrefsky 2005:19).

location where the percussor or billet struck the objective piece and often has evidence of this blow in the form of a point of applied force. The platform can also be referred to as the proximal end of the flake. The dorsal surface of a flake is the back side of a flake, which at one point was the exterior surface of the objective piece (Figure 4.1). Dorsal surfaces will be covered in either cortex or flake scars. The flake's interior, or ventral, surface is the smooth side of the flake detached from the objective piece. The ideal ventral surface will exhibit a bulb of percussion or force, radial fissures, an erailleur flake scar, and ripple marks (Andrefsky 2005:19; Whittaker 1994:16). The termination is the end opposite the platform (Figure 4.2); this end is also the distal end of the flake. Flake terminations can be classified as feathered, hinge, step, or plunging (also called overshoot or outrepassé) (Andrefsky 2005:21; Whittaker 1994:17-19). Discarded flakes along with other unmodified, detached pieces (shatter) enter the archaeological record and become known as debitage, or flaking debris, to archaeologists. Debitage is the by-product of tool and core reduction (Andrefsky 2005:16).

Tools can be further divided into expedient/informal versus formal and unifacial or bifacial. Expedient/informal tools should not be confused with the expedient technological strategy discussed in the previous chapter. The expedient technological strategy is a behavioral mindset that influences what tool types are used (Nelson 1991), whereas expedient/informal tools are tools that require little time and/or effort in their production (Andrefsky 2005:31). Informal/expedient tools include utilized flakes, retouched flakes, and amorphous and bipolar cores (Casey 2000; Cobb and Webb 1994; Johnson 1987). The recovery of these types of tools at an archaeological site can be used to infer that the makers of those tools worked within an expedient technological strategy.

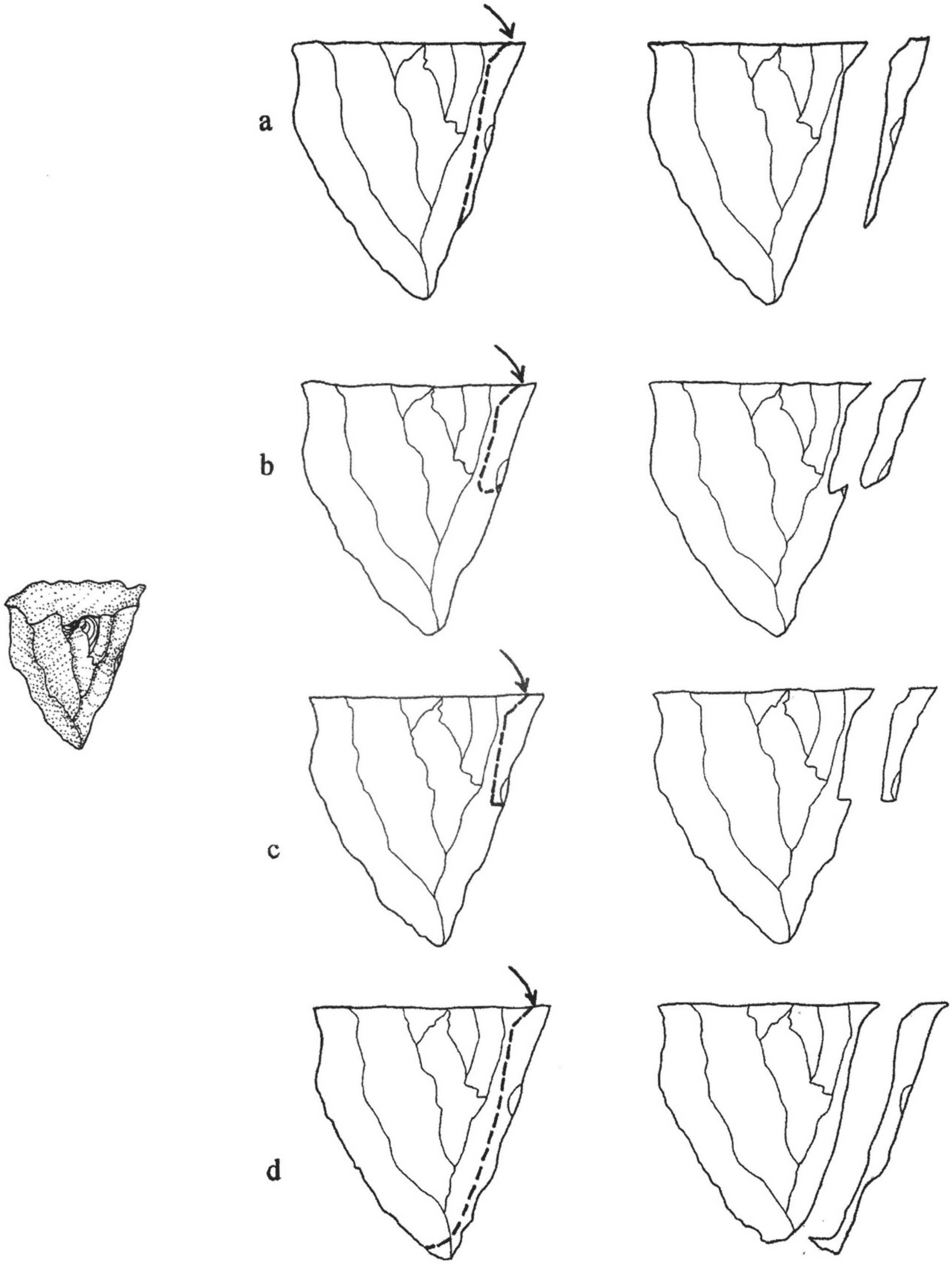

Figure 4.2. Flake Termination Types: (a) feathered; (b) hinge; (c) step; (d) plunging, overshoot, or outrepassé (Andrefsky 2005:21).

More time and energy was expended in the creation of formal tools—hafted bifaces, drills, endscrapers, and prepared cores (Johnson 1987). Throughout this dissertation, hafted bifaces and biface fragments are also referred to as projectile points/knives. When possible, these projectile points/knives are typed to a specific cultural period. Researchers view the production of formal tools as either staged (Andrefsky 2005; Callahan 1979; Crabtree 1966; Sassaman 1983; Shott 1994) or continuous (Hansen and Madsen 1983; Patterson 1981; Shott 1994; Sullivan and Rozen 1985; Whittaker 1987). When reduction is viewed as staged, the lithic reduction process is divided into anywhere from three to twelve stages that often include terms such as blanks and preforms (e.g., Andrefsky 2005:32 for one example of a staged bifacial reduction sequence). Viewing bifacial reduction on a continuum eliminates the use of arbitrarily defined stages (Shott 1994).

The analysis of lithic debitage tends to be based either on individual attribute analysis or a typological analysis (Andrefsky 2005:113-114). For individual attribute analysis, data are collected for specific attribute(s) based on the research goal. This method, discussed below, is often time-consuming and subject to researcher bias or error (Ahler 1989; Andrefsky 2005:114). Within a typological analysis, the debitage is sorted into groups, or types, based upon specific flake characteristics. Types of typological analysis include the “triple cortex” typology and the technological typology, among others (Andrefsky 2005).

The triple cortex typology groups debitage based on the amount of cortex on the dorsal surface. This analysis assumes that lithic reduction occurs in stages, with the first stage including the removal of most of the cortex from a cobble. As the reduction process progresses, the amount of cortex decreases. Thus, for example, debitage with over 50% cortex on the dorsal surface is classed as primary flakes, debitage with less than 50% cortex is grouped as secondary flakes, and debitage with no cortex on the dorsal surface is classified as tertiary flakes. These terms are frequently used; however, little consistency exists in terms of how much cortex is required for each flake type within this typology (Andrefsky 2005:115). While cortex can be an important attribute to record, it provides very little information in terms of determining the lithic reduction strategy.

A second typological analysis method, termed the technological typology by Andrefsky (2005), uses fracturing characteristics of the flakes to group debitage. Within this method, debitage can be classified as bifacial thinning flakes, bipolar flakes, edge rejuvenation flakes, striking platform preparation flakes, reduction flakes, scraper and unifacial retouch flakes, and notching flakes (Andrefsky 2005:120-126). Other flake types exist depending on the type of tool produced and the reduction method. Elements of a technological typology are discussed within this chapter and the next, even though this analytical typology was not used during the analysis of the Three Springs site debitage.

The most relevant terms for this dissertation are bipolar flakes and bifacial thinning flakes. Bipolar flakes are produced through bipolar reduction—a lithic reduction method that uses a hammer and anvil technique to create usable cutting edges from small nodules or cobbles (Andrefsky 2005; Casey 2000; Cobb and Webb 1994). This technique creates flakes with evidence of impact (load application) at both ends. Evidence of the load application will appear as crushed or sheared striking platforms with elongated bulbs of percussion (Andrefsky 2005:123-125; Casey 2000:85; Cobb and Webb 1994:207). It should be noted that bipolar reduction tends to shatter an objective piece into a variety of different forms, making the positive identification of bipolar flakes difficult (Andrefsky 2005:123).

Bifacial thinning flakes are another technological flake category mentioned throughout the literature discussed below and lithic analysis literature, in general. Bifacial thinning flakes are a well-used category, but no universally accepted definition exists for this flake type. Most lithic analysts agree with Andrefsky (2005) that bifacial thinning flakes are created when the face of a biface is trimmed. The objective of trimming is not necessarily to make the biface thinner (Andrefsky 2005:123). Bifacial thinning flakes, or flakes of bifacial retouch (Frison 1968:149-150), often possess faceted striking platforms and/or the original dulled edge of the biface. The dorsal surface of a bifacial thinning flake frequently exhibits the ridges between the flake scars (due to the fact that this dorsal surface was once the exterior surface of a biface) (Andrefsky 2005:123). The margins of bifacial thinning flakes are often feathered (Sassaman 1983). This artifact type occurs in the middle and late stages of biface production. The lack of a clear, well-accepted definition for this flake type makes the use of this flake type problematic, especially when collecting data from multiple research projects that identified bifacial thinning flakes using different criteria.

The terminology employed in the analysis of the lithic artifacts from the Three Springs site uses the morphological characteristics of the flake itself to divide the debitage into shatter, complete flakes, proximal flake fragments, medial flake fragments, and distal flake fragments. A complete flake has an intact striking platform and termination. A piece of debitage with an intact striking platform but no termination is a proximal flake fragment. Proximal flake fragments also include complete flakes with step terminations due to the fact that a step termination and a broken flake fragment are indistinguishable in the laboratory. A medial flake fragment has neither an intact striking platform nor termination. Medial flake fragments can easily be confused with shatter or blocky debris during analysis, and are distinguished by intact margins, a smooth ventral surface, and flake scars or cortex on the dorsal surface. A distal flake fragment has an intact termination but is lacking the striking platform.

For the analysis of the lithic debitage from the Three Springs site, medial, distal, and unidentifiable flake fragments are grouped under the umbrella category of flake fragment (Dawson et al. 2013). Debitage lacking a clear striking platform, termination, and clear ventral and dorsal surfaces is classified as shatter. Thus, shatter is defined as a piece of debitage that is typically blocky or angular and does not exhibit any diagnostic flake features (Andrefsky 2005; Sullivan and Rozen 1985).

Complete flakes and proximal flake fragments are referred to as platform-bearing debitage because both artifact types contain intact striking platforms. The condition of the platform can provide data on the type of lithic reduction strategy used to remove the flake from the objective piece. Classification types among the platforms include abraded, collapsed (or crushed), complex (also referred to as faceted), cortical, or simple (sometimes referred to as flat). Complex and abraded platforms are indicative of late-stage lithic reduction activities and are recognized to have undergone additional preparations. Complex platforms exhibit facets or flake scars and are angular in shape. Preparation of the striking platform by abrading the surface with a coarse-grained object is necessary when undertaking middle- and late-stage bifacial reduction. If the striking platform is not well prepared, then the force of the impact from the percussor will be blunted (Andrefsky 2005; Johnson 1987; Rigtrup 2009). Complex and abraded platforms coupled with a high dorsal flake scar count are indicative of bifacial thinning flakes produced during the later stages of bifacial reduction.

Collapsed or crushed platforms are indicative of bipolar reduction or, to a lesser degree, late-stage reduction. In theory, late-stage reduction removes smaller flakes from smaller bifaces and/or cores. Small flake size results in more fragile platforms that are more easily crushed through normal reduction techniques (Moore 2002; Rigtrup 2009).

Simple and cortical platforms suggest early-stage reduction when the objective piece has some or all of its cortex intact, as in the case of cortical platforms. Simple platforms are also produced during the early stages of lithic reduction when the careful preparation and abrading of fragile platforms are not necessary (Andrefsky 2005; Rigtrup 2009).

Debitage Analysis

The lithic debris such as flakes and shatter resulting from the production of chipped stone tools is collectively referred to as debitage. Debitage constitutes a substantial part of the prehistoric archaeological record; however, formerly this artifact type was often delegated to a secondary position in terms of analysis and interpretation. Instead, emphasis was placed on studying the completed projectile points, biface fragments, and tools. Over the past decade, a greater focus on the study of debitage has occurred within archaeology (Andrefsky 2001; Bradbury and Carr 2004, 2009; Diez-Martín et al. 2011; Edmonds 2012; Hill et al. 2011; Jerardino 2013; Lin et al. 2013; Parkington 2013; Potts 2012; Price 2012). Unlike the completed products of lithic reduction, debitage remains at the site (Shott 1994). Perforce, the archaeologist recovers an abundance of debitage and few, if any, completed tools from which to understand the behavior influencing the production of chipped stone tools. Debitage analysis can provide insight into the "kind and amount of…reduction and resharpening" that occurred at a specific location and time (Shott 1994:71). Understanding the reduction strategy and the mode of reduction that were used to create the flaking debris allows for conclusions to be made concerning behavior within the framework of the organization of technology. Methods of debitage analysis are divided into two broad categories: flake aggregate analysis and individual flake attribute analysis.

Flake Aggregate Analysis

Flake aggregate analysis, as the name implies, examines large subsets of debitage in terms of broad, general, characteristics such as weight, count, and raw material type. It is an efficient method for analyzing large quantities of lithic debitage. Methodologically, it shifts the focus away from individual artifacts to understanding characteristics of the debitage group as a whole (Ahler 1989:87). The benefits of flake aggregate analysis include its applicability to all debitage from a specific context regardless of flake completeness or debitage type (e.g., shatter); its ability to save time and money by analyzing an extremely large quantity of artifacts in a short period of time; its ability to include even the smallest flakes and flake fragments in the analysis; and its ability to collect replicable results and eliminate researcher bias from the analysis (Ahler 1989:87-88).

A variety of flake aggregate analysis methods are utilized by lithic analysts. Once size grade data are collected, the main difference between these analyses is the type of statistics used to interpret the data. Aggregate analysis employs a set of nested standard geological sieves. Debitage is sorted into size grades by shaking the sieves and manually manipulating the flakes through the two largest sieves (Ahler 1989:100) or all of the sieves (Bradbury and Carr 2009:2789). Once sorted into the respective size grades, the debitage is then sorted by raw material, counted, weighed, and inspected for cortex. A count is recorded for the number of debitage artifacts on which cortex is present per size grade. The data are then compared to the weight, counts, and size grade ratios of debitage created through experimental replication activities. This comparison aims to correlate lithic debitage to flintknapping behavior by determining the type of lithic reduction occurring, the stage of lithic reduction, the mode of reduction, and the byproduct of the lithic reduction method (Ahler 1989). For the analysis presented in the following chapter, debitage was sorted into four size grades: Group 1 (≥ 1 in or 25.4 mm), Group 2 (≥ 1/2 in or 12.7 mm), Group 3 (≥ 1/4 in or 6.4 mm), and Group 4 (≥ 1/8 in or 3.2 mm).

Patterson (1981, 1982, 1990) applied a log-linear model to aggregate debitage data: by plotting the proportion of debitage per size grade, bifacial reduction created a characteristic concave curve whereas other reduction strategies resulted in irregular patterning. Stahle and Dunn's (1982, 1984) analysis utilized the cumulative relative frequencies of the size-count distributions. Their analyses suggest that the stage of lithic reduction can be determined by changes in the slope of the linear model for bifacial reduction. Ahler's (1989) mass analysis compares the size distribution of debitage produced through experimental flintknapping to the debitage collected from the archaeological record in order to determine the reduction strategies and modes of reduction for the excavated assemblage.

Mass Analysis. Ahler (1989), a major player in the development of mass analysis, distinguishes mass analysis as a variety of flake aggregate analysis due to its strict focus on size grade distribution data. Bradbury and Carr (2009) further define Ahler's mass analysis as a type of flake aggregate analysis that uses extensive experimental data, tight data collection methods, and statistical analysis. Ahler (1989) highlights two inherent traits of flintknapping that allow for mass analysis to work: its reductive nature and the predictability of the load application.

Reductive traits allow us to generalize some universal principles in terms of flake size and amount of cortex. Because flintknapping is a reductive technology, flakes are progressively smaller and no flake will be bigger than the objective piece being knapped, whether it be a cobble, blank, or formal biface (Ahler 1989:89). Experiments have shown that the number of small flakes produced regardless of material, flaking procedure, or intended product is greater than the number of flakes in any other size. The reductive nature of flintknapping dictates that the amount of cortex on the dorsal surface of an artifact will significantly decrease as the tool/core reduction process progresses. Thus, it is logical to conclude that cortical flakes will be most common during early-stage reduction. The presence of cortex will be less frequent during late-stage reduction (Ahler 1989:89-90).

For non-bipolar reduction, differences in the 'load application' of various flaking procedures (percussion versus pressure flaking) and the placement of the load or force (marginal versus non-marginal percussion flaking) produce predictable differences in both flake size and shape (Ahler 1989:89). These differences result in predictable changes in the weight per size grade data. Analysis of experimental data has shown that percussion flaking produces larger flakes than pressure flaking. In fact, the majority of flakes produced through pressure flaking are so small that they often fall through the standard 1/4-in hardware cloth used to screen dirt during most excavations. Analysis of the percentage of debitage by size grade therefore should yield higher weights for the large size grades when percussion flaking is used but higher counts among the small size grades accompanied by low to absent counts for the large size grades when percussion flaking is used (Ahler 1989:91). In terms of the placement of the load application, experiments have shown that the increased thickness of non-marginal flakes results in higher weights in the large size grades (Ahler 1989:91). Lastly, due to the shape of debitage produced through bipolar percussion, the mean weight of this debitage is greater than the mean weight of bifacial thinning flakes (Ahler 1989).

Mass analysis, like other forms of lithic debitage analysis, has undergone extensive testing and scrutiny. Andrefsky (2007:393) argues that although mass analysis is often used to save time and money, it has "often resulted in spurious interpretations of the archaeological record." In fact, after applying mass analysis to a sample of experimentally produced lithic assemblages, Andrefsky (2007:400) concluded that this analytical method "is not effective for making accurate tool production or core reduction interpretations at archaeological sites." Critiques of mass analysis have highlighted replicator variability (Andrefsky 2007); raw material variation (Ahler 1989; Andrefsky 2007; Bradbury and Franklin 2000); and its inability to separate mixed archaeological assemblages (Ahler 1989; Andrefsky 2007; Bradbury and Carr 2004; Larson 2004; Root 1997, 2004) as the inherent flaws of this method. Replicator variability and raw material variation produce different size grade distributions during controlled testing, which suggests that the reliability of both the comparative data and its applicability to past assemblages are questionable (Andrefsky 2007).

In defense of mass analysis, Bradbury and Carr (2009) note that the issues raised by Andrefsky (2007) plague all types of lithic analysis to some degree. In fact, Bradbury and Carr (2004, 2009) and others (e.g., Morrow 1997 and, to a lesser extent, Prentiss 1998) argue that a combination of analyses using both an aggregate analysis method and data gathered from individual flake analysis provides a more accurate picture of the processes of debitage production than relying solely on the use of one method. I argue that flake aggregate analysis is applicable to the assemblages discussed in Chapter Five because all lines of evidence suggest an unmixed Middle Archaic occupation in Area 1 at the Three Springs site.

