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I am submitting herewith a thesis written by Joseph L. Tippett entitled "The Spatial Distribution of Lithic Materials: Implications for Early and Middle Archaic Hunter-Gatherer Mobility in South Carolina." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Anthropology.

Walter E. Klippel, Major Professor

We have read this thesis
and recommend its acceptance:

Accepted for the Council:

Associate Vice Chancellor
and Dean of the Graduate School

THE SPATIAL DISTRIBUTION OF LITHIC MATERIALS: IMPLICATIONS FOR EARLY AND MIDDLE ARCHAIC HUNTER-GATHERER MOBILITY IN SOUTH CAROLINA

A Thesis Presented for the Master of Arts Degree
The University of Tennessee, Knoxville

Joseph L. Tippett
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DEDICATION

I would like to dedicate this thesis to my wife, Keturah Faurot Burnham, without whose support this research would not have been possible.

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The frequency polygons presented in Chapter V were produced by Dr. Sassaman.

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ABSTRACT

Trends in the spatial distribution of lithic material types used in the manufacture of hafted bifaces have been identified by archaeologists working on problems of culture history in the southeastern United States (Caldwell 1954, 1958; Coe 1952, 1964; Chapman 1975, 1977). In this thesis, these trends are further documented and refined for North and South Carolina during the Early and Middle Archaic periods (ca. 9,500-6,000 B.P.).

The lithic material type and county proveniences have been analyzed for a robust sample of 13,389 Palmer\Kirk Corner Notched and Morrow Mountain I\Morrow Mountain II hafted bifaces. By focusing on the distribution of highly siliceous stone material from spatially circumscribed source areas, the author is able to suggest that hunter-gatherer territorial ranges were extensive during the Early Archaic period in the South Carolina Piedmont. Based on the evidence presented herein, it is hypothesized that band territories include multiple drainages with frequent movement across the grain of the Piedmont's river systems. This interpretation runs counter to the popular Anderson-Hanson (1988) single drainage band-macroband settlement model.

The long held belief that Middle Archaic band ranges were spatially limited is supported by an analysis of lithic materials which traditionally fall within the metavolcanic category. Increased use of local nonrhyolitic metavolcanic lithic material for the

manufacture of Morrow Mountain I\Morrow Mountain II hafted bifaces indicates reduced access to traditional lithic resource areas.

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CHAPTER I

INTRODUCTION

The purpose of this research is the testing of several expectations about hunter-gatherer mobility during the Early and Middle Archaic periods derived from current settlement models. The study analyzes spatial and temporal trends in lithic material variability for North and South Carolina during the Palmer-Kirk (ca. 9,500-8,800 B.P.) and Morrow Mountain (ca. 7,500-6,000 B.P.) phases . Lithic material frequency data obtained from a secondary analysis of Palmer\Kirk Corner Notched and Morrow Mountain I\Morrow Mountain II hafted bifaces is used to document the spatial distribution of lithic material categories.

A series of spatial transects are utilized to organize the data and track the movement of extralocal lithic material across the landscape. The results, which also include information on lithic material diversity, are applied to a series of expectations about Early and Middle Archaic hunter-gatherer mobility. Conclusions are drawn concerning the probable orientation and extent of hunter-gatherer group mobility on the South Atlantic Slope during the Palmer-Kirk and the Morrow Mountain phases.

The distribution of extralocal lithic material can be accounted for by either group mobility and\or exchange between individuals. At the present time, we lack the methods necessary to distinguish between the archaeological correlates of these two behavioral patterns. I have taken the position that whatever the mechanism of transport, extralocal material was moving across the Early and Middle Archaic landscape either for use or exchange. It follows, that lithic material distributions reflect the extent and orientation of specific interaction ranges. For the purpose of this thesis, the term mobility is used with the understanding that exchange could also account for a portion of the observed spatial variation.

Chapter I presents the general theoretical basis of the thesis. This research has been heavily influenced by a set of "middle range theories" about hunter-gatherer technological and spatial organization principally developed by Lewis R. Binford. As a group, these paradigms link the statics of the archaeological record with the dynamics of hunter-gatherer behavior (Binford 1977, 1979, 1980, 1982). In general, this framework of organizing principles has been incorporated into the Early and Middle Archaic settlement models summarized here.