Aggregate Trend Analysis. Bradbury and Carr (1995, 1999, 2004; Carr and Bradbury 2000), strong advocates for the use of multiple lines of evidence in lithic analysis, have employed a combination of aggregate analysis and individual flake attribute analysis to understand prehistoric lithic reduction activities. Their method combines Ahler's (1989) mass analysis with the calculated percentage of blocky debris (shatter) from Sullivan and Rozen's (1985) interpretation-free approach, and platform facet counts after Magne's (1985) research. Bradbury and Carr's method, referred to as "aggregate trend analysis," has proven to produce reliable results concerning reduction strategy when applied to experimental data and has been shown to be a viable method for understanding reduction strategy even when dealing with a mixed assemblage (Bradbury and Carr 2004).

Bradbury and Carr (2004) conducted forty-three individual flintknapping experiments with Fort Payne chert to create artifact assemblages from bipolar core reduction, hard hammer freehand core reduction, hard-/soft-hammer biface edging, soft- hammer biface thinning, and pressure-flaked tool edges. They analyzed debitage from these experiments via aggregate trend analysis to examine the total percent of blocky debris, total percent of platform-bearing debitage with 2+ facets, average weight for 1/4-in flakes, and percent of 1/4-in flakes for each experiment.

Trends were identified for the type of reduction method (e.g., core reduction versus tool reduction) and the stage of reduction (e.g., early-stage reduction versus late-stage or tool completion reduction). Their experiments (Bradbury and Carr 2004:75-76) suggested that blocky debris is most commonly associated with core reduction (both freehand and bipolar) and practically non-existent for tool production. Additionally, higher counts of platform-bearing debitage with 2+ platform facets in the assemblages are created through tool reduction when compared to core reduction. Finally, the average weight of the 1/4-in size grade debitage decreases while the frequency of debitage in this class increases as reduction progresses. Thus, lower weights and higher counts suggest tool reduction, whereas higher weights with lower counts suggest core reduction. This correlate was determined to not show significant differences in terms of the weight distribution of debitage from biface thinning reduction versus pressure flaking. Additionally, the percent of 1/4-in debitage cannot significantly differentiate between bipolar core reduction and biface edging.

In order to assess the usefulness of this method to assemblages created through a combination of lithic reduction strategies, Bradbury and Carr (2004) created simulated assemblages from their experimentally produced debitage. Examination of 26 simulated assemblages suggested that the trends previously highlighted remained applicable to mixed assemblages. Mixed assemblages with higher rates of biface reduction exhibited higher percentages of platforms with 2+ facets, lower percentages of blocky debris, higher percentages of 1/4-in flakes, and lower average weights of the 1/4-in flakes. As the amount of bifacial reduction in an assemblage decreased and core reduction increased, the simulated assemblages exhibited higher percentages of blocky debris, lower percentages of platforms with 2+ facets, and lower percentages of 1/4-in flakes with higher average weights. They used data from these experiments to create a series of regression formulae (Table 4.1) to compute the percentage of biface reduction in a mixed assemblage based on the abovementioned attributes.

Table 4.1. Regression Formulae.

Attribute	**Regression Formulae[a] (% biface reduction=)**
% blocky debris	1.064 – (7.052 x blocky)
% 2+ facets	(6.359 x facets) – 0.177
avg. weight 1/4-in flakes	1.987 – (2.258 x weight)
% count 1/4-in flakes	(3.757 x count) – 2.31

[a]Bradbury and Carr 2004.

Individual Flake Analysis

Individual flake analysis, which records specific attributes for each individual artifact, is the most common form of lithic analysis. I undertake individual flake analysis to collect additional data from the platform-bearing debitage recovered from the Three Springs site to further elucidate the types of lithic reduction strategies that occurred there. Flake attributes (e.g., platform type, flake shape, dorsal surface features) allow for the discrimination of reduction strategies and reduction modes, and thus enable the researcher to understand the behaviors associated with a specific artifact (Ahler 1989:86). In addition, the identification of specific attributes on individual flakes allows for the separation of mixed component artifact assemblages (Ahler 1989:86). Theoretically, this last point seems logical: if each flake can inform the researcher about the specific reduction episode and the behavior it resulted from (assuming each episode produced a different end product such as a Clovis point, core, or blade tool as in Morrow 1997), then the lithic analyst should be able to separate out the artifacts from each discrete reduction episode.

The disadvantages of this method include the time-consuming nature of recording attribute data for individual artifacts; the potential researcher bias inherent in discerning some of the attributes; the omission of the smaller flakes from analysis to save time; the analysis of only complete flakes or platform-bearing flakes; and the inability of this method to adequately link individual attribute data to human behavior as shown in studies with experimentally produced data (Ahler 1989:86-87).

Researchers have examined the usefulness of specific attributes in understanding reduction strategy and mode. Sullivan and Rozen (1985) shifted their focus of lithic analysis away from the idea of stages of reduction and instead used the idea that lithic reduction is a continuous process. The lack of stages prompted them to call their method an interpretation-free method of lithic analysis. They identified a set of easily replicable, morphological attributes (complete flake, broken flake, flake fragment, and debris or shatter) to correlate debitage type to a specific behavior (Sullivan and Rozen 1985). Their interpretation-free method provided some interesting conclusions; however, it does not correlate correctly when tested using experimentally produced debitage and, for the most part, has fallen out of use by lithic analysts (Shott 1994:78). Regardless of the problems with Sullivan and Rozen's method, one of their conclusions remains applicable to debitage assemblages: the amount of debris (also called blocky debris or shatter) is higher for core reduction than for tool production (Bradbury and Carr 1995, 2004; Prentiss and Romanski 1989; Sullivan and Rozen 1985; Tomka 1989).

Other researchers who have examined a variety of lithic debitage attributes have identified a set of minimum attributes that should be recorded for all debitage. This minimum set aims to be easily replicated by other researchers and is useful in terms of identifying certain knapping behaviors (Shott 1994:79). Magne and Pokotylo (1981) are credited with establishing the minimum attribute set, which includes artifact weight, dorsal cortex (at least presence/absence, if not percentage covered), dorsal surface scar count, platform angle of complete flakes and proximal flake fragments, platform class or type, condition (intact or broken; complete or fragment), and raw material type (Shott 1994:79-81). Magne and Pokotylo (1981) and Shott (1994) encourage each lithic analyst to add additional attributes as needed for their specific research questions.

Site-Specific Lithic Analysis Methods

Analysis of the debitage collected from the Three Springs site included both flake aggregate analysis and individual attribute analysis (Dawson et al. 2013). Aggregate analysis was employed to expedite the analysis of the large quantity of debitage recovered from the data recovery excavations. Individual attribute analysis was used to understand the lithic reduction strategies through which the platform-bearing debitage was created. A third analysis—aggregate trend analysis—was applied to the data as part of this dissertation in order to understand the lithic reduction method of an assemblage produced through a mixture of lithic reduction strategies. Details concerning the excavation history of the site and the results of the lithic analysis were presented in Chapter One, while the lithic analysis methods are summarized below.

The aggregate analysis method follows Ahler's (1989) mass analysis method. This method was used to collect data concerning the number of artifacts per size grade and weight per size grade for all debitage. In addition, all debitage was examined for flake condition (complete flake, proximal flake fragment, flake fragment, shatter, tool and/or core), raw material type, and signs of thermal alteration. Size grade data were collected using a set of United States Standardized geological sieves for four size grades: Group 1 (≥ 1 in or 25.4 mm), Group 2 (≥ 1/2 in or 12.7 mm), Group 3 (≥ 1/4 in or 6.4 mm), and Group 4 (≥ 1/8 in or 3.2 mm). Artifacts were manually manipulated through all of the sieves following the recommendation of Bradbury and Carr (2009). Weights for each size grade were measured in grams on a digital scale.

The platform-bearing debitage (all complete flakes and proximal flake fragments) was examined further for the individual flake attributes of the presence or absence of cortex, dorsal flake scar count, platform condition, and technology type, if evident. The attributes selected for individual flake analysis were based on the work of Andrefsky (1998), Bradbury and Carr (2004), Magne (1985), Shott (1994), and Sullivan and Rozen (1985). Categories for the number of scars on the dorsal surface of platform-bearing flakes and flake fragments included 0 for surfaces completely covered in cortex; 1 for surfaces with one flake scar and approximately 50% of the dorsal surface covered in cortex; 2 for surfaces with two flake scars, whether or not the flakes have cortex as well; and 3 for flakes with three or more scars on the dorsal surface and no dorsal cortex (Dawson et al. 2013). Platform condition was assessed under 10x magnification and classed in one of the five following categories: simple (flat, unfaceted, lacking cortex), cortical (wholly or partially covered in cortex), complex (multiple flake removal scars on the platform), abraded (appeared rounded or ground), and crushed (heavily damaged/could not be classified into the other categories).

Tools and cores were separated from the debitage during analysis of the lithic assemblage from the Three Springs site. Tools included formal bifaces and biface fragments, expedient flake tools, and cores. Formal tools were identified to a specific cultural type when possible. Biface fragments were described based on morphological attributes such as base, tip, or barb. Data concerning maximum length, width, thickness, presence/absence of cortex, and thermal alteration were collected for all formal tools.

Debitage was examined for evidence of use-wear and retouch: flakes or shatter with either were classified as expedient tools. Use-wear has been defined as "no intentional trimming to produce modification but with minor fracturing, bruising and crushing, battering or nibbling damage to one or more edges or faces" (Clark and Kleindienst 1974:84). Retouch is the intentional modification of an edge or margin. The identification of expedient tools among the quartz artifacts was difficult, but not impossible. However, the differentiation between use-wear and retouch on quartz artifacts was impossible. But, according to Andrefsky (2005:79), all expedient tools "have been modified by humans [either as] a result of intentional retouching or chipping [or] as a result of being used." Viewing expedient tools in this manner suggests that the important point is identification of the tool, not distinguishing between use-wear and retouch.

Attributes examined for the expedient tools include the type of debitage (flake fragment, complete flake, blade, or shatter), size grade, weight, presence/absence of cortex, and presence/absence of thermal alteration. When the expedient tool was made on a complete flake, the number of dorsal flake scars was also recorded. Additional data collected for the expedient tools included edge morphology (straight, concave, convex, or pointy), type of use if discernable (retouch or use-wear), location of use (left/right margin, distal edge, unidentifiable), type of tool (unimarginal, bimarginal, or combination tools), and, if applicable, presence of hafting (modified to fit into a handle) or backing (ground to fit into your hand) (Andrefsky 1998, 2005; Dawson et al. 2013).

Cores constitute the final category of lithic artifacts. When identified, attribute data concerning size grade, weight, presence/absence of cortex, and presence/absence of thermal alteration were recorded for each core. Cores were classified as bifacial, polyhedral, multidirectional, or fragments (Dawson et al. 2013).

Lithic Raw Materials

As noted in the previous chapter, the identification of the lithic raw material type provides important information concerning behavior, mobility, and the organization of technology. In fact, Andrefsky (1994) argues that accessibility to and the quality of the lithic raw materials in an area strongly influence the technological organization of tools produced by the people in that region. Data for the lithic raw materials recovered at the Three Springs site are presented below.

The majority of the lithic artifacts recovered at the Three Springs site were made of quartz. Vein quartz and quartz cobbles and pebbles are readily available throughout the Piedmont, and pebbles and cobbles of quartz are readily available in the streams and rivers of the Coastal Plain. The presence of impurities in the quartz result in variation of the color of the quartz (Mottana et al. 1977:244). Quartz artifacts were divided into five categories based on color: citron, crystal, rose, smoky, and white/milky. When the color could not be discerned, the quartz was classed as unidentified (Dawson et al. 2013).

Quartzites (metaquartzites) are formed when heat and pressure metamorphoses quartz sandstone (Novick 1978). Grain sizes of quartzite range from very fine to large grains visible to the naked eye (Andrefsky 1998:54-55). Quartzite varies in color from the typical white or gray to an orange-red color (Dawson et al. 2007). The variation in color is most likely the result of impurities in the matrix. Quartzite is common in the Piedmont region of the South Atlantic Slope, and quartzite cobbles and pebbles are present in the rivers and streams throughout the Coastal Plain. Quartzites are rarely recovered on Fort Jackson (Dawson et al. 2007).

Orthoquartzites, like quartzites, originated from sandstone. The main difference between the two lithic types is that heat and pressure forced the quartzite grains to join while orthoquartzite grains are cemented together by silica (Andrefsky 1998; Novick 1978:433; Upchurch 1984). Orthoquartzites are commonly recovered from prehistoric sites throughout South Carolina and have been called the most abundant lithic material in the Coastal Plain (Cliff et al. 1999:70). The orthoquartzite artifacts recovered on Fort Jackson are extremely grainy with a brownish appearance and individual quartz grains visible to the naked eye. Orthoquartzite outcrops have been identified in the lower Santee River Valley (Anderson et al. 1982:120-122; Charles 1981:15), the Savannah River Valley (Goodyear and Charles 1984:116) and near Sparkleberry Landing in Sumter County, South Carolina (Goodyear and Wilkinson 2014:36).

Rhyolite is a metavolcanic rock. It is abundant in the Uwharrie Mountains of the Carolina Slate Belt of North Carolina (Daniel 1996:3), as well as in the Piedmont of South Carolina (Cliff et al. 1999:68). Rhyolite ranges in color from gray or dark gray to black. Although many researchers (e.g., Abbott 1993; Cliff et al. 1999; Daniel and Butler 1991, 1996) classify rhyolites based on their inclusions, or lack thereof, the lithic analysis for the Three Springs site separated the assemblage into rhyolite and flow-banded rhyolite. Flow-banded rhyolite, like general rhyolite, ranges in color from gray to dark gray and possesses a similar texture. The difference is that flow-banded rhyolite exhibits diagnostic banding formed when molten rhyolite flowed across the ground surface (Novick 1978:427). Cliff et al. (1999) further divide the category of flow-banded rhyolite into subcategories based on the inclusion or not of phenocrysts, which are crystals commonly found in specific igneous rock flows.

Chert is a broad category that includes flint, chalcedony, agate, jasper, hornstone, novaculite, and some semiprecious gems (Luedtke 1992:5). It is a sedimentary rock composed primarily of microcrystalline silica (Novick 1978). Three types of cherts were identified at the Three Springs site. Two of these cherts, Coastal Plain and Black Mingo, are indigenous to the South Carolina Coastal Plain. The third chert, Ridge and Valley, was brought into the Coastal Plain from the Ridge and Valley Province of the Appalachian Mountains of eastern Tennessee. However, the presence of "a hard, pitted volcanic-like cortex" on some Ridge and Valley chert artifacts from the South Carolina Piedmont led Goodyear et al. (1979:184-187) to suggest that a source location might also be present in the Piedmont (Goodyear et al. 1989:32).

Coastal Plain chert is a broad category that encompasses all light tan to white fossiliferous cherts of the South Atlantic Coastal Plain. Within this overarching category are local variations such as Briars Creek chert and Allendale chert. Diagnostic characteristics of Coastal Plain chert are rounded, weathered fossils within a cream-colored matrix that turns pink or red when exposed to heat (Anderson 1979b; Goodyear and Charles 1984). Sources of Coastal Plain chert have been identified in Allendale, Calhoun, Clarendon, and Sumter counties in the South Carolina Coastal Plain (Goodyear and Charles 1984:5-7).

Black Mingo chert exhibits a coquina-like, fossiliferous matrix with a large number of easily visible marine fossils (Cliff et al. 1999:69). The color is typically purplish to black, and artifacts made from Black Mingo chert often show evidence of thermal alteration. Black Mingo chert boulders and cobbles have been identified at High Creek Plantation and Buyck's Bluff, both in Calhoun County, South Carolina. Outcrops of Black Mingo chert have also been noted at Sparkleberry Landing, Sumter County, South Carolina (Goodyear and Wilkinson 2014:36).

Ridge and Valley chert originates in the Ridge and Valley Province of the Appalachian Mountains. This chert type accounts for a very small portion of the lithic artifacts recovered from Fort Jackson, in general, and the Three Springs site, in particular. Ridge and Valley chert includes high-quality translucent black, gray and blue cherts commonly found in archaeological assemblages from the South Carolina Piedmont (Goodyear et al 1979:184-187). Two variations of these cherts have been recovered on Fort Jackson: the typical black, translucent material and a stark gray, thermally altered chert (Clement et al. 2002).

Piedmont silicate is another broad category encompassing a group of highly siliceous lithics with a sugary texture. These unnamed silicates are frequently found in lithic assemblages in the Fall Line (Novick 1978:432). Piedmont silicate ranges in color from light tannish-brown to greenish-tan to reddish-purple. Piedmont silicate cortex appears as a smooth brownish-red material. The presence of cortex and the variation in color strongly suggest that Piedmont silicate was collected as cobbles (Goodyear and Charles 1984; Novick 1978). To date, no outcrops or quarry sites have been identified for Piedmont silicate. This lithic type is frequently recovered from archaeological sites on Fort Jackson.

Sheared phyllite is a lithic material categorized as a Piedmont silicate. Sheared phyllite has the same sugary texture as Piedmont silicate; however, small veins of quartz cut through the material, resulting in a sheared appearance. Petrological analysis of sheared phyllite suggests it is a typical material that originated in the Carolina Slate Belt (Upchurch 1984:136). Colors of the matrix range from blue-gray to green with white veins or shears. A potential quarry site was documented in Laurens County, South Carolina, by Tommy Charles, but a more detailed analysis would have to be initiated to appropriately subcategorize these materials and determine their relationships (Dawson et al. 2007).

Argillite is a sedimentary rock composed of clay-size particles. It is typically light green in color. Argillite was formed by the lithification of clays originating from weathered feldspar and alumino-silicate deposits (Novick 1978:431). Due to the layering of the sediments during lithification, argillite is platy like slate and produces blocky shatter (Novick 1978:431). Argillite debitage from Fort Jackson is often heavily eroded, while the argillite tools tend to be minimally worked and heavily weathered (Clement et al. 2005).

Vitric tuff is a very fine-grained igneous rock formed through the compaction of volcanic ash. Its deep green color resembles chert (Goodyear et al. 1989:32; Novick 1978:428). Vitric tuff, like the rhyolites, is found in the Carolina Slate Belt region of North Carolina (Abbott 2004).

Hematite is the mineral form of iron oxide. It varies in color from black and gray to reddish brown and red (Mottana et al. 1977:66). Prehistorically, hematite was most likely used as a source of red pigment (Stafford et al. 2003).

Ferruginous sandstone is a sedimentary rock that contains high quantities of iron, which gives this rock a red color. Some pieces of ferruginous sandstone from Fort Jackson show polish and deep grooves, possibly from use, and have been classified as abraders (Clement and Dawson 2009; Clement et al. 2005; Dawson et al. 2007).

Sedimentary rocks with a grainy texture include claystones, siltstones, mudstones, and grainstones. These stones are differentiated from each other based on their grain size: Claystone refers to the smallest grain size, followed by siltstone, mudstone, and grainstone. Zumberge and Rutford (1991:27) utilize the term mudstone for all of these grainy sedimentary rocks.

Diabase has also been found in the assemblages of archaeological sites on Fort Jackson (Clement and Dawson 2009; Dawson et al. 2007) and this is true of the Three Springs site (Dawson et al. 2013). It is usually recovered as unmodified cobbles/chunks. Diabase is an igneous rock found in the Carolina Slate Belt of North Carolina.

‘Unidentified’ is a catch-all category used for lithic materials that could not otherwise be assigned to a more specific group.

Summary

This chapter served as an introduction to lithic analysis. The chapter began with a brief overview of the basics of lithic reduction in order to define the terms used throughout this dissertation and the vast body of literature on lithic artifacts. Next, Chapter Four introduced the two main types of lithic debitage analysis: flake aggregate analysis (including mass analysis) and individual flake attribute analysis. I use an aggregate trend analysis (Bradbury and Carr 2004), which is a combination of mass analysis and individual flake attribute analysis, to operationalize the organization of technology concept with the lithic debitage collected at the Middle Archaic Three Springs site in the Sandhills Province of Richland County, South Carolina. This chapter concluded with an overview of the lithic raw material types recovered at Fort Jackson and, more specifically, the Three Springs site.

CHAPTER 5
A MIDDLE ARCHAIC CASE STUDY FROM THE SANDHILLS PROVINCE, FORT JACKSON, RICHLAND COUNTY, SOUTH CAROLINA

In this chapter, I present data from excavations focused on the Middle Archaic component of Locus 3 Block 12 Area 1 of the Three Springs site (38RD837/841/842/844), a large, Sandhills site on the United States Army Garrison of Fort Jackson in Richland County, central South Carolina (Figure 5.1). The artifact analysis employs mass debitage analysis and individual debitage attribute analysis to understand the technological activities occurring at this location. This analysis and discussion have been undertaken to understand site structure and function during the

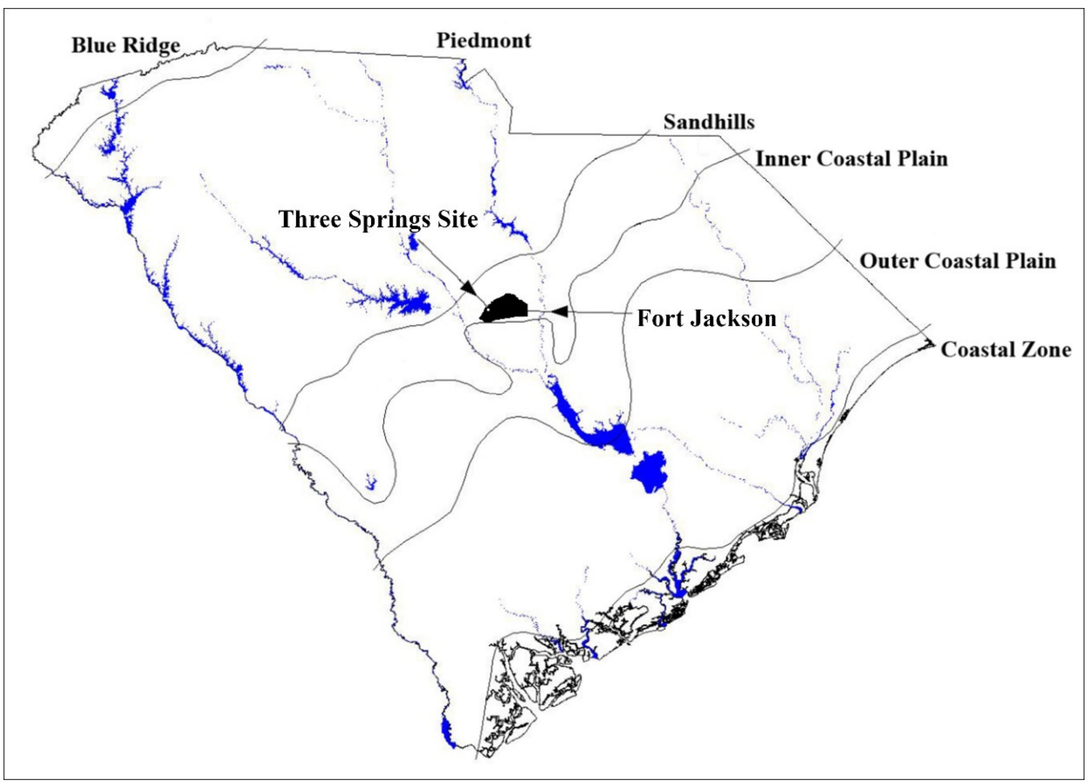

Figure 5.1. Location of the Three Springs Site (Dawson et al. 2013).

Middle Archaic in the Sandhills Province in order to determine whether the occupation clusters we found represent the remains of highly mobile groups of foragers as postulated in Sassaman's (1991) model of Middle Archaic land use and settlement in the Piedmont.

In 2008, the Applied Research Division of the South Carolina Institute of Archaeology and Anthropology (SCIAA-ARD) on the Columbia campus of the University of South Carolina was contacted by the Fort Jackson, Directorate of Public Works, Environmental and Natural Resource Division to mitigate the impending damages caused by the construction of a Basic Combat Training Facility at the location of the Three Springs site. The goal of the data recovery project was to understand site formation processes, site structure, and site function of the Middle Archaic components of this large Sandhills site (Dawson et al. 2013). A unique suite of field methods was employed to offset the difficulties associated with archaeological research in this sandy environment. These field methods included the excavation of micro-interval shovel test pits at 1-m or 0.5-m intervals to delineate discrete occupation clusters. Units measuring 2 m x 2 m were excavated by smaller sub-units measuring 25 cm x 25 cm (for a total of 64 sub-units per level). Each of these sub-units were excavated in 5-cm horizontal levels. For Archaic period sites in the Sandhills, features are identified as dense, isolated concentrations of artifacts (Clement et al. 2005). Thus, levels were divided into smaller excavation squares to facilitate the identification of features via the three dimensional clustering of artifacts, rather than relying on distinct changes in soil color or texture that rarely occur in sand. Artifacts, predominantly lithic debitage, were analyzed using a combination of mass analysis and individual attribute analysis as described in Chapter Four.

Area 1 of the Three Springs site provides an exemplary example of distinct occupation clusters correlating to the Middle Archaic period. Three occupation clusters were identified via high-density concentrations of three different lithic raw materials: quartz, Piedmont silicate, and Black Mingo chert. The vertical distribution of artifacts from each occupation cluster, coupled with the geomorphological analysis and optically stimulated luminescence dating of the soils, strongly correlate these occupation clusters to the Middle Archaic period. As such, the following analyses provide a view of Middle Archaic site structure and function in the Sandhills.

Locus 3 Block 12 Area 1

Locus 3 of the Three Springs site (Figure 1.7) was identified during the 2002-2004 testing project as the location of deep, stratified soils, a concentration of Middle Archaic point types, and isolated concentrations of lithic debitage. Within this locus, three discrete blocks of micro-interval shovel test pits were excavated. Block 12 is the only block to be discussed herein because it was the only one to produce occupation clusters associated with the Middle Archaic Morrow Mountain cultural horizon. Block 12 is situated near the center of Locus 3 on a gentle ridge slope overlooking two small springheads and an intermittent drainage to the north (Figures 1.7 and 5.2).

This block contained 260 1-m interval shovel test pits that were excavated in 10-cm levels. Analysis of the artifacts recovered from the micro-interval shovel tests highlighted two areas (Areas 1 and 2) with very dense lithic concentrations. Area 1 was identified in the southwestern part of this block and Area 2 to the east. Within these two areas, seven 2 m x 2 m units were excavated: four of the units were excavated in Area 1 and three excavation units were placed in Area 2. Analysis of the artifacts from Area 2

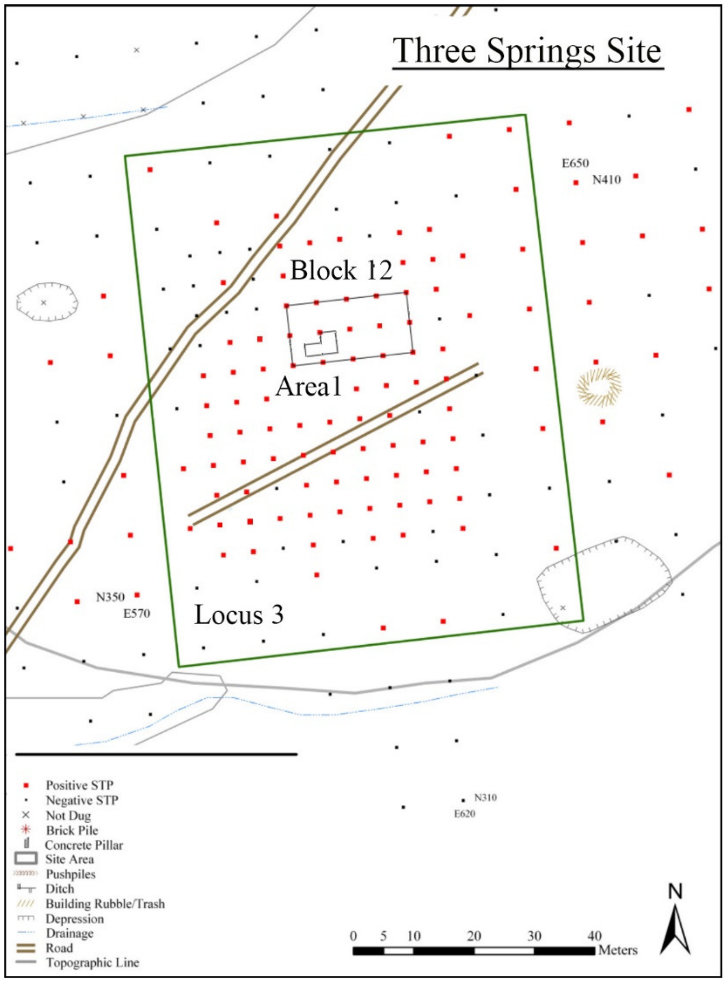

Figure 5.2. Locus 3 Block 12 Area 1 (Dawson et al. 2013).

strongly suggests that this part of the block has been heavily disturbed by tree roots (Dawson et al. 2013); as such, it will not be discussed any further. Area 1, however, appears stratigraphically intact as shown by the vertical distribution of artifacts and the optically stimulated luminescence (OSL) dates and the geomorphological analysis of this area's soils.

Locus 3 Block 12 Area 1 (henceforth called Area 1) covers 21 m² in the southwestern corner of Block 12 of the Three Springs site. Within this area, 21 1-m interval shovel test pits were excavated. Following the excavation of the micro-interval shovel test pits, three 2 m x 2 m excavation units, TU4-N386E603, TU6-N386E605, and TU8-N388E605, were placed in Area 1. These units—the shovel test pits and the 2 m x 2 m units—were excavated in a portion of the site untouched by previous excavations due to the testing interval of the earlier work at the site. The artifacts from Area 1 will be briefly summarized here.

A total of 1,052 artifacts were recovered from the micro-interval shovel test pits excavated within Area 1. Of the eleven lithic raw material types identified, milky quartz and Piedmont silicate are the most common (Table 5.1). The bulk of the lithic artifacts were classed as debitage. Two orthoquartzite biface fragments (which mended together), one milky quartz blank fragment, one non-diagnostic milky quartz biface fragment, one milky quartz core fragment, and one Piedmont silicate flake tool fragment were identified in the assemblage (Dawson et al. 2013).

The lithic assemblage for TU4-N386E603 numbers 18,772. Seventy-seven percent of the assemblage was classed as smoky quartz (n=14,390) although twenty-two raw material types were identified (Table 5.1). Two diagnostic artifacts—a Coastal Plain chert Morrow Mountain point (Cat. 4773.2) and a reworked, Coastal Plain chert Early Archaic Side Notched point (Cat. 4772.3)—were recovered from this excavation unit (Table 5.2; Figure 5.3). The Morrow Mountain point was recovered from level 8 (50-55 cmbs) and the Early Archaic point was recovered from level 10 (60-65 cmbs). OSL dates for 50 cmbs were calculated at 6.78±0.80 ka (6,780 ya +/- 800 years) and 6.99±0.78 ka (6,990 ya +/- 780 years) for the sample taken at 60 cmbs. Like the shovel test pits, the bulk of the lithic artifact assemblage consisted of debitage. However, twenty flake tools,

Table 5.1. Lithic Raw Materials.

Raw Material Type	Shovel Test Pits (n=21)	TU4 N386E603	TU6 N386E605	TU8 N388E605
Argillite		1		1
Chert, Black Mingo	1	2	3	100
Chert, Coastal Plain	4	11	80	15
Chert, Ridge and Valley		2	4	1
Diabase		2		
Grainstone	7			2
Hematite			1	
Metavolcanic		2	38	11
Orthoquartzite	2	3	4	
Piedmont silicate	200	227	610	3,437
Quartz, citrine		2	6	1
Quartz, clear		563	1,182	109
Quartz, milky	800	2,102	2,498	2,285
Quartz, rose	4	21	18	89
Quartz, smoky	4	14,390	133	
Quartz, undetermined	18	1,300	118	
Quartz, vein		3	8	
Quartzite		12	8	6
Rhyolite	7	7	15	13
Rhyolite, flow-banded			15	10
Sandstone		120	73	
Schist		1		60
Sheared phyllite				1
Siltstone	1			
Vitric Tuff				8
Unidentified	4	1	6	
TOTAL	1,052	18,772	4,820	6,149

Table 5.2. Diagnostic Bifaces.

Unit	Depth (cmbs)	Material	Biface Type	Length (mm)	Width (mm)	Thickness (mm)
TU4-N386E603	50-55	Coastal Plain chert	Morrow Mountain	40.17	29.39	8.74
TU4-N386E603	60-65	Coastal Plain chert	EA[a] Side-Notched	39.24	27.74	10.27
TU8-N388E605	40-45	Quartz	Morrow Mountain	31.88	35.84	8.64

[a]Early Archaic.

Figure 5.3. Diagnostic Bifaces from TU4-N386E603.

six cores/core fragments, and thirty-five non-diagnostic biface fragments were also identified in the lithic assemblage (Dawson et al. 2013).

Altogether 4,820 lithic artifacts were recovered from TU6-N386E605. Over eighteen raw material types were recovered (Table 5.1). This increased variety includes the recovery of flow-banded rhyolite, hematite, and Ridge and Valley chert. No diagnostic lithic artifacts were recovered from TU6-N386E605. Debitage again accounted for the vast majority of the lithic assemblage. In addition to the debitage, five non-diagnostic bifaces, thirteen biface fragments, seventeen cores/core fragments, and forty-three flake tools were recovered (Dawson et al. 2013).

Lithic artifacts for TU8-N388E605 numbered 6,149. Unlike the other excavation units in Area 1, the most common lithic raw material type from this unit is Piedmont silicate (56%) (Table 5.1). Diversity among the lithic raw materials of TU8-N388E605 is also high. Sheared phyllite, vitric tuff, and an uncommonly large number of Black Mingo chert were recovered. The proximal end of a quartz Morrow Mountain point, Cat.

Figure 5.4. Diagnostic Biface from TU8-N388E605.

5794.1, was recovered from level 7 (40-45 cmbs) (Table 5.3; Figure 5.4). Like the other units in Area 1, the bulk of the lithic artifacts in TU8-N388E605 is debitage. Five non-diagnostic biface fragments and two expedient tools were also identified in this assemblage (Dawson et al. 2013).

Site Structure

Understanding site structure at Area 1 of the Three Springs site required geomorphological analysis of the on-site soils, optically stimulated luminescence (OSL) dating of the soils, and an examination of the vertical distribution of artifacts recovered from the archaeological excavations. Site structure refers to both how the site was formed and how, if present, post-depositional factors impacted the site. In order to understand how the site formed, it is necessary to determine how the soils were deposited over the archaeological components. The geomorphological analysis of the site's soils provided information on the depositional processes and the post-depositional processes (e.g., bioturbation, erosion) responsible for moving the sediments. The use of OSL to date the soils from Area 1 provided a time frame for when the soils were deposited at this location. Taken together, these analyses strongly suggest that the soils and, by extension, the archaeological components, are stratigraphically intact with limited post-depositional disturbance. Post-depositional disturbance processes were noted in the upper 30 cm of the soil column, with minimal impact to the soils below approximately 30 cmbs, which includes the soils containing the Middle Archaic occupation clusters at 40-50 cmbs.

The archaeological components strongly correlate to the Middle Archaic as shown through the vertical distribution of artifacts and the recovery of two Morrow Mountain points. A very small Early Archaic component of Coastal Plain chert was also identified below the dense Middle Archaic occupation at circa 60 cmbs. Since the focus of this dissertation is the Middle Archaic, the Early Archaic occupation will not be discussed herein. Area 1 was the only location identified at this very large multi-component archaeological site with a clear-cut, undisturbed Middle Archaic horizon.

Geomorphological Analysis

Soil samples were collected by Drs. Andrew Ivester, Mark Brooks, and Christopher R. Moore from Area 1 (specifically the southwestern corner of TU4-N386E603) for both geomorphological and OSL dating analysis (Figure 5.5). The soil samples were collected from a continuous column in 2.5-cm increments. A suite of analytical procedures including granulometry, loss on ignition analysis, geochemical soil analysis, and an examination of biogenic silica were performed on soil samples. The goal of the geomorphological work in Area 1 was to understand how the sediments were deposited at this location and to determine the degree to which the sediments have shifted through time.

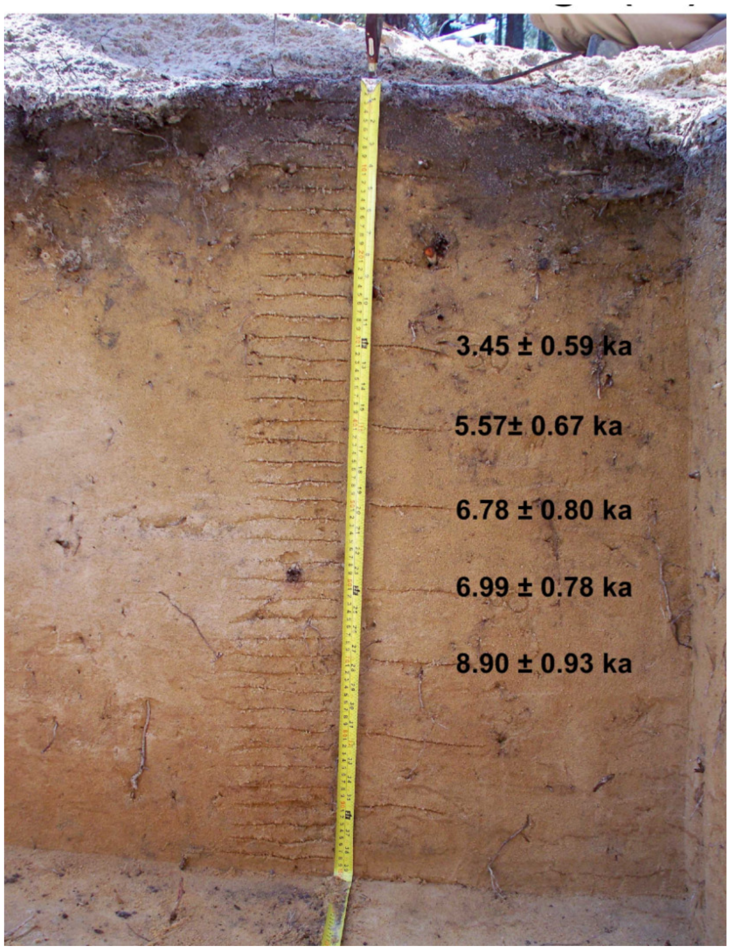

Figure 5.5. Soil Profile with OSL Dates, TU4-N386E603. Photo courtesy of Dr. Christopher R. Moore.

Sediment is deposited via two main mechanisms: wind and water. Wind-blown sedimentation, or eolian deposition, means that artifacts experience little, if any, movement as they become buried by sediment. When sediments are deposited via slope wash or erosion, then a high likelihood exists that the water moving the sediment to this area would also move artifacts.

Analysis of the samples was conducted by Dr. Andrew Ivester of the University of West Georgia and Profile Science, LLC. The results of these analyses suggested that site formation processes for Area 1 favor eolian deposition instead of slope wash (Ivester et al. 2011:10). Thus, it is assumed that the artifacts have moved very little since their deposition at this location. In addition, the analysis concluded that the soils below 30 cmbs and, thus, the Middle Archaic cultural horizon, were minimally impacted by bioturbation.

Optically Stimulated Luminescence

OSL was also conducted on soil samples from Area 1. This dating method measures the amount of light emitted from quartz sand grains. The amount of light can be used to determine how long the quartz grains have been buried and not exposed to sunlight. Five soil samples were collected from the south wall of TU4-N386E603 at the depths of 30 cmbs, 40 cmbs, 50 cmbs, 60 cmbs, and 70 cmbs (Figure 5.5). Analysis was conducted by Dr. Tammy Rittenour of the Luminescence Laboratory at Utah State University. Samples were prepared for analysis by the author. The samples were analyzed using a single-aliquot regenerative-dose procedure on single grains of quartz sand following that of Murray and Wintle (2000).

Using the Central Age Model, the OSL results support the geomorphological conclusion that the soils in Area 1 are stratigraphically intact with the oldest dates provided by the deepest soil samples and the more recent dates corresponding to soils higher in the profile (Table 5.3). In addition, the OSL results support the geomorphological conclusion that bioturbation in this area was minimal, with the highest amounts of bioturbation present in the upper 30 cm of the soil column. Dates for the soils that contain the Middle Archaic cultural horizon were calculated at 6,780 kya +/- 800 years (Rittenour 2013).