The spatial trends in lithic raw material variability presented in this thesis cannot be understood without reference to the landscape of North and South Carolina. Chapter II contains a discussion of the contemporary and paleoenvironmental contexts of the research area. The emphasis is on data useful for the interpretation of large scale patterning in the distribution of lithic resources. Much of the reasoning about prehistoric hunter-gatherer mobility is based on the spatial analysis of specific types of lithic resources. This is especially true of the lithic resources exploited in the research area during the Early and Middle Archaic periods.

Chapter III summarizes the Archaic chronology of North and South Carolina (Chapman 1975, 1977, 1985; Coe 1964). The research design calls for a secondary analysis of lithic material categories derived from hafted biface types that are temporally sensitive and widely distributed. The Palmer-Kirk Corner Notched and Morrow Mountain types meet the following selection criteria: (1) they have been consistently identified from well documented stratigraphic contexts, (2) they are associated with a series of radiocarbon dates and (3) they have a wide and well defined geographic distribution. This critical approach resulted in the selection of Palmer-Kirk Corner Notched and Morrow Mountain I\Morrow Mountain II type hafted bifaces as sampling units from which temporally sensitive information about the distribution of raw materials was obtained.

Over the last two decades Southeastern archaeologists have created Early and Middle Archaic settlement-subsistence models to explain selected aspects of the archaeological record. Several of these models pertain to the study area. In Chapter III these models are discussed from the perspective of Early and Middle Archaic hunter-gatherer group mobility.

The North and South Carolina data sets are considered in Chapter IV. Special attention is paid to the methods used to capture the information. Known sampling biases are discussed, as are a set of operating assumptions about the limitations and opportunities presented by these two unique data sets. Sampling and analytical units are defined in Chapter IV.

The methodology employed for the analysis is detailed in this chapter. It consists of cross tabulations between categories of lithic materials and county proveniences. The contingency tables are filled with raw frequency data. In order to mute the influence of sample size, the counts are converted to percentages. The relative percentages are displayed as a series of graphs containing frequency polygons.

A county by county comparison of the incidence and distribution of lithic materials along a series of spatial transects is preformed and the results interpreted in Chapter V. Each graph characterizes the spatial distribution of the materials along transects selected to address specific propositions about Early and Middle Archaic hunter-gatherer mobility. Expectations about the range and orientation of hunter-gatherer group mobility are evaluated in light of the findings. Both the synchronic and time transgressive implications of the analysis are discussed.

Chapter VI presents a summary of the results and implications of this research for regional settlement models. A regional approach to the identification, mapping and sampling of lithic quarry clusters is presented as one approach to the resolution of contending ideas about hunter-gatherer group mobility and late prehistoric lithic material exchange. Following Daniel and Butler (1990), further work on the identification of Piedmont and Coastal Plain quarry sites is proposed along with a program of lithic resource finger-printing through petrographic and chemical analysis.

THEORETICAL BACKGROUND

This research is dependent on a series of basic operating principles drawn from the theories of cultural evolution, materialism and ecology (Carneiro 1968; Harris 1968; Thomas 1979). Culture is viewed as a complex adaptive system by which man adjusts to variation in the social and biophysical environment (Carneiro 1968; Clarke 1968; Kirch 1980). Cultural systems are composed of articulated interacting subsystems which broadly reflect the three primary means by which societies adapt to their environments: social, technological and ideational (Carneiro 1968; Steward 1955).

The unique time depth of the archaeological record allows archaeologists to contribute to anthropology through the study of cultural differences and similarities (Harris 1968; Thomas 1979). In this thesis that task is accomplished through a comparative study of technological organization during the Early and Middle Archaic periods in North and South Carolina. The focus of the research is on the distribution of lithic raw materials. This approach recognizes the importance of lithic technology within the adaptational systems of prehistoric hunter-gatherers and the utility of lithic assemblages for comparative purposes.