Table 5.3. OSL Age Information.

Depth (cmbs)	Utah State University Sample Number	OSL Age (ka) CAM
30	USU-934	3.45 ± 0.59
40	USU-935	5.57 ± 0.67
50	USU-936	6.78 ± 0.80
60	USU-937	6.99 ± 0.78
70	USU-938	8.90 ± 0.93

Vertical Distribution of Artifacts

The artifacts from the excavation units in Area 1 were examined in terms of their vertical distribution. Understanding the vertical distribution of artifacts relies on previous work in the South Carolina Coastal Plain and on Fort Jackson. Michie (1990) examined a large sample of sites from the South Carolina Coastal Plain and noted that Archaic and PaleoIndian components were consistently recovered between 30 and 70 cmbs. More specifically, Michie (1990) postulated that Late Archaic components were situated between 28 and 35 cmbs, Middle Archaic components were found between 35 and 55 cmbs, Early Archaic components were stratigraphically recovered between 50 and 60 cmbs, and the PaleoIndian artifacts were recovered at a depth deeper than 60 cmbs. Cable and Cantley (2006) add that although these depths vary depending on the depositional environment, the relative vertical sequence is accurate. Cable and Cantley (2006:38) expanded Michie's (1990) sequence to note that Mississippian and Woodland components typically are confined to the upper 30 cm of a site.

When this relative vertical sequence is used in conjunction with the research conducted at site 38RD628 in the northeastern part of Fort Jackson (Clement et al. 2005) and the OSL data collected from Area 1, a general depth for the Middle Archaic occupations of Area 1 can be hypothesized. Clement et al.'s (2005) data recovery project at site 38RD628 showed that levels with the greatest number of artifacts are suggestive of a buried stable ground surface—the original ground surface on which the artifacts were deposited. Post-depositional processes in sand, however, will move artifacts both above and below this original surface and result in a vertical battleship-shaped distribution (Brooks et al. 1998; Clement et al. 2005:65-66). All three of the occupation clusters in Area 1 produced battleship-shaped vertical artifact distributions. The peaks of these distributions were 45-50 cmbs for quartz and 40-50 cmbs for both Piedmont silicate and Black Mingo chert (Figure 5.6). The OSL dates support the hypothesis that the artifact distributions are intact because the soils in this part of the site are stratigraphically and chronologically in order.

Site Function during the Middle Archaic

The function of the occupation clusters identified in Area 1 was examined using the artifacts—lithic tools and debitage—recovered during the archaeological excavations. Lithic analysis was undertaken to more fully understand the types of lithic reduction occurring at the Middle Archaic period occupation clusters. The type of lithic reduction will help to address questions concerning Middle Archaic behavior and economy—site function—in the South Carolina Sandhills via the organization of technology concept. Determining the lithic reduction strategy from lithic debitage can be accomplished in a variety of ways depending on the type of raw material, the degree to which the archaeological assemblage is created through a mixture of lithic reduction strategies, and the methods employed in the debitage analysis (Table 5.4). As presented in the previous chapter, the lithic debitage from the Three Springs site was analyzed using both aggregate flake analysis (mass analysis) and individual flake attribute analysis.

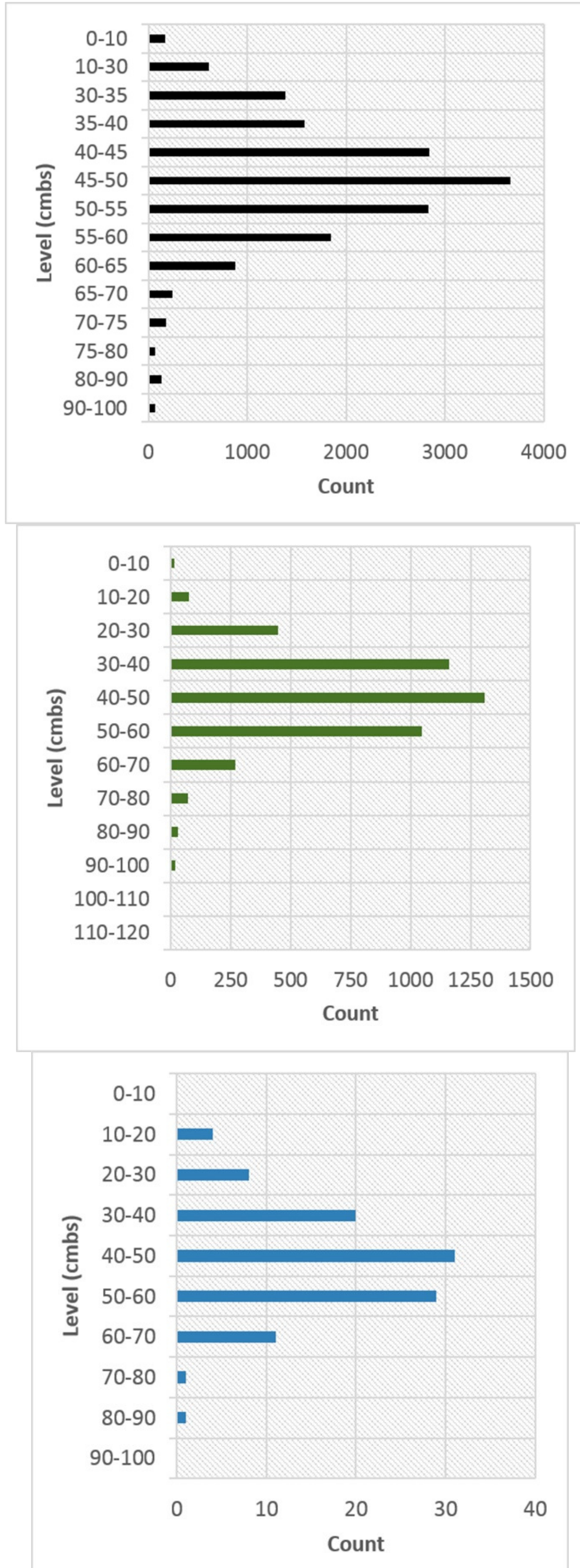

Figure 5.6. Vertical Distributions of quartz (top), Piedmont silicate (center), and Black Mingo chert (bottom), Area 1.

Aggregate flake analysis of debitage determines the lithic reduction strategy through a comparison of the size grade data of the archaeologically recovered debitage to experimentally replicated data. Four size grades were used in the following analyses: Group 1 (≥ 1 in or 25.4 mm), Group 2 (≥ 1/2 in or 12.7 mm), Group 3 (≥ 1/4 in or 6.4 mm), and Group 4 (≥ 1/8 in or 3.2 mm). For the remainder of the discussion, size grades will be referred to by group and number. Statistical analysis is then employed to determine whether the archaeologically recovered debitage significantly correlates to the debitage produced during control flintknapping experiments on similar raw materials (Ahler 1989; Bradbury and Carr 2004, 2009). The problems with solely applying Ahler's (1989) mass analysis to the quartz, Piedmont silicate, and Black Mingo chert debitage from the Three Springs site include a lack of comparative, experimental data for two of the three lithic raw materials and the possibility of having an assemblage created through a combination of lithic reduction strategies. One published replication experiment using quartz has been identified (Potts 2012), which will be discussed below; however, no experimental studies exist for Piedmont silicate or Black Mingo chert.

Combining the mass analysis data with the individual flake attribute data collected from the debitage at the Three Springs site allows for the sample to be analyzed using Bradbury and Carr's (2004) aggregate trend analysis. Aggregate trend analysis does not rely solely on experimentally replicated data derived from a similar raw material and has been shown to be applicable to mixed lithic assemblages (Bradbury and Carr 2004). However, given that the regression formulae were created using the data from experiments with Fort Payne chert, variation in the fracturing mechanics of the different types of lithic raw materials recovered from Area 1 will affect the results of the aggregate

Table 5.4. Lithic Reduction Criteria.

Reduction Strategy	Mass Analysis[a]	Aggregate Trend Analysis[b]	Individual Attribute Analysis (Platform Condition)[c]	Artifact Assemblage
Freehand Core Reduction	Low counts and high weights for the 1/4-in size grade; cortex might be present.	High percentages of blocky debris; little, if any, platform-bearing debitage with 2+ facets; high weights for the 1/4-in size grade.	Simple or cortical platforms.	Identification of cores, core fragments, and/or flake tools.
Bipolar Core Reduction	Same as Freehand Core Reduction: low counts and high weights for the 1/4-in size grade; cortex might be present. Confirmed by the presence of bipolar flakes, bipolar shatter, and/or *pièces esquillées* in artifact assemblage.	The same as Freehand Core Reduction: high percentages of blocky debris; little, if any, platform-bearing debitage with 2+ facets; high weights for the 1/4-in size grade. Confirmed by the identification of bipolar flakes, bipolar shatter, and/or *pièces esquillées* in the artifact assemblage.	Collapsed Platforms.	Identification of bipolar flakes, bipolar shatter, and/or *pièces esquillées*.
Tool Reduction	High counts and low weights for the 1/4-in size grade; no cortex.	Very little, if any, blocky debris; 8-15% of debitage should have 2+ platform facets; low average weight per 1/4-in flake; high percentage of the flakes in 1/4-in size grade.	Abraded and complex platforms; collapsed platforms on debitage from 1/4-in and 1/8-in size grades.	Identification of flake tools.
Bifacial Reduction	Similar to Tool Reduction: high counts and low weights for the 1/4-in size grade; no cortex. Confirmed by the recovery of bifaces and biface fragments.	Very little, if any, blocky debris; high percentage of platform-bearing debitage with 2+ facets; low average weights per 1/4-in flakes and very high percentage of flakes in 1/4-in size grade.	Abraded and complex platforms; collapsed platforms on debitage from 1/4-in and 1/8-in size grades.	Identification of bifacial cores, bifacial thinning flakes, complete bifaces, and biface fragments.

[a] Ahler 1989.
[b] Bradbury and Carr 2004.
[c] Andrefsky 1998; Magne 1985.

trend analysis (Bradbury, personal communication 2016). Nevertheless, the trends noted through Bradbury and Carr's (2004) research should remain applicable to a variety of raw material types such as quartz, Piedmont silicate, and Black Mingo chert. Specific aspects (i.e., weight and count data for the 1/4-in size grade) from the mass analysis coupled with data concerning the percent of platform-bearing debitage with 2+ platform facets and the percent of blocky debris were used to determine the lithic reduction strategy through an examination of trends. For the analysis herein, platform-bearing debitage with 2+ platform facets was correlated to the 'complex' platforms collected from the Three Springs site data. Blocky debris calculations used the information from the debitage identified as shatter among the Three Springs site dataset.

Individual attribute data were recorded from the platform-bearing debitage collected from the three occupation clusters in Area 1. The attributes analyzed were presence/absence of cortex, platform condition, dorsal flake scar count, and technology type, when evident. Platform condition and technology type are the most informative in terms of determining the lithic reduction strategy. However, the assignment of a flake to a specific type of technology is a rather subjective form of analysis. Therefore, only platform condition will be discussed below.

Prior to presenting the data, some correlates need to be presented in order to relate this analysis back to the main point of this dissertation. An understanding of high residential mobility is accessible through the identification of the specific lithic reduction strategies occurring at a site. From Andrefsky (1994) we can assume that highly mobile foraging groups will use an expedient tool technology in areas where lithic raw material is abundant, regardless of the quality of this material (like in the South Carolina

Sandhills). Relating an expedient tool technology back to lithic artifacts, we can assume that an expedient tool technology would not be focused on the production of bifaces. Instead, an expedient tool technology would rely on utilized flakes, retouched flakes, and amorphous and bipolar cores (Casey 2000; Cobb and Webb 1994; Johnson 1987). However, in areas where high-quality lithic raw materials are scarce or located at a great distance, then formal tools made of this high quality material may be common among sites associated with high residential mobility (Andrefsky 1994:31).

The lithic artifacts from the Three Springs site are examined to determine if the archaeological remains at this site were deposited by highly mobile foraging groups. Mass analysis, aggregate trend analysis, and flake platform condition should show that the local quartz debitage resulted from core reduction, tool reduction, and/or bipolar reduction with little, if any, bifacial reduction. Piedmont silicate and Black Mingo chert, which are higher quality lithic raw materials available some distance from the site, would show signs of bifacial reduction as tool maintenance was performed. Thus, the reduction strategies used should be reflected in the size and weight distributions of the debitage, the amount of shatter versus platform-bearing debitage with 2+ facets, and platform condition (Table 5.4).

Despite the lack of visible, preserved soil stains or stable surfaces, Cable and Cantley (2006:44) successfully identified individual occupation clusters in the Sandhills Province of North and South Carolina from micro-interval shovel testing based on “raw material distributions, the identification of tool clusters, and the occasional diagnostic artifacts.” The distribution of raw materials in Area 1 suggest three separate occupation clusters based on raw material type: quartz, Piedmont silicate, and Black Mingo chert. Due to inconsistencies in the classification of milky and smoky quartz, quartz counts are merged under the name of 'quartz' for the remainder of the discussion. Using the vertical distribution of artifacts, as well as geomorphological analysis and OSL dating of the soils, the occupation clusters presented below were correlated to the Middle Archaic period. Based on the recovery of two Morrow Mountain points, the clusters specifically date to the Morrow Mountain cultural horizon.

In the following section, I present a discussion of the lithic analyses conducted on the debitage from the three occupation clusters identified in Area 1. The discussion of each occupation cluster begins with an overview of the artifacts recovered and the horizontal distribution of these artifacts. Analyses begin with mass analysis, followed by aggregate trend analysis, and individual attribute analysis (specifically, platform condition). The results of analysis and how these results correlate to a specific lithic reduction method will be presented in Chapter Six.

Occupation Cluster 1: Quartz

The highest concentrations of quartz were recovered from the micro-interval shovel test pits at N387E604 and N387E605 (Figure 5.7). TU4-N386E603 was placed directly on top of the densest quartz concentration; TU6-N386E605 and TU8-N388E605 skirt the eastern and northeastern edges, respectively, of the quartz occupation cluster identified by the micro-interval shovel testing. Plotting the vertical distribution of quartz artifacts in TU4-N386E603 reveals a battleship-shaped curve that peaks at 45-50 cmbs (Figure 5.6). In order to incorporate data from the micro-interval shovel test pits, which were excavated in 10-cm arbitrary levels, for the remainder of this discussion I define the

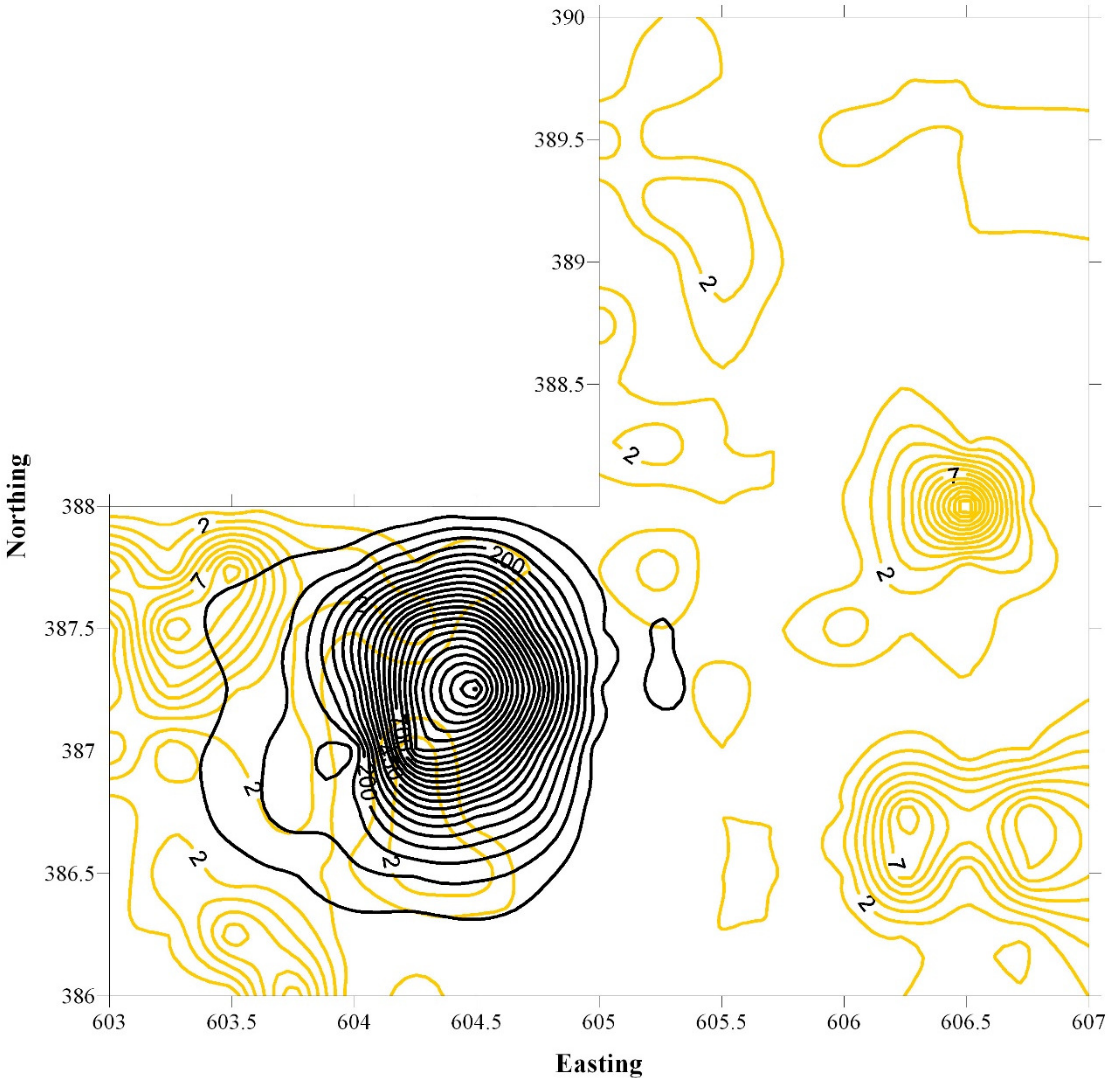

Figure 5.7. Quartz Occupation Cluster (black contour lines) and Fire-Cracked Rock and Sandstone Concentrations (yellow contours), Area 1.

quartz occupation cluster to include the quartz artifacts found between 40 and 60 cmbs. The examination of artifacts from this depth range provides a buffer to collect data concerning the artifacts that might have moved vertically in the soils due to gravity and other post-depositional processes.

When quartz artifacts, fire-cracked rock and sandstone, and lithic tools found between 40 and 60 cmbs are plotted horizontally using Surfer 8 software, a single occupation cluster is evident (Figure 5.8). The quartz occupation cluster most closely corresponds to the Type 1 occupations identified by Cable and Cantley (2006:46), which consist of dense debitage concentrations of a single lithic raw material. For this occupation type, Cable and Cantley (2006:46) postulate that the debitage was produced through the reduction of unmodified cores or biface cores. Tool clusters of the same raw material and rejected tools are often associated with Type 1 clusters. Cable and Cantley (2006:46) conclude that Type 1 occupation clusters represent a "forager household or small multi-household residence occurring either in isolation or within a larger aggregation of households."

The main lithic reduction location (i.e., the densest concentration of artifacts) is centered at approximately N387.25E604.5 (Figure 5.8). A quartz Morrow Mountain point was recovered from 40-45 cmbs of TU8-N388E605, northeast of the densest part of the debitage and tool concentration. A second Morrow Mountain point, made of Coastal Plain chert, was recovered to the southwest of the quartz occupation cluster between 50 and 55 cmbs. It should be noted that only four other Coastal Plain chert artifacts were recovered from between 40 and 60 cmbs of TU4-N386E603—all debitage—and a very small, utilized flake fragment and 17 pieces of Coastal Plain chert debitage were recovered from between 40 and 60 cmbs of TU6-N386E605. Additional tools include non-diagnostic bifaces (n=1) and biface fragments (n=39) of quartz (n=36), Piedmont silicate (n=3), and an unidentified metavolcanic material (n=1); flake tools and flake tool fragments (n=28) of quartz (n=23), Piedmont silicate (n=4) and Coastal Plain chert (n=1; mentioned above); blade-like flake tools (n=4) made of crystal quartz (n=1), flow-banded rhyolite (n=1), and Piedmont silicate (n=2); and one piece of quartz utilized shatter.