The chief contributions of this thesis can be partitioned into two categories based on the relative mix of empirical and theoretical observations contained in each. The first category is largely empirical and concerns the extraction of patterning from the archaeological record. Specifically, the distribution of lithic raw material is used to address expectations about the extent and orientation of hunter-gatherer mobility across the landscape of North and South Carolina during the Palmer-Kirk phase (ca. 9,500-8,800 B.P.) and the Morrow Mountain phase (ca. 7,500-6,000 B.P.).

The analysis of lithic raw material spatial variation is a precondition for evaluating different expectations about the orientation and range of hunter-gatherer mobility. It has been demonstrated that the distribution of extralocal raw material can be used to track mobility in those cases where resources are spatially incongruent (Anderson and Hanson 1988; Sassaman et al. 1988; Sassaman 1991). The temporal and spatial structure of extralocal raw material spatial variation is linked to hunter-gatherer mobility through a series of bridging arguments about the organizational aspects of lithic resource procurement (Binford 1980).

The evaluation of competing expectations is a precondition for the revision of existing settlement models. It is hoped that the observations made in this thesis will initiate a cycle of settlement model assessment and revision on the South Atlantic Slope. The importance of models to archaeological research is appropriately defined by Binford (1972:456) when he states that: "It is model building and testing in the context of comparative studies of patterning and their implied organization characteristics which will greatly expand our knowledge of the past.".

RESEARCH PROBLEM

The documentation of lithic resource spatial variation provides a base-line for evaluating, resolving and revising models of hunter-gatherer mobility and band range. Comparative studies of lithic raw material distribution designed to address Archaic period hunter-gatherer mobility have been previously conducted for the Savannah River Valley and across much of the South Carolina Coastal Plain (Anderson and Hanson 1988; Sassaman et al. 1988; Sassaman 1991). Following in the path of these earlier studies, a series of five linear transects have been selected for analysis to provide additional comparative information on the distribution and proportions of tractable lithic raw materials occurring in Early and Middle Archaic assemblages.

During the initial Palmer\Kirk phases of the Early Archaic, high quality cryptochrystalline raw material was extensively utilized for the production of formal stone tools (Goodyear et al. 1979). The analysis of Early Archaic assemblages from across the Piedmont and Coastal Plain has documented relatively high proportions of cryptochrystalline raw materials at significant distances from their source areas (Anderson et al. 1979; Anderson et al. 1982; House and Wogaman 1978; Tippitt and Marquardt 1984; Wetmore and Goodyear 1986). The presence of Coastal Plain chert away from its source area has been used by several researchers to infer group mobility patterns and\or exchange for the period (Anderson and Schuldenrein 1983; Anderson and Hanson 1988; Daniel 1991; O'Steen 1991; Sassaman et al. 1988).

By the close of the Early Archaic period the proportion of noncryptochrystalline lithic resources being utilized for the manufacture of stone tools was increasing as a percentage of the total raw material assemblage. This change in lithic resource procurement occurred against a backdrop of changing technological organization characterized by the gradual abandonment of highly curated tool kits in favor of expedient situational gear.

This trend continued into the Middle Archaic, reaching its maximum expression during the Morrow Mountain I and II phases (Blanton 1983; Claggett and Cable 1982; Sassaman 1983). The increasing use of local raw materials associated with a technological focus on expedient tools has been used to infer significant changes in hunter-gatherer technological organization and mobility on the South Atlantic slope during the Holocene (Blanton and Sassaman 1989; Claggett and Cable 1982). Chapman (1985) presents evidence from the Little Tennessee River Valley that Middle Archaic groups procured lower quality lithic resources in areas typified by highly tractable Ridge and Valley cherts. The growing dependence on localized lithic resources that are often of inferior quality appears as a pan regional phenomenon during the Middle Archaic period from the Ridge and Valley across the Appalachians to the South Atlantic Slope (Canouts and Goodyear 1985; Chapman 1985; Purrington 1984).

These generalizations about lithic resource procurement during the Early and Middle Archaic periods have been linked to specific hunter-gatherer adaptive strategies through a series of settlement-subsistence models (Anderson and Schuldenrein 1983; Anderson and Hanson 1988; Blanton and Sassaman 1989; Claggett and Cable 1982; Chapman 1985; Daniel 1991; Goodyear et al. 1979; House and Wogaman 1978; O'Steen 1991; Sassaman et al. 1988; Sassaman 1991). This series of competing settlement models provide a point of departure for the analysis of lithic raw material variability in terms of hunter-gatherer group mobility.

The existing models can be divided into two groups based on differing interpretations of the mix of collector versus forager strategies used by hunter-gatherers during the Archaic period. A dichotomous settlement system, logistically organized and partitioned into seasonally occupied base camps and extractive loci has been proposed for the Early Archaic (Chapman 1985; Gardner 1977, 1983; Goodyear et al. 1979; House and Wogaman 1978).

An alternative settlement model for the period has been proposed. It is based on an increased proportion of residential mobility in the seasonal round (Anderson and Hanson 1988; Anderson and Schuldenrein 1983; Claggett and Cable 1982). This change in adaptational strategy is believed to have been in response to the emergence of a homogenous hardwood canopy over the southeastern Atlantic Slope during the early Holocene (Anderson and Hanson 1988:264; Claggett and Cable 1982:684).

In general these models are robust, with clear archaeological implications for the technological organization of Early and Middle Archaic hunter-gatherers. As such, they are an ideal source of expectations about the orientation and range of collector and forager groups across the landscape of North and South Carolina. The evaluation of these competing positions of Early and Middle Archaic hunter-gatherers is the principal goal of this thesis.

The data for the spatial analysis was obtained from the artifact and projectile point classification studies conducted by the South

Carolina Institute of Archaeology and Anthropology and the Research Laboratories of Anthropology, University of North Carolina at Chapel Hill (Charles 1981, 1983, 1986; Davis and Daniel 1990). The North and South Carolina data sets contain information on over 100,000 hafted bifaces organized by site and county proveniences.(Anderson 1991:99). The authors have succeeded in organizing a body of data from private and institutional artifact collections which is of great value to scholars seeking to understand the broad patterns of Archaic period hunter-gatherer mobility on the South Atlantic Slope.

Lithic material variability during the Early and Middle Archaic periods is isolated from the North and South Carolina data sets by: (1) selecting hafted bifaces for the analysis on the basis of regional comparability; (2) partitioning the samples by lithic material category; (3) constructing a series of linear transects composed of contiguous counties for comparative purposes; (4) graphing the relationship between lithic material percentages and distance from source areas using frequency polygons; (5) comparing lithic material percentages for the Early Archaic period within and between these linear transects; (6) comparing Early Archaic and Middle Archaic lithic resource variability using the frequency polygons.

By conducting this analysis, the broad patterns of lithic resource procurement and utilization during the Early and Middle Archaic periods on the South Atlantic Slope are revealed. These patterns represent the archaeological correlates of hunter-gatherer technological organization and can be interpreted in terms of group mobility.

CHAPTER II

THE GEOLOGY, PHYSIOGRAPHY AND GENERAL ENVIRONMENTAL CHARACTERISTICS OF THE RESEARCH AREA

It is broadly recognized that human groups interact with the environment through a complex system of adaptive behaviors (Binford 1968; Flannery 1968; Steward 1955; White 1959). It is further recognized that the environment acts to limit the range of cultural variation (Kirch 1980). These theoretical concepts act to define the relationship between the biophysical environment and human adaptation. The interaction between prehistoric adaptational systems and the environment sets the theoretical boundary conditions for this discussion of the research areas environmental characteristics. Only those parts of the environment believed to have most influenced prehistoric hunter-gatherer adaptive systems are included in the discussion.

The presentation of environmental information in this chapter is topical in organization. Complete areal coverage of the various subdivisions of the Piedmont and Coastal Plain has been sacrificed in favor of a more detailed description of topics relevant to this thesis. For example, far more emphasis is placed on the geology of the research area than is placed on its flora and fauna.

The scale of the areal coverage is based on the physiographic division of the study area into Piedmont and Coastal Plain physiographic units (Fenneman 1938). It is acknowledged that much local variation will be masked by this approach. However, the scale is consistent with the goals of the research.