These tools were recovered throughout Area 1 between 40 and 60 cmbs. The flake tools and flake tool fragments form a circular pattern around the debitage concentration and the small void to the southwest. All of the flake tools/tool fragments were recovered from the two southern units—TU4-N386E603 and TU6-N386E605 (Figure 5.8). Thirteen

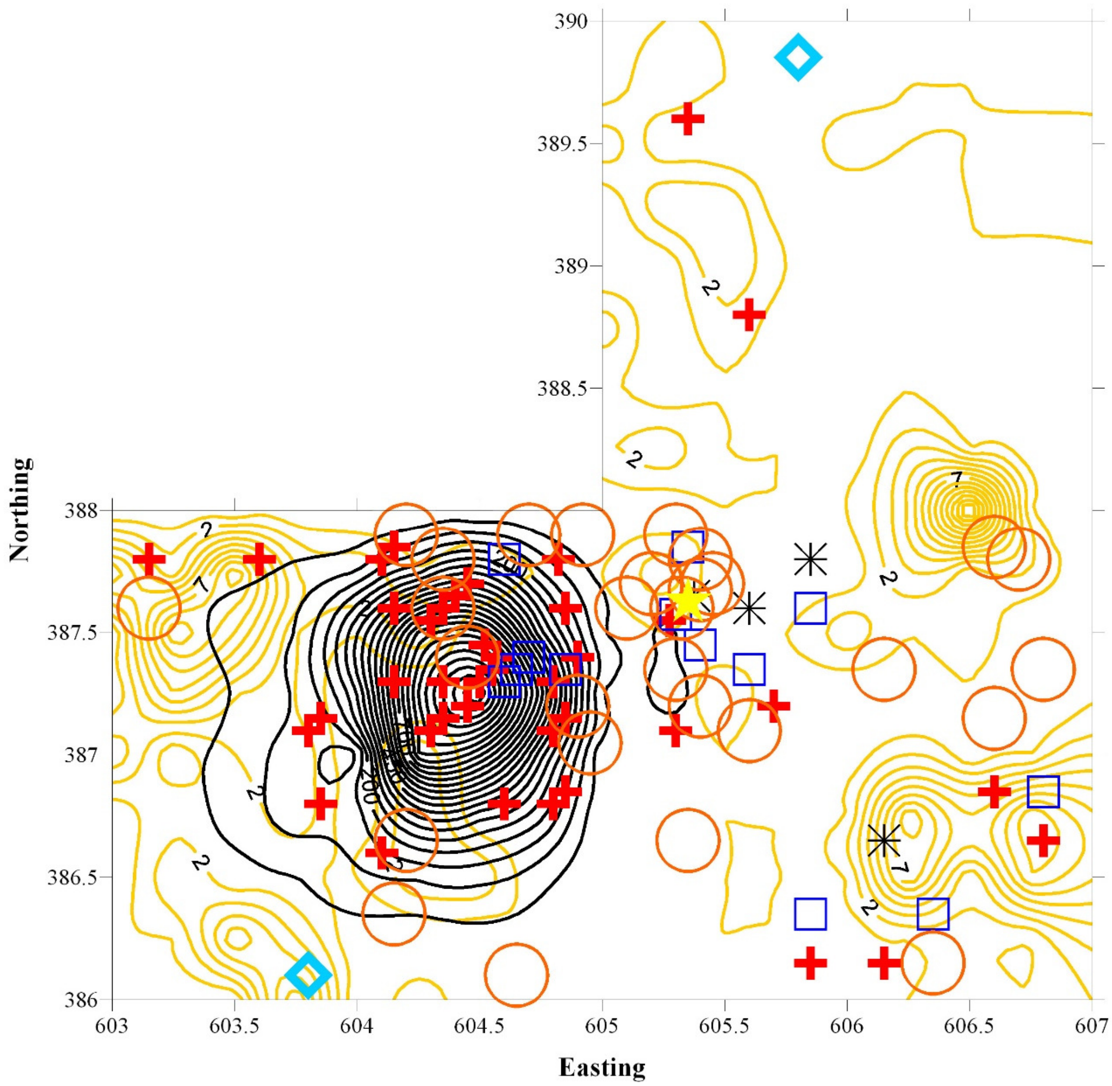

Figure 5.8. Quartz Occupation Cluster (black contours), Sandstone and Fire-Cracked Rock concentrations (yellow contours), Morrow Mountain Point and Point Fragment (blue diamond), Non-diagnostic Bifaces/Biface Fragments (red cross), Flake Tools (orange circles), Utilized Shatter (yellow star), Blade-like Flake Tools (black *), and Cores/Core Fragments (blue square), Area 1.

quartz cores and core fragments complete the artifact assemblage from between 40 and 60 cmbs. Core/core fragments were identified as unpatterned (n=5), multidirectional (n=7), and one possible unidirectional/blade core.

The variety and density of tools in this quartz occupation cluster suggest that a variety of activities were occurring at this location, and further support the idea that this occupation cluster correlates to Cable and Cantley's (2006) Type 1 occupation. A concentration of fire-cracked rock and sandstone—a possible hearth—was identified to the southwest of the densest part of the quartz occupation cluster. A possible second hearth feature to the southeast could also be associated with this occupation cluster.

Mass Analysis. Potts' (2012) flintknapping experiments with low-quality quartz from central Alabama provide comparative mass analysis data for four reduction strategies: bipolar reduction, freehand core reduction, soft-hammer uniface reduction, and soft-hammer biface reduction. Aggregate data from the quartz occupation cluster recovered from between 40 and 60 cmbs was compared to the data generated through Potts' (2012) experiments (Table 5.5). Cortical data was either not recorded or no cortex was present among the debitage recovered from the quartz occupation cluster. Instead, the percent of cortical material per size grade was calculated using data from the platform-bearing debitage for the quartz occupation cluster. The lack of direct cortical data from this site is not a problem, given that Potts (2012) found that the percent of cortex does not weigh heavily in the interpretation of the data. In fact, the main differences between reduction strategies relies on mean flake weight and the percent of weight per size grade.

Table 5.5. Quartz Debitage Mass Analysis Comparison.

Size Grade[a]	N=	Weight (g)	% Count	% Weight	% Cortical	Mean Weight (g)
Bipolar[b]						
G1	2	49.0	1.0	36.9	100.0	24.50
G2	7	38.6	3.6	29.0	57.1	5.51
G3	33	32.5	16.9	24.5	60.6	0.98
G4	153	12.7	78.5	9.6	29.4	0.08
Freehand Core[b]						
G1	4	124.5	0.7	24.4	75.0	31.12
G2	35	245.0	5.7	48.0	65.7	7.00
G3	116	100.2	18.9	19.6	42.2	0.86
G4	457	40.7	74.7	8.0	15.0	0.08
Soft-Hammer Uniface[b]						
G1	0	0.0	0.0	0.0	0.0	0.00
G2	2	29.4	10.0	94.2	50.0	14.70
G3	1	0.4	5.0	1.3	0.0	0.40
G4	17	1.4	85.0	4.5	17.6	0.08
Soft-Hammer Biface[b]						
G1	0	0.0	0.0	0.0	0.0	0.00
G2	2	4.0	2.0	23.8	100.0	2.00
G3	16	6.5	16.2	38.7	31.2	0.40
G4	81	6.3	81.8	37.5	6.1	0.07
Three Springs Quartz, Area 1[c]						
G1	12	269.9	0.001	5.9	30.0	22.50
G2	447	2,237.5	3.9	48.7	25.8	5.00
G3	1,874	1,432.6	16.4	31.2	10.3	0.76
G4	9,090	658.5	79.6	14.3	20.0	0.07

Note: Data from Area 1 at the Three Springs site compared to data from experiments conducted by Potts (2012) with quartz.
[a]G1 (≥1 in or 25.4 mm), G2 (≥1/2 in or 12.7 mm), G3 (≥1/4 in or 6.4 mm), G4 (≥1/8 in or 3.2 mm).
[b]Potts (2012) experimental results.
[c]Summary of Quartz debitage in Area 1 of the Three Springs site. Percent cortical data for Three Springs Quartz, Area 1, taken from platform-bearing debitage (n=1,068).

The latter was shown to provide significant separation between core (bipolar and freehand) and tool (uniface and biface) reduction strategies (Potts 2012:121-122).

Comparing the data from the quartz occupation cluster to Potts' (2012) data reveals a mean weight distribution per size grade similar to that created through bipolar reduction, even though the mean weight (0.76 g) of the Group 3 size grade is close to that produced through freehand core reduction (Potts 2012:119). In terms of percent of weight per size grade, the data from the quartz occupation cluster is fairly evenly distributed between the Group 2 and Group 3 size grades like that noted for the quartz bipolar reduction experiments by Potts (2012:120). Both measurements suggest that the main activity used to create the debitage in the quartz occupation cluster of Area 1 was bipolar core reduction.

Aggregate Trend Analysis. The quartz debitage was also examined using Bradbury and Carr's (2004) aggregate trend analysis (Table 5.6). Prior to this analysis, the 9,090 pieces of debitage in the Group 4 size grade were omitted in order to match Bradbury and Carr's (2004) analysis, which does not use data from debitage less than 1/4-in in size. Removal of the Group 4 debitage brings the total number of quartz debitage included in the aggregate trend analysis to 2,333. The current analysis employs the size and weight

Table 5.6. Quartz Debitage Aggregate Trend Analysis Comparison.

Reduction Group	% Blocky Flakes	% with 2+ Facets	Avg Weight 1/4-in Flakes	% Count 1/4-in Flakes
Core[a]	15.2	0.9	0.94	60.1
Bipolar[a]	17.4	0.0	0.76	84.6
Biface Edge[a]	1.4	12.1	0.56	83.2
Biface Thin[a]	0.1	26.0	0.35	95.2
Final Biface[a]	0.0	75.0	0.35	100.0
Uniface[a]	0.0	8.3	0.37	97.9
Three Springs Quartz[b] (n=2,333)	6.9	11.1	0.76	80.3

Note: Data from Area 1 at the Three Springs site compared to data from experiments conducted on Fort Payne chert by Bradbury and Carr (2004).
[a]Bradbury and Carr (2004) experimental results.
[b]Data from Area 1 of the Three Springs site.

data for the Group 3 size grade, count and weight of the platform-bearing debitage with 2+ platform facets, and the count and weight of blocky debris for the assemblage. The analysis of the artifacts from the Three Springs site did not specifically identify blocky debris. Instead, the analysis recorded shatter and medial flake fragments—many of which would have been classed as blocky debris. Thus, it should be noted that the percent of 'blocky debris' in the quartz occupation cluster is probably higher than recorded here.

Data from the quartz occupation cluster in Area 1 of the Three Springs site was compared to the general trends calculated from experimental data for core reduction, bipolar reduction, biface edging, biface thinning, final biface, and uniface reduction (Bradbury and Carr 2004:76). The comparison indicates the quartz debitage was created through a mixture of lithic reduction strategies (Table 5.6). The percentage of blocky debris and the average weight of the 1/4-in flakes are indicative of core reduction: the percent of blocky debris is closest to the percent produced from freehand core reduction, whereas the average weight of 1/4-in flakes is equal to that generated through bipolar reduction. However, the high percentage (11.1%) of platform-bearing debitage with 2+ facets suggests that more than just core reduction is occurring. If this assemblage had been created completely through core reduction (either freehand or bipolar), then the percentage of debitage with 2+ facets should have been closer to 0%. Instead, the percent of platform-bearing debitage with 2+ facets in the quartz debitage is closest to that produced by biface edge reduction. Taken together, these data suggest that both core reduction and bifacial edge reduction were occurring at this location.

Bradbury and Carr (2004) derived regression formulae for each attribute using data from their experiments with Fort Payne chert. The regression formula determines the percentage of the assemblage produced through biface reduction using the percentage of blocky debris, percentage of platform-bearing debitage with 2+ facets, average weight of 1/4-in flakes, and percentage by count of 1/4-in flakes (Table 5.7). The results of the regression analysis suggest that both core reduction and biface reduction were used to create the quartz assemblage. Furthermore, the percentages of blocky debris and of platform-bearing debitage with 2+ facets suggest that core and biface reduction were occurring in equal proportion.

Table 5.7. Regression Formula[a] Results for All Raw Materials.

	Blocky Debris	**2+ Facets**	**Average Weight 1/4-in Flakes**	**Count 1/4-in Flakes**
Area 1 Occupations Clusters	=1.064-(7.052 x X)	=(6.359 x X)-0.177	=1.987-(2.258 x X)	=(3.757 x X)-2.31
Quartz	58.0	52.9	27.1	70.7
Piedmont silicate	36.6	35.3	94.8	82.1
Black Mingo chert	35.6	45.9	135.5	91.0

[a]Bradbury and Carr (2004).

However, these are two of the most questionable attribute categories for the quartz dataset: blocky debris is problematic because some of these artifacts could have been misclassified as medial flake fragments, and platform facet counts for quartz debitage are questionable because of the inherent difficulty of counting platform facets on quartz artifacts (Potts 2012). The results of the regression analysis using the average weight of the 1/4-in flakes and the percent count of this size grade suggest completely opposite scenarios. Based on the average weight, a small portion of the quartz assemblage was created through bifacial reduction (27.1%), while the count of 1/4-in flakes suggests that a much larger portion (70.7%) was created through a bifacial lithic reduction strategy.

Individual Attribute Analysis. Platform condition was recorded for 1,135 complete flakes and proximal flake fragments made of quartz. However, determining platform condition for quartz debitage is difficult due to the nature of the material (Potts 2012); thus, the following results are questionable. The bulk of the platforms were identified as abraded (Table 5.8). Between 24-31% of the platforms were classed as simple or complex, and 3% or less were cortical or collapsed. The high number of abraded and complex platforms among the quartz assemblage suggest that late-stage bifacial reduction activities were occurring in Area 1. The high number of simple platforms furthermore suggests that early-stage lithic reduction activities were also occurring to a lesser extent. The small number of collapsed platforms provides minimal evidence for bipolar reduction.

Table 5.8. Quartz Debitage Platform Conditions.

Platform Type	Count	Percent
Abraded	444	39.1
Collapsed/Crushed	26	2.3
Complex	277	24.4
Cortical	38	3.3
Simple	350	30.8
TOTAL	1,135	100.0

Occupation Cluster 2: Piedmont Silicate

The Piedmont silicate occupation cluster is located to the northeast of the quartz occupation cluster (Figure 5.9). A large concentration of Piedmont silicate debitage was recovered from Area 1, and tools associated with this occupation cluster and made of the same raw material include a non-diagnostic biface fragment and two utilized flakes from TU8-N388E605. In addition, four more non-diagnostic biface fragments, two blade-like

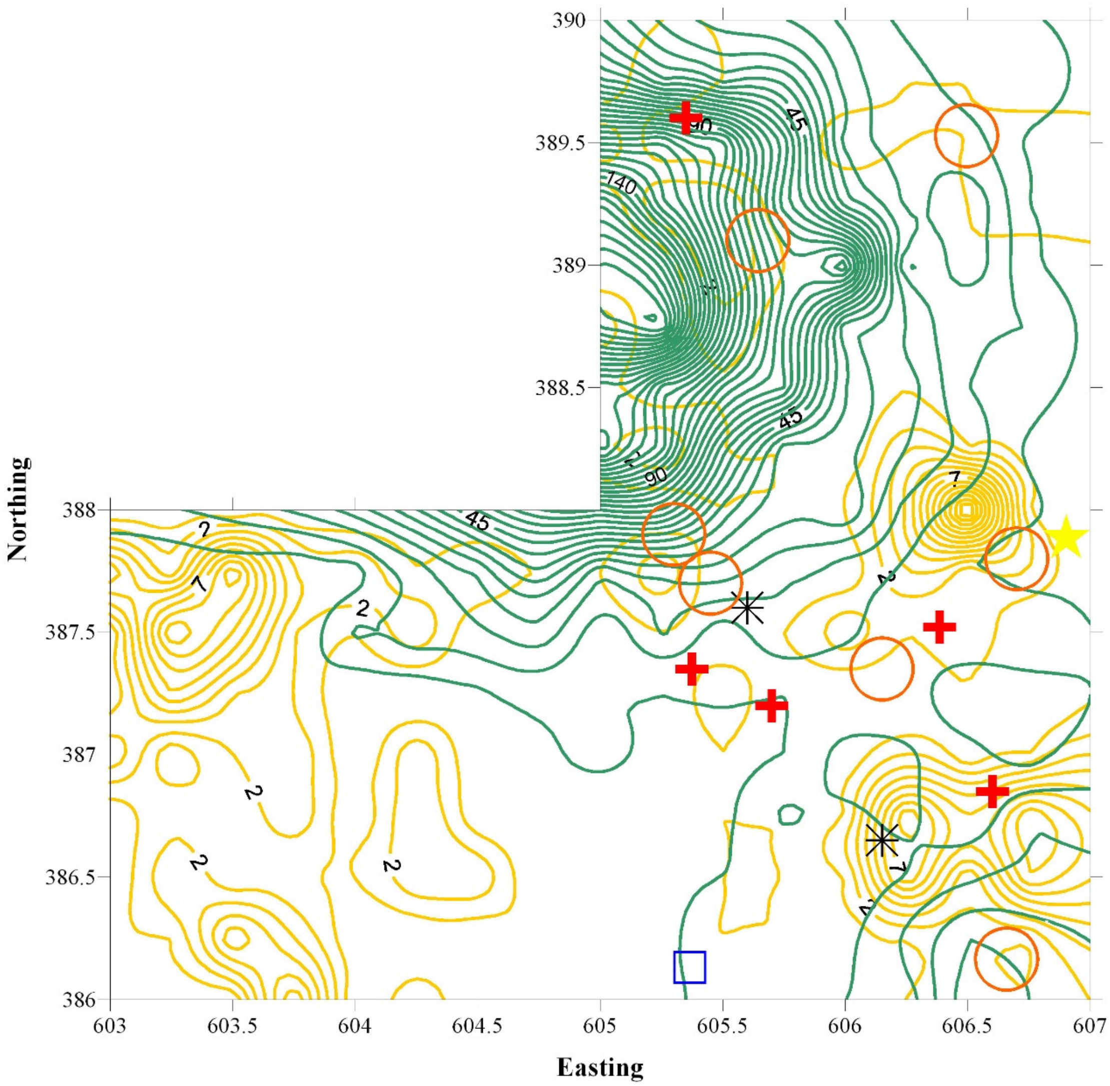

Figure 5.9. Piedmont Silicate Occupation Cluster (green contours), Sandstone and Fire-Cracked Rock Concentrations (yellow contours), Non-diagnostic Bifaces/Biface Fragments (red cross), Flake Tools (orange circles), Utilized Shatter (yellow star), Blade-like Flake Tools (black *), and Core (blue square), Area 1.

flake tools, and five utilized flake tools were recovered from TU6-N386E605 as part of this occupation area.

The horizontal distribution of Piedmont silicate artifacts suggest two separate occupation clusters: the dense cluster in TU8-N388E605 and a second cluster in the southeastern corner of TU6-N386E605. This conclusion was reached based on the decreased number of artifacts between the small concentration of Piedmont silicate debitage in the southeastern corner of TU6-N386E605 and the denser concentration in TU8-N388E605. It appears that the smaller concentration in TU6-386E605 is associated with another Piedmont silicate cluster located outside of the excavated area. For this reason, the Piedmont silicate artifacts from the southeast quadrant of TU6-N386E605 were removed from the present analysis of the Piedmont silicate occupation cluster.

The Piedmont silicate occupation cluster—like the quartz occupation cluster—resembles the Type 1 occupation clusters identified by Cable and Cantley (2006:46). To review, Type 1 occupation clusters are dense debitage scatters of a single lithic raw material associated with tool clusters, rejected tools, and manufacturing rejects of the same material. Cable and Cantley (2006:46) determined that Type 1 occupation clusters were produced through the reduction of unmodified cores or biface cores, and represent either forager residences or small, multi-household residences in isolation or associated with others. In addition to the Piedmont silicate artifacts mentioned above, a cluster of sandstone and fire-cracked rock located at the southeast corner of the scatter could be a hearth associated with this occupation cluster.