PHYSIOGRAPHY

The research area includes parts of the Piedmont of North and South Carolina and the Coastal Plain of South Carolina (Figure 2.1). These areas encompass approximately 80,800 square km (50,500 square miles) of terrain. A combination of present day physiographic and political features are used to define these boundaries. The western and eastern boundaries of the research area are defined by the ridges of the Appalachian Mountains and the shoreline of the Atlantic Ocean. The southern boundary of this area is formed by the Savannah River which also serves as the administrative line of demarcation between the states of Georgia and South Carolina. Approximately, 480 km (300 miles) north of the mouth of the Savannah River lies the border between North Carolina and Virginia at 36 degree 30 minute N latitude (Figure 2.1). This line is arbitrary reflecting political and administrative convenience rather than a definitive biotic, physiographic or cultural boundary. The linear cross country transects used to analyze the spatial component of lithic material variability are contained within this broad expanse of territory (Figure 2.2).

The Piedmont represents a highly dissected plateau of river valleys and intervening ridges. At its widest point in North

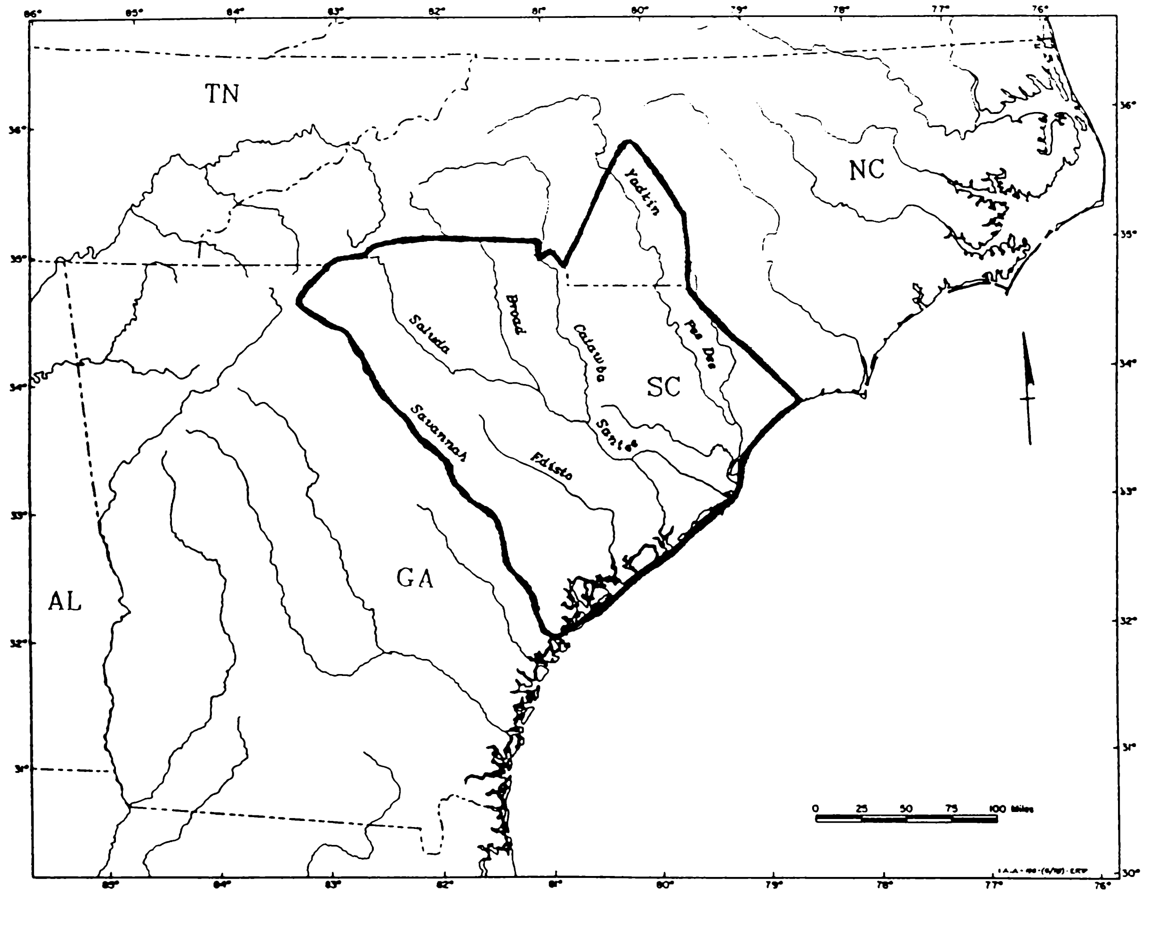


Figure 2.1. Location of the Research Area.