An examination of the vertical distribution for all of the Piedmont silicate artifacts (n=4,447) from Area 1—including the cluster in the southeast quadrant of TU6-N386E605—reveals the battleship-shaped curve identified by Clement et al. (2005) at site 38RD628 (Figure 5.6). Piedmont silicate artifacts were recovered from 0 to 120 cmbs, with the densest quantities found between 30 and 60 cmbs. The highest number of artifacts (n=1,310) were recovered from between 40 and 50 cmbs within the levels corresponding to the Middle Archaic period. Because the number of artifacts outside of the 30- to 60-cm range is so small, the entire Piedmont silicate assemblage from all of the shovel test pits and the 2 m x 2 m excavation units were used to understand the material's vertical distribution. Based on the horizontal distribution of artifacts, the southeast quadrant of TU6-N386E605 was omitted from the following analyses, bringing the total number of Piedmont silicate debitage to 4,111.

Mass Analysis. Mass analysis, following Ahler (1989), can be employed to understand lithic reduction strategies. A common problem in using Ahler's (1989) mass analysis is that experimentally produced data does not exist for all lithic raw materials, which unfortunately is the case for Piedmont silicate. Thus, mass analysis, per se, was not used on the Piedmont silicate debitage from Area 1.

However, some general trends identified by Ahler (1989) and Ahler and Christensen (1983) through their work with mass analysis can be applied to the Piedmont silicate debitage. These trends show that as the stage of reduction progresses, the average weight of the 1/4-in debitage decreases, while the percentage of flakes in the 1/4-in size grade increases.

Low counts but high weights in the 1/4-in size grade would indicate early-stage, core or bifacial reduction. In this cluster, the 1/4-in size grade consists of relatively high numbers of flakes coupled with low weights, indicating stage late-stage biface or tool reduction and/or maintenance (Table 5.9). The average weight of the Piedmont silicate decreases substantially from 39.63 g/flake in the Group 1 size grade to 0.46 g/flake in the Group 3 size grade. The percentage of flakes per size grade increases as the size grade decreases, so that the debitage in the Group 1 size grade makes up only 0.3% by count of the assemblage, but the debitage in the Group 3 size grade and smaller accounts for 95%

by count of the assemblage. The identification of high counts of small flakes and low counts of large flakes in the data for the Piedmont silicate occupation cluster strongly suggests that late-stage lithic reduction in the form of biface/tool production and/or maintenance created this assemblage.

Table 5.9. Piedmont Silicate Debitage Size Grades.

Size Grade[a]	Count	Weight (g)	Avg Weight 1/4-in Flakes	% Weight	% Count of Flakes
G1	12	475.5	39.63	29.0	0.3
G2	195	523.7	2.69	31.9	4.7
G3	1,076	490.0	0.46	29.8	26.2
G4	2,828	152.5	0.05	9.3	68.8
TOTAL	4,111	1,641.7		100.0	100.0

[a]G1 (≥1 in or 25.4 mm), G2 (≥1/2 in or 12.7 mm), G3 (≥1/4 in or 6.4 mm), G4 (≥1/8 in or 3.2 mm).

Aggregate Trend Analysis. Aggregate trend analysis was used to analyze the debitage from the Piedmont silicate occupation cluster. This analysis method does not use debitage less than 1/4-in in size; therefore, data from the Group 4 size grade were removed prior to analysis. In total, 1,283 pieces of Piedmont silicate debitage were examined using Bradbury and Carr's (2004) aggregate trend analysis (Table 5.10). When compared to Bradbury and Carr's (2004) experimentally produced datasets on Fort Payne chert for core reduction, bipolar reduction, biface edging, biface thinning, final biface, and uniface reduction, the Piedmont silicate debitage was produced through a mixture of reduction strategies. The percentage of debitage with 2+ platform facets correlates to uniface reduction, whereas the percentage of blocky debris and the percentage by count of 1/4-in flakes resemble the data produced through core reduction, freehand and bipolar, respectively. The average weight of the 1/4-in flakes is halfway between the weights expected for uniface reduction and biface edge reduction. The only conclusion that can

Table 5.10. Piedmont Silicate Debitage Aggregate Trend Analysis Comparison.

Reduction Group	% Blocky Flakes	% with 2+Facets	Avg Weight 1/4-in Flakes	% Count 1/4-in Flakes
Core[a]	15.2	0.9	0.94	60.1
Bipolar[a]	17.4	0.0	0.76	84.6
Biface Edge[a]	1.4	12.1	0.56	83.2
Biface Thin[a]	0.1	26.0	0.35	95.2
Final Biface[a]	0.0	75.0	0.35	100.0
Uniface[a]	0.0	8.3	0.37	97.9
Three Springs Piedmont silicate[b] (n=1,283)	9.9	8.3	0.46	83.9

Note: Data from Area 1 at the Three Springs site compared to data from experiments conducted on Fort Payne chert by Bradbury and Carr (2004).
[a]Bradbury and Carr (2004) experimental results.
[b]Data from Area 1 of the Three Springs site.

be reached through this comparison is that core, bifacial, and tool reduction were occurring in the Piedmont silicate occupation cluster.

When these data were input into the regression formulae derived by Bradbury and Carr (2004) to determine the percentage of a mixed assemblage produced through bifacial reduction, this analysis again produced conflicting results (Table 5.7). The percentages of blocky debris and 2+ faceted platform-bearing debitage suggest that only 35% of the assemblage was created through bifacial reduction, whereas the average weight and count of the 1/4-in flakes suggest that bifacial reduction played a much bigger role in the production of the Piedmont silicate lithic assemblage. These conflicting results could be due to fracturing differences between Piedmont silicate and Fort Payne chert, the lithic raw material from which the regression formulas were calculated.

Individual Attribute Analysis. Platform condition was recorded for 1,002 of the 1,007 pieces of platform-bearing debitage in the Piedmont silicate occupation cluster (Table 5.11). A slight majority of the platforms were classified as collapsed or crushed (50.2%).

Table 5.11. Piedmont Silicate Debitage Platform Conditions.

Platform Type	Count	Percent
Abraded	35	3.5
Collapsed/Crushed	503	50.2
Complex	175	17.5
Cortical	27	2.7
Simple	262	26.1
TOTAL	1,002	100.0

The second most common platform type was simple, followed by complex. Less than 4% of the Piedmont silicate platform-bearing debitage were classed as abraded or cortical.

Collapsed or crushed platforms are indicative of bipolar reduction or late-stage bifacial reduction. An examination of the size grade data for the collapsed/crushed platform-bearing debitage shows that the bulk of this category is composed of very small flakes and flake fragments (Table 5.12). The few remaining pieces of debitage with collapsed or crushed platforms were found in the Group 2 sieve. The small size of the debitage with collapsed/crushed platforms suggests late-stage bifacial reduction and/or tool production or maintenance. The lack of bipolar flakes or shatter in the artifact assemblage supports this hypothesis. The recovery of complex and abraded platforms lends support to this conclusion because these platform types are common features of bifacial thinning flakes and are indicative of middle- and late-stage bifacial reduction.

Over one-quarter of the platforms are simple and cortical, suggesting early-stage bifacial or core reduction. However, given that only 7.4% of the platform-bearing debitage from the Piedmont silicate occupation cluster possessed cortex, this low frequency indicates that some of the cortex was removed from the cobbles at a different

Table 5.12. Size Grade Data for Piedmont Silicate Collapsed/Crushed Platform-Bearing Debitage.

Size Grade[a]	Count	% Count of Flakes
G1	0	0
G2	49	9.7
G3	219	43.4
G4	237	46.9
TOTAL	505	100.0

[a]G1 (≥1 in or 25.4 mm), G2 (≥1/2 in or 12.7 mm), G3 (≥1/4 in or 6.4 mm), G4 (≥1/8 in or 3.2 mm).

location, suggesting that Piedmont silicate cobbles were brought to this location in a somewhat prepared form.

Occupation Cluster 3: Black Mingo Chert

Black Mingo chert, although not readily available in the immediate vicinity of the Three Springs site, can be found within approximately 55 km (approximate distance as the bird flies from the case study site to Sparkleberry Landing on the northeastern side of Lake Marion, Sumter County, South Carolina). The Black Mingo chert occupation cluster consists of 106 artifacts—105 pieces of debitage and a non-diagnostic biface fragment. The bulk (n=101) of the Black Mingo chert concentration was recovered from TU8-N388E605; the remainder—four pieces of debitage and the biface fragment—was recovered from TU4-N386E603 and TU6-N388E603. The densest part of the Black Mingo chert occupation cluster is located at N389.25E606.25 (Figure 5.10). Vertically, the Black Mingo chert artifacts were recovered from 10 to 90 cmbs. This distribution reveals the battleship-shaped curve noted by Clement et al. (2005) at site 38RD628 and shows that the Black Mingo chert artifacts are densest between 40 and 50 cmbs (Figure

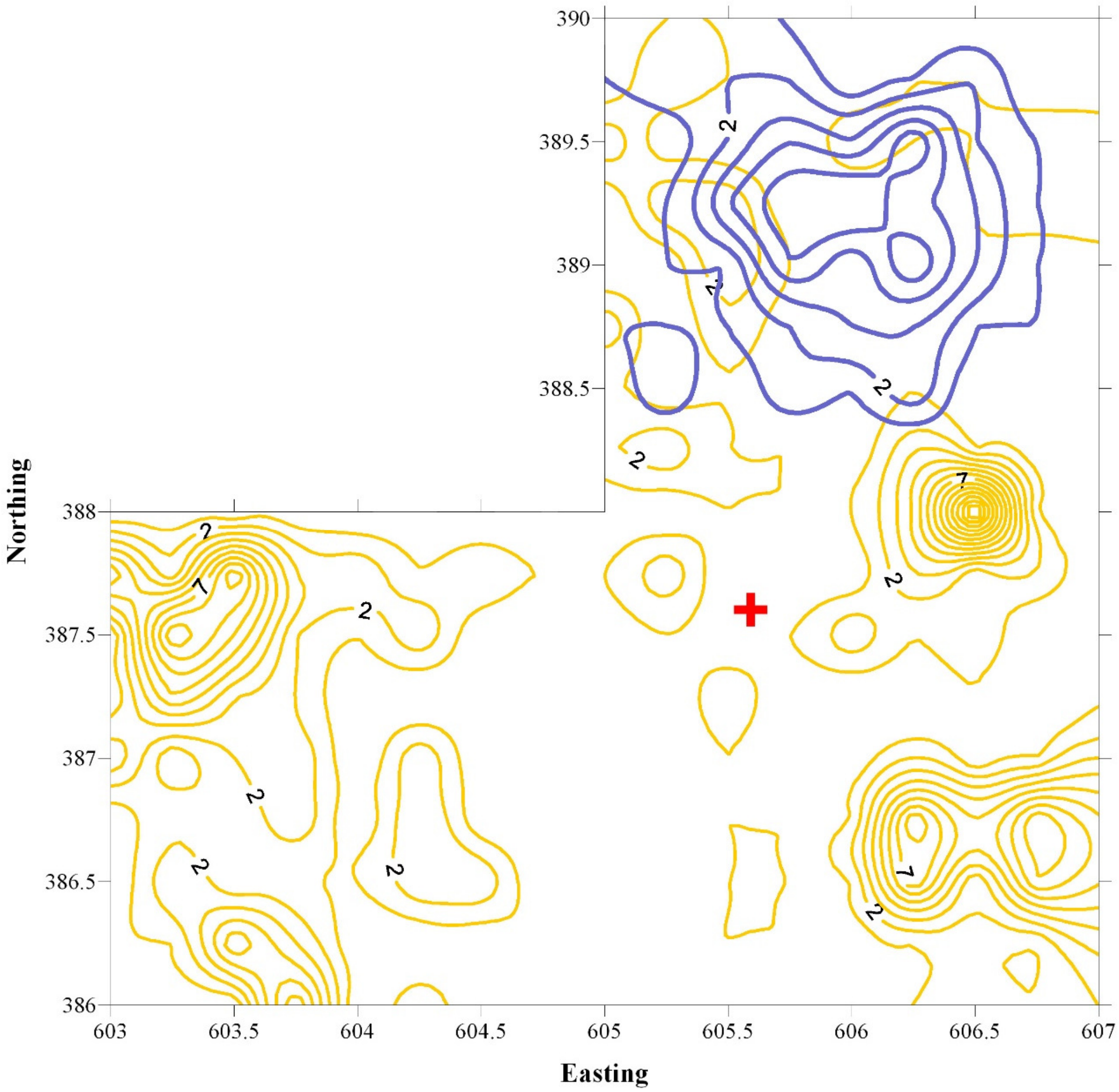

Figure 5.10. Black Mingo Chert Occupation Cluster (blue contour lines), Fire-Cracked Rock and Sandstone Concentrations (yellow contours), and Non-diagnostic Biface Fragment (red cross), Area 1.

5.6). Due to the relatively small number of Black Mingo chert artifacts in this occupation cluster, the entire assemblage was used in the following analyses.

The Black Mingo chert occupation cluster most closely resembles the Type III clusters identified by Cable and Cantley (2006), which are extremely low-density debitage scatters associated with a small number of tools. Activities at these types of occupation clusters focus on tool maintenance. Cable and Cantley (2006:46-47) conclude that Type III occupation clusters were the remains of logistical camps or extraction loci used by special task groups within a collector economy.

Mass Analysis. The sample size of 105 pieces of debitage is very small in terms of the type of data that mass analysis is used to analyze. This fact, coupled with the lack of experimentally produced lithic reduction data for Black Mingo chert or a comparable raw material, strongly suggests that mass analysis is not an appropriate method for understanding the lithic reduction method(s) occurring within this occupation cluster. Therefore, mass analysis following that of Ahler (1989) was not conducted on this assemblage.

Previous work using mass analysis, however, highlighted two important aspects of lithic reduction that can be applied to the small Black Mingo chert debitage assemblage (Ahler 1989; Ahler and Christensen 1983). During late-stage lithic reduction, the percentage of flakes in the small size grades increases whereas the average weight of flakes in these size grades decreases. Given that very few (n=5) pieces of Black Mingo chert debitage occur in the larger size grades, but over 95% of the assemblage occurs in the two smallest size grades (Table 5.13), the chert was used in late-stage reduction. As expected for late-stage lithic reduction such as tool production or maintenance, the average weight of the flakes decreases substantially from 28.6 g/flake in the Group 1 size grade to 0.07 g/flake in the Group 4 size grade.

Aggregate Trend Analysis. Aggregate trend analysis was conducted on an even smaller subset of the Black Mingo chert debitage because aggregate trend analysis does not include debitage from the Group 4 size grade, which consisted of 75 pieces of

Table 5.13. Black Mingo Chert Debitage Size Grades.

Size Grade[a]	Count	Weight (g)	Avg Weight 1/4-in Flakes	% Weight	% Count of Flakes
G1	2	57.1	28.55	69.4	1.9
G2	3	12.8	4.27	15.6	2.9
G3	25	7.1	0.28	8.6	23.8
G4	75	5.3	0.07	6.4	71.4
TOTAL	105	82.3		100.0	100.0

[a]G1 (≥1 in or 25.4 mm), G2 (≥1/2 in or 12.7 mm), G3 (≥1/4 in or 6.4 mm), G4 (≥1/8 in or 3.2 mm).

debitage. Removing Group 4 decreased the total number of Black Mingo chert debitage analyzed with aggregate trend analysis to 30—a very small assemblage for understanding lithic reduction at an aggregate level. The size and weight data for the Group 3 size grade, count and weight of the platform-bearing debitage with 2+ platform facets, and the count and weight of blocky debris for the assemblage were collected for the Black Mingo chert debitage (Table 5.14). Once again, the items that were sorted into shatter are considered to equal the category of blocky debris.

Table 5.14. Black Mingo Chert Debitage Aggregate Trend Analysis Comparison.

Reduction Group	% Count of Flakes	% with 2+ Facets	Avg Weight 1/4-in Flakes	% Count of 1/4-in Flakes
Core[a]	15.2	0.9	0.94	60.1
Bipolar[a]	17.4	0.0	0.76	84.6
Biface Edge[a]	1.4	12.1	0.56	83.2
Biface Thin[a]	0.1	26.0	0.35	95.2
Final Biface[a]	0.0	75.0	0.35	100.0
Uniface[a]	0.0	8.3	0.37	97.9
Three Springs Black Mingo chert[b] (n=30)	10.0	10.0	0.28	83.3

Note: Data from Area 1 at the Three Springs site compared to data from experiments conducted on Fort Payne chert by Bradbury and Carr (2004).
[a]Bradbury and Carr (2004) experimental results.
[b]Data from Area 1 of the Three Springs site.

The small size of the debitage assemblage is worrisome when using a method designed for large quantities of debitage. The analysis of the Black Mingo chert data with aggregate trend analysis suggests that a mixture of lithic reduction activities was occurring within this occupation cluster (Table 5.14). The high percentage of platform-bearing debitage with 2+ facets suggests bifacial reduction. The data collected from the 1/4-in flakes also point to bifacial reduction. However, the frequency of blocky debris is suggestive of core reduction: ten percent is unexpectedly high for bifacial reduction, a reduction strategy that creates little to no blocky debris. Instead, the percentage of blocky debris approaches the range expected for both freehand and bipolar core reduction, but it is still considerably low for these reduction strategies. The difference in the frequency of blocky debris could, however, be a result of fracturing differences between the archaeologically recovered material—Black Mingo chert—and the material used to create the trend dataset—Fort Payne chert.

When the data from the aggregate trend analysis is entered into the regression formulae developed by Bradbury and Carr (2004), the results are conflicting like those calculated for Piedmont silicate (Table 5.7). The amounts of blocky debris and platform-bearing debitage with 2+ platform facets suggest that bifacial reduction produced less than half of the debitage, whereas the average weight and percentage of debitage in the 1/4-in size grade overwhelming suggest that this lithic assemblage was produced via bifacial reduction.

Individual Attribute Analysis. Platform condition was recorded for 28 pieces of Black Mingo chert (Table 5.15). Not only was the assemblage of platform-bearing debitage few in number, but also the actual pieces of debitage were small. Ten pieces were identified in the Group 3 size grade, whereas the remaining eighteen pieces of platform-bearing debitage were recovered in the Group 4 size grade. The majority of platform types were collapsed or crushed, which is usually indicative of bipolar reduction. However, considering the extremely small size of the flakes—seven of the collapsed platforms were identified on 1/4-in flakes and eleven collapsed platforms among the 1/8-in flakes—it is more likely that the collapsed/crushed platforms were created during late-stage lithic reduction, such as tool production or maintenance.

Table 5.15. Black Mingo Chert Debitage Platform Conditions.

Platform Type	Count	Percent
Abraded	0	0.0
Collapsed/Crushed	18	64.3
Complex	5	17.9
Cortical	0	0.0
Simple	5	17.9
TOTAL	28	100.1

Summary

This chapter has presented data on the lithic debitage and tools from the Three Springs site—a large multi-component site on the United States Army Garrison of Fort Jackson in the Sandhills Province of Richland County, South Carolina. Geomorphology, optically stimulated luminescence, and the vertical distribution of artifacts strongly suggest that even though no visible surfaces can be discerned in the sandy soils, the Middle Archaic occupations of Area 1 can be isolated. Lithic analyses collected data on both aggregate and individual artifact scales, and the data were interpreted to determine the lithic reduction strategies used to create the three lithic raw material clusters within this area. In the following chapter, I will place these results within a broader framework of the organization of technology in order to understand how lithic reduction strategies correlate to mobility.

CHAPTER 6
ADAPTIVE FLEXIBILITY IN THE SANDHILLS PROVINCE: DISCUSSION AND CONCLUSIONS

This dissertation has explored the Middle Archaic occupations of the Inner Coastal Plain, specifically the Sandhills Province, in order to argue that Kenneth Sassaman's model of Adaptive Flexibility (Sassaman 1991) is applicable not only to the Piedmont, but also the Sandhills Province of the South Atlantic Slope. Sassaman's Adaptive Flexibility model proposes that shared knowledge and a reliable resource structure allowed group members a great deal of flexibility when it came to individual behavioral responses in terms of social organization (i.e., group membership, co-residence size) within the Morrow Mountain cultural horizon. Through the use of high residential mobility, expedient technology, and open social networks, Morrow Mountain populations avoided specialization and social debt during resource acquisition, which created an egalitarian society. This society existed for approximately two thousand years, circa 7,500-5,500 BP. (Blanton 1983, 1984; Sassaman 1991).

Chapter Six serves as a conclusion to this dissertation. In the first part of this chapter I discuss the results of the analysis presented in Chapter 5. In the following section, I review the five hypotheses presented in Chapter One and provide a brief review of how this research addressed each hypothesis. Next, I discuss variation between Sassaman's (1991) model of Adaptive Flexibility in the South Carolina Piedmont and its application to the Sandhills Province. Finally, I place the analysis results from the previous chapter into a broad context of Middle Archaic settlement and land use for the Sandhills Province of the Inner Coastal Plain of the South Atlantic Slope, highlighting areas for future research.

Discussion of Analysis Results

In the following section, I summarize the results of the three methods of lithic analysis presented in the previous chapter. Mass analysis, aggregate trend analysis, and an analysis of platform condition were conducted on the debitage from the three Morrow Mountain occupation clusters (quartz, Piedmont silicate, and Black Mingo chert) identified in Locus 3 Block 12 Area 1 of the Three Springs site. The following discussions are presented by occupation cluster in order to discern the types of lithic reduction strategies that created each cluster.

Occupation Cluster 1: Quartz

Mass analysis, aggregate trend analysis, and individual attribute analysis (specifically platform condition) provided a variety of results in terms of determining the types of lithic reduction strategies responsible for creating the debitage in the quartz occupation cluster. Mass analysis favors bipolar reduction; aggregate trend analysis suggests that both core and tool reduction occurred here; and an examination of platform condition points to bifacial/tool reduction as the source of the debitage. The quartz artifact assemblage shows that all of the above reduction strategies occurred within the quartz occupation cluster. Bipolar flakes confirm that quartz cobbles were knapped through bipolar reduction, while the identification of amorphous cores and core fragments show that freehand core reduction also occurred. The recovery of non-diagnostic bifaces and biface fragments along with flake tools and tool fragments supports the idea that bifacial/tool reduction was employed with the quartz.

How do these data fit with the idea of high residential mobility? High residential mobility in an area with easily accessible lithic raw materials (regardless of quality) would appear in the archaeological record as an expedient tool technology. Expected lithic artifacts within an expedient tool technology include flake tools, amorphous cores, and bipolar cores. The quartz occupation cluster in Area 1 contains all of these artifacts. However, it also contains a rather large number of non-diagnostic bifaces and biface fragments. Bifacial reduction could indicate where highly mobile foraging groups were retooling. The discarded Morrow Mountain point fragment could be a manufacturing reject like those Cable and Cantley (2006) identified at Type 1 occupation clusters. Or, given the difficulty in analyzing quartz, the numerous biface fragments in the lithic assemblage could be misidentified bipolar flakes and/or *pièces esquillées*.

Occupation Cluster 2: Piedmont Silicate

The Piedmont silicate occupation cluster differs from the quartz concentration. Whereas the quartz occupation cluster could be associated with an expedient technology mindset, the Piedmont silicate artifacts suggest the planned creation of bifacial blanks or prepared cores, which is part of a curated technological behavior (Andrefsky 1994; Johnson 1987; Torrence 1983). Prepared cores and the mindset associated with setting up a formal toolkit (i.e., curation technological behavior) are commonly associated with high residential mobility in areas where lithic raw material sources are scarce.

Both debitage and core/tool analyses indicate more than one reduction strategy was used in this occupation cluster. As revealed in the debitage, Piedmont silicate was used mainly in bifacial/tool reduction rather than core reduction. Mass analysis, per se, was not conducted on this assemblage due to a lack of comparative, experimentally produced data. Instead, the dataset was examined in terms of the trends noted by Ahler (1989) and Ahler and Christensen (1983), which suggest that late-stage bifacial and/or tool reduction was responsible for creating this lithic assemblage. The aggregate trend analysis is rather inconclusive, but nonetheless suggests that more than one lithic reduction strategy was utilized within this occupation cluster. An examination of the platform condition supports the results of the basic trend analysis that late-stage lithic reduction—either biface or other tool—was occurring here. The recovery of biface fragments (n=3) further supports the idea of late-stage bifacial lithic reduction. Piedmont silicate cobbles were not flaked using bipolar reduction since no bipolar flakes or shatter were identified among the artifacts. Debitage scatters created through late-stage bifacial reduction (i.e., tool production and/or maintenance) would be expected at a Type 1 occupation cluster.

Did the recovery of a cobble of Piedmont silicate allow the occupants of this site the ability to retool with raw material that was of a higher quality than the quartz so common to the Sandhills? Were these hunters and gatherers preparing as part of their seasonal round to move farther away from the Fall Zone into an area with more scarce lithic sources?

Occupation Cluster 3: Black Mingo Chert

Analysis of the debitage associated with the Black Mingo chert occupation cluster suggests that this raw material was used for late-stage lithic reduction activities such as tool production and/or maintenance. The lack of comparable, experimental data resulted in not using Ahler's (1989) mass analysis with this assemblage. Instead, the size grade data were examined for the trends noted by Ahler (1989) and Ahler and Christensen (1983). Aggregate trend analysis was conducted on a very small subset of the Black

Mingo chert assemblage. Both aggregate analyses, although not ideal, did suggest that late-stage bifacial reduction occurred, a conclusion supported by the analysis of platform condition. The recovery of one non-diagnostic biface fragment lends support to this hypothesis. Furthermore, the lack of cores and bipolar flakes in the artifact assemblage supports the idea that the Black Mingo chert was used for late-stage biface/tool reduction.

Late-stage bifacial reduction is not expected to occur at sites associated with high residential mobility and a foraging economy. However, Black Mingo chert is a higher quality lithic raw material than the readily-available local quartz. Black Mingo chert can be obtained in Sumter County, South Carolina, and along the bluffs south of the Congaree River in Calhoun County, South Carolina, both some distance from the site. In areas where high-quality lithic raw materials are scarce or at a great distance, formal tools of the high-quality material are more common than expedient tools (Andrefsky 1994:31). The Black Mingo chert occupation cluster may be explained as a location of tool maintenance for a biface brought to this location within a foraging economy, rather than indicating a Type III logistic camp or special task/extraction site (Cable and Cantley 2006) within a collector economy.

Summary

Analysis suggests that within the quartz occupation cluster (a raw material readily available locally), bipolar reduction, freehand core reduction, and bifacial/tool reduction were employed to produce bifaces, flake tools, and debitage. Lithic reduction strategies within the Piedmont silicate occupation cluster (a local raw material of better quality than quartz) favored late-stage bifacial reduction with a minimal amount of freehand core reduction. Late-stage bifacial reduction appears to solely be responsible for creating the debitage recovered in the Black Mingo chert occupation cluster (a non-local, high-quality raw material).

When viewed within the organization of technology framework, quartz and Piedmont silicate were used within an expedient tool technology based on the recovery of bipolar shatter and flake tools among the quartz assemblage, and flake tools within the Piedmont silicate assemblage. The quartz and Piedmont silicate were also employed in a curated tool technology as shown in the production of bifaces. The Black Mingo chert debitage appears to have been part of a curated tool technology, but one that could have been used by foragers in a locale with scarce sources of high quality lithic raw materials. Although it is difficult to say that the lithic reduction strategies confirm without a doubt that the men, women, and children who knapped this material were part of a highly mobile foraging society, current evidence supports the hypothesis that these occupation clusters were created within a foraging economy as opposed to either extraction sites or residential bases within a logistical based system.

Five Hypotheses of Adaptive Flexibility

Adaptive Flexibility is a settlement model developed to explain the distribution of highly redundant artifact assemblages of locally available lithic raw materials of the Morrow Mountain cultural horizon in the Piedmont region of South Carolina (Sassaman 1991). An immediate-return economy with little social debt was created through an expedient, unspecialized tool technology and high residential mobility. This economy easily adapted to the consistent resource bases provided in both riverine and interriverine/upland environments of the Piedmont. However, this settlement model was specifically designed for the Piedmont region and never intended to be applied to

Morrow Mountain groups in the Coastal Plain (Sassaman, personal communication 2016), even though the Fall Zone and Inner Coastal Plain (which includes the Sandhills Province) possess distinct riverine and upland/interriverine zone like the Piedmont region (Sassaman 1983:53-54).

The identification and excavation of additional sites dating to the Morrow Mountain cultural horizon in the Sandhills Province allows us to examine whether Adaptive Flexibility could explain these occupations. In order to examine the applicability of Adaptive Flexibility to the Morrow Mountain occupations of the South Carolina Sandhills, five hypotheses were developed. These hypotheses and a summary of the results provided within this dissertation are presented below.

1) If the Morrow Mountain occupations in the Sandhills Province result from frequent residential mobility, then resources need to be reliable.

High residential mobility is a characteristic of a foraging economy. Within a foraging economy, the group moves from one resource patch to another when resources in the first become depleted. Sassaman (1991) argued that in order to sustain a foraging economy, the environment needed to be possess both reliable and homogeneous resource structure. However, in opposition to Sassaman's argument, ethnographical data suggests that hunters and gatherers will employ a foraging-based economy of highly mobile residential groups in areas where resources are scarce or widely scattered (Phillips 1987:175; Stein Mandryk 1993:40).

Within Chapter Two, pollen and environmental data from the Sandhills Province of central South Carolina showed that this region could provide a reliable resource base; however, resource types varied greatly between the upland and riverine zones. Taylor et al. (2011) argue that the shift from an oak to pine forest occurred in the Sandhills Province of Richland County, central South Carolina, quickly in the middle Holocene most likely due to a higher frequency of fires. Gunn and Foss (1992) have argued based on the rate of soil movement in the South Carolina Sandhills Province that the uplands in this region lacked dense forest cover and instead provided an open grassland, which, in turn, was an attractive location for bison, elk, and/or white-tailed deer. A southern pine forest overstory and an understory of open vegetation and/or scrub oak—similar to the vegetation in the Sandhills Province today—require frequent understory fire (Wagner 2003).

In either scenario, the highly mobile foraging groups of the Morrow Mountain cultural horizon could have hunted bison, elk, and white-tailed deer in the uplands. A different set of resources, including a variety of flora and fauna, would have been supported at springheads and seeps throughout the province, forming a reliable although not homogenous resource base.

Due to the high acidity of the sandy soils in the Sandhills Province, preservation of faunal material from the Archaic period is poor. Protein residue analysis was conducted on a sample of temporally diagnostic projectile points from the Central Savannah River Area of South Carolina. This analysis positively identified protein from deer, bison, bear, and rabbit for the Middle Archaic Morrow Mountain points of the Inner Coastal Plain (Moore et al 2016:142). At the present time, no macrobotanical or faunal remains have been recovered from Archaic period sites on Fort Jackson, Richland County, South Carolina.

2) If Morrow Mountain sites in the Sandhills Province are the remains of highly mobile groups of foragers, then the lithic artifact assemblages should contain expedient tools instead of specialized tools.

The analysis of lithic artifact assemblages from Area 1 of the Three Springs site identified three occupation clusters dating to the Middle Archaic period and specifically the Morrow Mountain cultural horizon. The results of this analysis are presented in Chapter Five of this dissertation. Occupation clusters correlate to dense concentrations of a single raw material type. The three occupation clusters at the Area 1 of the Three Springs site were correlated with quartz, Piedmont silicate, and Black Mingo chert.

The results of analysis suggest that the readily-available, local quartz was used to create expedient tools in the form of utilized flakes and utilized shatter. Further evidence for the use of quartz in an expedient technological strategy lies in the recovery of amorphous/unpatterned cores and bipolar flakes. However, the quartz debitage also suggests that bifacial reduction occurred within the quartz occupation cluster. Highly mobile foraging groups practice an expedient technological strategy in areas where low-quality raw material is readily available (Andrefsky 1994).

Piedmont silicate, Black Mingo chert, and Coastal Plain chert are higher quality lithic raw materials. Piedmont silicate is locally available in the Sandhills, whereas Black Mingo and Coastal Plain cherts are local to the Coastal Plain region but not readily available at the Three Springs site. Among highly mobile foraging groups, high-quality lithic raw materials are expected to be used within a curated technological strategy (Andrefsky 1994). Analysis of the debitage from all three of the higher quality lithic raw materials suggest that they were part of a curated technological strategy. The Piedmont silicate was used to create prepared cores and bifacial blanks. However, the identification of utilized blade-like flakes and utilized flakes among the Piedmont silicate debitage also show that this raw material was used in an expedient technological strategy. The Black Mingo chert debitage was created through late-stage bifacial reduction and/or maintenance. The Coastal Plain chert artifact is a formal tool, specifically a Morrow Mountain projectile point/knife, which demonstrates that this raw material was used with a curated technological strategy.

In summary, expedient tools were identified in the lithic debitage from Area 1 of the Three Springs site for both the quartz and Piedmont silicate occupation clusters. When both the raw material quality and availability to occupants of the Three Springs site are considered (Andrefsky 1994), the three occupation clusters—quartz, Piedmont silicate, and Black Mingo chert—and the Coastal Plain chert Morrow Mountain projectile point/knife strongly suggest that the groups creating these lithic scatters exercised high residential mobility.

3) If the Middle Archaic occupations of the Inner Coastal Plain are part of a forager-based economy with high residential mobility, then the large Middle Archaic sites in the Coastal Plain will reflect a highly mobile lifestyle and any large site size should reflect repeated visits by

small groups to the same location rather than one large group staying at a large, residential base.

Clement and Wilson (2004) note that Middle Archaic period sites in the Coastal Plain tend to be larger than their Piedmont counterparts. However, Cable and Cantley (2005, 2006; Cantley and Cable 2002a, 2002b) have shown that larger site size for hunter-and-gatherer sites in the Coastal Plain when compared to the Piedmont region results from repeated visits through time to the same location. In addition, the current archaeological survey methods are too large and miss campsites smaller than the survey interval. As presented in Chapter Two and, in greater detail, in Chapter Three, Cable and Cantley (2005, 2006; Cantley and Cable 2002a, 2002b) employed a regime of close-interval shovel testing to illustrate that large Archaic period sites of the Coastal Plain, in both North and South Carolina, are palimpsests of occupation clusters recurring on the same landform rather than residential bases occupied by large groups for extended periods of time. Their assumption concerning site function have been confirmed through lithic analysis.

The Three Springs site fits within this palimpsest model of repeated prehistoric occupations as evidenced by the size of the site and the distribution of archaeological components. Archaeological testing of the Three Springs site increased site size to approximately 74,400 m^2 or roughly 18 acres (Dawson et al. 2007:297). These 18 acres were repeatedly visited throughout the Archaic period and less frequently during the Woodland, Mississippian, and late nineteenth/early twentieth centuries. Morrow Mountain projectile points/knives (n=11) were recovered throughout the site during the 2002-2004 testing project (Dawson et al. 2007). The widespread distribution of diagnostic points over the 18 acre site, coupled with the significant amounts of lithic debitage, strongly suggests that the Three Springs site was created through the palimpsest model identified by Cantley and Cable (2002a and 2002b; Cable and Cantley 2005, 2006) at Poinsett Electronic Combat Range, Sumter County, South Carolina. Excavations in Area 1 confirmed this assumption through the identification of three distinct occupation clusters.

4) If members of these highly mobile groups of foragers had equal, individual access to resources, then we would expect to see an even distribution of local lithic raw materials.

Adaptive Flexibility works within the Piedmont because group membership is flexible and because resources and knowledge are shared throughout the group. The equal access to resources, both in terms of biota, knowledge, and lithic raw materials, disengaged the people from the land in order to maintain high mobility which, in turn, kept the society egalitarian (Sassaman 1991). The distribution of lithic raw material types at Area 1 of the Three Springs site suggests that the lithic raw materials available within the Inner Coastal Plain were accessible to the Morrow Mountain people who utilized the Three Springs site. Piedmont silicate as well as quartz cobbles are readily available in the creeks within the Fall Zone and the Sandhills Province.

On the other hand, higher quality Black Mingo chert and Coastal Plain chert are available at a short distance from the Three Springs site. Black Mingo chert can be found in Sumter and Calhoun counties of South Carolina, whereas Coastal Plain chert outcrops are present further away in Allendale County, South Carolina.

5) If the model of Adaptive Flexibility explains Middle Archaic uses of both the Coastal Plain and the Piedmont, then the increased interassemblage variability noted by Sassaman (1991:36-37) in the Middle Archaic artifact assemblages of the Coastal Plain needs to be further examined.

Interassemblage variability was determined through the statistical analysis of the frequencies of the lithic artifact types (chunks, other flakes, thinning flakes, hafted bifaces, other bifaces, unifaces, and utilized flakes) recovered from 21 single-component Morrow Mountain sites identified during survey of the Richard B. Russell Reservoir in the Piedmont region of the Savannah River Valley of South Carolina (Sassaman 1991). Piedmont Morrow Mountain period sites were calculated to have little interassemblage variability, whereas Sassaman (1991) noted more variation in the Coastal Plain Morrow Mountain lithic assemblages. The frequency of each artifact type was fairly consistent at all 21 Piedmont sites with the exception of utilized flakes, which Sassaman (1991) attributed to the difficulty in discerning use-wear on quartz artifacts.

Addressing lithic assemblage variability between Morrow Mountain occupations of the Piedmont and the Coastal Plain is difficult. This difficulty stems from a number of reasons, one of which is a lack of excavated, single-component Morrow Mountain sites within the Coastal Plain. Coastal Plain sites tend to be multi-component palimpsests. Additional excavations using mirco-interval shovel test pits will be needed to identify and isolate Middle Archaic Coastal Plain Morrow Mountain occupation clusters in order to discuss variation between the lithic assemblages of the Coastal Plain sites, and then to compare this interassemblage variability to Sassaman's (1983, 1991) data for the Piedmont. Unlike the lithic data used in this dissertation, work undertaken for the purpose of understanding interassemblage variability between Morrow Mountain sites of these two physiographical regions should employ the artifact types (i.e., chunks, other flakes, thinning flakes, hafted bifaces, other bifaces, unifaces, and utilized flakes) used by Sassaman (1983, 1991).

The presence of Brier Creek points and Allendale/MALAs (Middle Archaic Late Archaic) points at Middle Archaic period sites in the Coastal Plain region of the Savannah River Valley further distinguish Coastal Plain from Piedmont assemblages (Sassaman 1991:36-37). Chapter Two presented recent research concerning both point types at the Big Pine Tree site in Allendale County, South Carolina. Excavations have firmly placed Brier Creek points and the Allendale/MALA forms chronologically after the Morrow Mountain and before the Late Archaic cultural horizons (Tommy Charles, personal communication 2016). Adaptive Flexibility was specifically developed to explain the low-density, redundant lithic scatters of the Morrow Mountain occupations in the South Carolina Piedmont. Therefore, the presence of an increased variety of formal point types postdating the Morrow Mountain occupations at sites in the Coastal Plain should not impact the expanded settlement model for the Morrow Mountain cultural horizon.

Morrow Mountain points were in use for an estimated 2,000 years (circa 7,500-5,500 BP [Blanton 1983, 1984; Gunn and Foss 1992; Sassaman 1991]); thus, the addition of multiple point types (e.g., Guilford points, Brier Creek points, and the Allendale/MALA points) in the later Middle Archaic period raises many new questions. Are differences between Guilford/Guilford Stemmed points and Brier Creek points the result of differing raw material types or different cultural/societal origins? Do the Allendale/MALA points represent groups migrating into the region from the west? Are the Brier Creek points also associated with an influx of people from the south/southwest central Georgia region? Or, were these point types created by groups already in the region? Does the increased variety in point types in the latter part of the Middle Archaic period represent a shift toward ownership of resources and the differentiation of group territory? Can we discern a visible link/continuity of traits between the late Middle Archaic period points (Guilford, Guilford Stemmed, Brier Creek, and Allendale/MALA) and the point types present in the Late Archaic period?

Another form of interassemblage variability is the increased occurrence of Coastal Plain chert in the artifact assemblages of Morrow Mountain sites on the Coastal Plain of the Savannah River Valley (Sassaman 1991:36-37), where such chert is local and readily available within the Savannah River Valley. Morrow Mountain lithic scatters in the Piedmont are dominated by quartz, a readily-available, local raw material. The use of easily accessible, local lithic raw material enabled Morrow Mountain populations within the Piedmont region to maintain high residential mobility without having to transport higher quality lithic raw material and, thus, accrue social debt. In both the Piedmont and this restricted Coastal Plain area, groups depended on local lithic raw material.

This dissertation has suggested that within the Sandhills Province, the key characteristics of Adaptive Flexibility—a reliable resource base, high levels of residential mobility, generalized and unspecialized expedient toolkits, and equal access to raw materials—were present during the Morrow Mountain cultural horizon. Pollen data suggests that the vegetation was reliable although not homogeneous, with different resources available in the riverine and interriverine/upland zones. In addition, data presented herein has shown that unspecialized toolkits within an expedient technological strategy were used by the Morrow Mountain groups who created the three occupation clusters at the Three Springs site. Lithic raw materials appear to have been accessible to all members of the group based on the variety of raw material types at the Three Springs site.

Lastly, this dissertation has presented research to address the differences—larger site sizes in the Coastal Plain compared to the Piedmont and increased interassemblage variability, specifically the presence of Brier Creek and Allendale/MALA projectile points in Coastal Plain assemblages—noted in Morrow Mountain occupations of the Coastal Plain in comparison to the Piedmont. Large Morrow Mountain sites in the Coastal Plain accumulated from repeated visits to the same locale by small groups rather than small groups occupying finite landforms in the upland zones of the Piedmont. The greater interassemblage variation within the Coastal Plain Morrow Mountain occupations based on the types of lithic artifacts is impossible to address with the currently available archaeological data for the region. However, interassemblage variability based on an increased variety of point types at Coastal Plain Middle Archaic sites has suggested that these additional point types (i.e., Brier Creek points and Allendale/MALA points) post-date the Morrow Mountain cultural horizon. Thus, the applicability of Adaptive Flexibility to the Morrow Mountain occupations of the Inner Coastal Plain, specifically the Sandhills Province, could be possible. The following section will attempt to synthesize the data presented within this dissertation to understand Middle Archaic (specifically Morrow Mountain) settlement and land use on the South Atlantic Slope.

The Archaic Period on the South Atlantic Slope

By 10,000 BP, the earth entered the Holocene Epoch, characterized by a warmer climate associated with decreased glaciation, increased sea level, and an increased variety of biota that had been unavailable in the colder Pleistocene environment. Around the same time, human populations in the southeastern United States began to increase. Archaeologists recognize these changes by naming a cultural period known as the Archaic period that began at circa 10,000 BP. This period lasted until circa 3,000 BP.

During the Early Archaic period (circa 10,000 to 8,000 BP), population increase is suggested based on an increased number of prehistoric lithic scatters employing high-quality lithic raw materials and a curated tool technology of formal bifaces (e.g., Dalton, Hardaway-Dalton, Hardaway, Kirk, MacCorkle, Palmer, St. Albans, and Taylor) and other tools (e.g., hafted end-scrapers, drills, and awls). The remains of these small, highly mobile residential groups suggest that they employed a generalist foraging economy (Claggett and Cable 1982) and a logistic-based collector system in order to exploit both riverine and interriverine zones (Anderson and Hanson 1988; Rigtrup 2009) throughout the year.

The identification of large, aggregation sites within the Fall Zone of the South Atlantic Slope led archaeologists to hypothesize that Early Archaic bands met seasonally in macrobands to share knowledge and mates. Disagreement exists whether bands were organized within river drainages (Anderson and Hanson 1988), across numerous drainages (Bridgman Sweeney 2013), around sources of high-quality stone (Daniel 1994, 1998), or some combination of the above that varied through time.

By 8,000 BP, the beginning of the Middle Archaic, lithic artifact scatters in the Piedmont region of the South Atlantic Slope drastically changed. High-quality lithic raw materials were replaced by readily-available materials regardless of quality; and many of the specialized, formal tools of the preceding period were replaced with an expedient technological strategy of utilized flakes (Blanton 1983, 1984; Blanton and Sassaman 1989; Sassaman 1983, 1991). This technological change also occurred in the Sandhills Province of the Inner Coastal Plain (Anderson 1979a, 1996; Clement and Dawson 2007; Dawson et al. 2007; McMakin and Poplin 1997). Site locations suggest, however, that groups within the Morrow Mountain cultural horizon in the Middle Archaic continued to exploit both the riverine and interriverine/uplands environment of the Piedmont (Anderson et al. 1979; Sassaman 1983). An identical site distribution has been noted in the Sandhills Province; however, the riverine zones of the large rivers of the Sandhills show limited use compared to the riverine zones around the small tributaries (Clement and Dawson 2009; McMakin and Poplin 1997).

One major difference between the Early and Middle Archaic periods is climate: the Middle Archaic period corresponds to a period of increased temperature known as the Hypsithermal (Anderson et al. 2013; Delcourt and Delcourt 1984; Watts 1980). Overall, the Hypsithermal brought greater seasonal temperature extremes, meaning that the summers were warmer and the winters were colder than today in the southeastern United States (Anderson et al. 2013; Gunn and Foss 1992). Disagreement exists on the local effects of the Hypsithermal based on whether hotter temperatures were associated with wetter (e.g., Goman and Leigh 2004; Leigh and Feeney 1995; Taylor et al. 2011) or drier (e.g., Gunn and Foss 1992; Gunn and Wilson 1993; Watts 1980) conditions. Although Piedmont vegetation during the Middle Archaic period appears to have been stable (Anderson 1996:174; Delcourt and Delcourt 1984; Goodyear et al. 1979:29-30), some argue the Coastal Plain experienced instability. The quick transition from oak- to pine-dominated forests in the Sandhills Province during the Middle Archaic period created vegetation in this region similar to today, which consists of an overstory of pine and a scrub oak/wiregrass understory in the uplands (Taylor et al. 2011).

By the middle Holocene, the rate of sea level rise slowed. Modern estuaries and floodplains began to form, due in part to sea level changes and in part to increased precipitation that increased run-off and sedimentation in rivers throughout the Coastal Plain (Brooks et al. 1990). Within the Savannah River Valley region of the Inner Coastal Plain and the Sandhills Province, the modern floodplain along the main river channel was established by circa 4,000 ^{14}C yr BP, with formation of the tributary stream floodplains developing shortly thereafter (Brooks et al. 1990). If this timeframe is applicable to the Inner Coastal Plain and Sandhills region of central South Carolina, then the Morrow Mountain populations within the Sandhills and Inner Coastal Plain occupied the region prior to the formation of the modern floodplains.

As mentioned above, on the South Atlantic Coastal Plain, the Hypsithermal was associated with either wetter (e.g., Goman and Leigh 2004; Leigh and Feeney 1995; Taylor et al. 2011) or drier (e.g., Gunn and Foss 1992; Gunn and Wilson 1993; Watts 1980) conditions. Regardless, the hotter summers and colder winters led to environmental instability in the Coastal Plain (Gunn and Foss 1992). However, considering the fact that the Morrow Mountain cultural horizon lasted for two thousand years—a short time period geologically but a long time period anthropologically—it could have been punctuated with periods of both wetter and drier conditions due to fluctuations in atmospheric circulation patterns. Gunn and Foss (1992) mention cyclic patterns but still argue for drier conditions during the middle Holocene.

Whether the Hypsithermal resulted in wetter or drier conditions, in either case vegetation cover in the Sandhills likely remained open and supportive of large herbivores such as bison, elk, and white-tailed deer. During periods of increased precipitation (Goman and Leigh 2004; Leigh and Feeney 1995; Taylor et al. 2011), the high percolation rate of the sandy soils in the Sandhills Province provided well-drained soils as opposed to more poorly drained soils and ponding elsewhere. To maintain the open understory so enticing to large herbivores, Middle Archaic people could have undertaken seasonal low-level burnings to manage the Sandhills vegetation. If precipitation decreased while temperatures rose (Gunn and Foss 1992; Watts 1980), then the vegetation in the upland zones of the Sandhills Province would have naturally remained open. In either case, the Sandhills vegetation would have attracted large herbivores to the area and would have provided a reliable resource base to the mobile groups of Middle Archaic hunters and gatherers.

The quick transition from oak to pine during the Middle Archaic period (Taylor et al. 2011) would have created vegetation similar to today (an overstory of pine and a scrub oak/wiregrass understory) earlier than originally thought (Watts 1980). As noted above, this vegetation would have proved attractive to the large herbivores (e.g., bison, elk, and white-tailed deer). This, in turn, would have attracted highly mobile groups of hunters and gatherers to this region and provided a reliable food resource to Morrow Mountain groups within the Sandhills Province. In order to maintain the open vegetation, the Middle Archaic people could have manipulated their environment through seasonal burnings to keep the scrub oak understory from taking root, to promote acorn production, or to improve browse for deer. Taylor et al. (2011) propose that changes in the fire regime contributed to the ambiguity in terms of the rapid shift from oak to pine noted in the pollen record from the northeastern corner of Fort Jackson, Richland County, South Carolina.

The impact of human-induced fire regimes on vegetation in the eastern United States is just beginning to be understood and employed in discussion of archaeological settlement and land use. While climate change has undoubtedly impacted vegetation in the southeastern United States, the role of prehistoric populations in manipulating the vegetation has recently been shown to have had a substantial impact (Abrams and Nowacki 2008; Delcourt and Delcourt 1997; Nowacki and Abrams 2008; Stewart 2002; Wagner 2003). Researchers argue that the vegetation encountered by the first European settlers and explorers within the eastern United States had been substantially shaped by Native American burning and agricultural land use (Abrams and Nowacki 2008; Nowacki and Abrams 2008; Stewart 2002). Researchers (Abrams 1992; Abrams and Nowacki 2008; Lorimer 2001; Stewart 2002; Wagner 2003; Whitney 1994; Williams 2002) point out that prehistoric populations employed fire in a number of ways. Fire would have been used to clear forest undergrowth in order to spot and track game and/or to prevent ambush, to clear leaf litter for easier collection of nuts, and to clear trails and fields for planting. It also helped to reduce vermin, weeds, and flammable materials around habitations. Controlled burns improved hunting by opening woodlands, promoting acorn production, and improving browse for deer. Fire also helped protect the group by driving away enemies, helping escape from capture, and clearing brush from around habitations to prevent ambush (Abrams and Nowacki 2008:1124; Wagner 2003:133-134).

A comparison of the fossil pollen record, charcoal particle record, and archaeological record for the region around Horse Cove Bog, North Carolina, in the southern Appalachian Highlands has suggested that changes in pollen type and increases in charcoal quantities within the core samples were a result of human activities as far back as the Late Archaic period and not caused by climate change or lightning-induced fires (Delcourt and Delcourt 1997). Thus, the idea that prehistoric populations in the Sandhills Province of South Carolina were deliberately modifying the local vegetation through controlled burning (e.g., Taylor et al. 2011) is very plausible.

Archaeologically, the warmer temperatures and increased patchiness of the resource base caused a shift from logistic mobility and a curated technological strategy to residentially mobile foragers with an expedient technological strategy (Cable 1982, 1996). For the South Carolina Piedmont, Sassaman's application of Adaptive Flexibility provides a good explanatory model of Morrow Mountain land use, settlement, technological organization, and social structure. Highly mobile residential groups depended on both riverine and interriverine/upland zones. Utilization of these different resource zones was possible because of groups' generalized and expedient tool technology; their reliance on readily-available, local lithic raw materials; and their flexible behavioral responses in terms of group organization and social structure.

Gunn and Foss (1992) proposed that the Middle Archaic (Morrow Mountain and Guilford) occupants of Copperhead Hollow (38CT58), an upland Sandhills site, were visiting this location to hunt the large herbivores attracted to the open, uplands vegetation. Copperhead Hollow is situated on a landform (i.e., a sand dune) similar to that of site 38LX5, a Morrow Mountain horizon site situated in the Sandhills Province south of Fort Jackson, overlooking the Congaree River floodplain. Artifact analysis suggested that the recovery of a high number of utilized flakes at this site suggested it was used repeatedly for the hunting and processing of deer or other hunted animals by Morrow Mountain groups (Anderson 1979a:222-225). A high number of utilized flakes were also recovered from Area 1 of the Three Springs site. Could Area 1 have served as a location repeatedly visited by Morrow Mountain groups hunting white-tailed deer, elk, or bison?

The identification of large, Fall Zone sites (e.g., Nipper Creek [38RD18] and the Treehouse site [38LX531]) with evidence of Morrow Mountain period habitations (e.g., post molds, storage pits) suggests that like their Early Archaic predecessors (Anderson and Hanson 1988), Morrow Mountain groups were aggregating at Fall Zone sites, perhaps on a seasonal basis. If groups were seasonally gathering at the Fall Zone, then the seasonal movements of groups from the Piedmont into the Coastal Plain proposed for the Early Archaic period (Anderson and Hanson 1988) could be continuing through the early Middle Archaic period. Seasonal aggregation would have employed logistic mobility. Technological strategies associated with logistic mobility would include the acquisition of higher quality lithic raw materials and a curated technological strategy (Andrefsky 2005; Binford 1980; Cable 1982).

Concluding Remarks and Future Research

Based on the results of analysis of the lithic artifacts from Area 1 of the Three Springs site, I argue that the expectations outlined in the five hypotheses have been met and that the Adaptive Flexibility model is applicable to the Morrow Mountain horizon in the Sandhills Province of the Inner Coastal Plain. However, I do not think Adaptive Flexibility adequately addresses the potential reasons that Morrow Mountain populations shifted the focus of their time and energy away from procuring high quality lithic raw material and changing lithic technologies for approximately two thousand years. Viewing this dataset from a larger, regional viewpoint, I argue that residentially mobile groups entered the Sandhills Province seasonally to exploit the large herbivore populations in the open vegetation characteristic of the uplands. Similar to the Piedmont Morrow Mountain, Sandhills Morrow Mountain populations continued to practice the technological organization (expedient tool technology using readily-available and local raw materials), social organization (individual choice in terms of group membership, nascent group ownership of resources, but equal access to resources), and a foraging-based economy associated with Adaptive Flexibility.

However, I argue that more was occurring within the Morrow Mountain populations of the Sandhills Province and I speculate that Morrow Mountain groups within this region may have ameliorated vegetation through controlled burns in the uplands (e.g., Wagner 2003) and/or opening up canopy around nut trees (e.g., Abrams and Nowacki 2008) in order to maintain an attractive location for bison, elk, and white-tailed deer populations (Taylor et al. 2011). Such actions can result in changes in the gene pool of weedy plants (Delcourt and Delcourt 2004; Delcourt et al. 1998; Gardner 1997;

Gremillion 1998, 2004; Moore and Dekle 2010; Wagner 2003, 2005). The development of the Eastern Agricultural Complex evident by the Late Archaic period was facilitated through the use of controlled burns and the intentional or unintentional modification of forested areas (Delcourt et al. 1998; Moore and Dekle 2010). However, archaeological evidence for human-induced controlled burns and the intentional or unintentional modification of trees or weedy plants is difficult, if not impossible, to support with the current archaeological and palynological dataset for the Sandhills Province.

I find it difficult to believe that for two thousand years, a cultural horizon changed so little in terms of their lithic technology—the lasting archaeological remains of this culture. Thus, in opposition to the avoiding both the accrual of social debt and an attachment to property as proposed by Adaptive Flexibility, I argue that Morrow Mountain groups invested their time (time made available by not changing their lithic technology) in improving the upland zone vegetation, and thus their resource base, within the Sandhills Province (and also the Piedmont region?) for the benefit of the group. Resource management resulted in a conscious decrease of territory size in order to protect group investments. By the final centuries of the Middle Archaic period, management investment in specific territories (and thus a rise in territoriality and the control of both biotic and abiotic resources) resulted in group differentiation, as shown in the rise of different point types such as Guilford, Guilford Stemmed, Brier Creek, and Allendale/MALA. The transition from unintentionally to deliberately changing nature (Abrams and Nowacki 2008; Nassaney and Cobb 1991:288-292) continued throughout this period and resulted in the creation of the first hand-built, low-fired pottery (Stallings Fiber Tempered pottery) in the Savannah River Valley and Georgia Coastal Plain

(Sassaman 1998) and the domestication of plants by the Late Archaic period (Delcourt et al. 1998; Fritz 1990; Moore and Dekle 2010).

The one consistent feature of hunter-and-gatherer society is the lack of a consistent pattern (Kent 1992, 1996; Price 2002). With that said, it is important to remember that one explanation will not explain the entire lifeway of one group or cultural period because, in truth, we have no way to know what was happening thousands of years ago. This dissertation has offered one view or, more accurately, has proposed that Sassaman's (1991) model of settlement and land use for the South Carolina Piedmont can be applied to the Sandhills Province. However, this dissertation goes further by planting the seed that Morrow Mountain populations were consciously engaged with the resources in their changing environment and were among the earliest groups to move from unintentionally to intentionally improving their resource bases.

Additional research will be needed to confirm or dispute this proposition. In order to fully understand the Middle Archaic period in South Carolina and the larger South Atlantic Slope, the addition identification and excavation of occupation clusters is needed. Research should focus on the Sandhills Province, the Fall Zone, and the Outer Coastal Plain. Macrobotanical, faunal, and microbotanical data are also needed to broaden our interpretations of the archaeological remains for the Morrow Mountain cultural horizon, the preceding Stanley horizon, and the proceeding Guilford, Brier Creek, and Allendale/MALA horizons.

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APPENDIX A
SCIENTIFIC NAMES OF PLANTS
AND ANIMALS

Common Name—Plants	Scientific Name
Alder	*Alnus* sp.
Azalea, swamp	*Rhododendron viscosum*
Bald cypress	*Taxodium distichum*
Bay, loblolly	*Gordonia lasianthus*
Bay, red	*Persea borbonia*
Bay, sweet	*Magnolia virginiana*
Blueberry, highbush	*Vaccinium formosum*
Cedar, Atlantic white	*Chamaecyparis thyoides*
Cherry, black	*Prunus serotina*
Fetterbush	*Lyonia lucida*
Goldenrod, wooden	*Chrysoma pauciflosculosa*
Grape, muscadine	*Vitis rotundifolia*
Grape, summer	*Vitis aestivalis*
Greenbrier	*Smilax rotundifolia*
Gum, black	*Nyssa sylvatica*
Holly	*Ilex opaca*
Honey cup	*Zenobia pulverulenta*
Maple, red	*Acer rubrum*
Myrtle	*Myrica* sp.
Oak	*Quercus* sp.
Oak, blackjack	*Quercus marilandica*
Oak, bluejack	*Quercus incana*
Oak, sand post or Margaret's	*Quercus margarettae*
Oak, southern red	*Quercus falcata*
Oak, turkey	*Quercus laevis*
Pepperbush, sweet	*Clethra alnifolia*
Persimmon	*Diospyros virginiana*
Pine	*Pinus* sp.
Pine, longleaf	*Pinus palustris*
Pine, pond	*Pinus serotina*
Rosemary	*Ceratiola ericoides*
Sand myrtle	*Leiophyllum buxifolium*
Sassafras	*Sassafras albidum*
Sheepkill (sheep laurel)	*Kalmia angustifolia*
Sparkleberry	*Vaccinium arboretum*

Common Name—Plants (con't)	Scientific Name
Sumac, poison	*Toxicodendron vernix*
Tulip tree (Tulip poplar)	*Liriodendron tulipifera*
Willow, Virginia	*Itea virginica*
Wiregrass	*Aristida stricta*

Common Name—Animals	Scientific Name
Bear, black	*Ursus americanus*
Bison	*Bison*
Bobcat	*Lynx rufus*
Deer, white-tailed	*Odocoileus virginianus*
Elk	*Cervus canadensis*
Fox, gray	*Urocyon cinereoargenteus*
Opossum	*Didelphis virginianus*
Raccoon	*Procyon lotor*
Skunk	*Mephitis*
Squirrel	*Sciurus* sp.
Turkey	*Meleagris gallopavo*