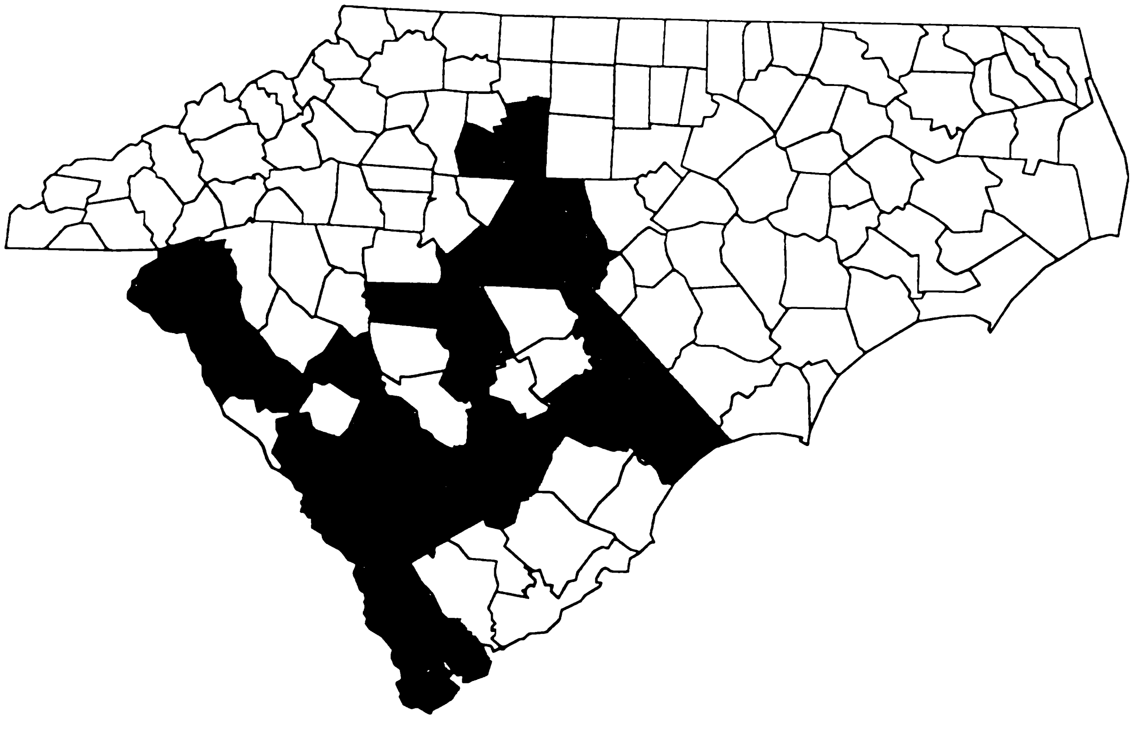


Figure 2.2. Location of the Spatial Transects in North and South Carolina.

Carolina, the Piedmont is about 240 km (150 miles) wide. Elevations vary from about the 610 m (2000 feet) along the Blue Ridge Escarpment to approximately 91 m (300 feet) above mean sea level adjacent to the Coastal Plain. The relief is expressed as a series of northeast to southwest trending ridges with little local variation across drainages.

The Piedmont is dotted with discrete areas of highly resistant crystalline rock formed from igneous plutons of Triassic age (Kovacik and Winberry 1989). These topographic features, known as monadnocks, rise some hundreds of feet above the surrounding terrain. Perhaps the most famous of these is Stone Mountain in Georgia.

The Fall Line forms an irregular boundary between the Piedmont and Coastal Plain Provinces in South Carolina (Figure 2.1). About two-thirds of the State of South Carolina falls within the Coastal Plain Province which is divided into three physiographic regions: the Upper, Middle and Lower Coastal Plain (Snyder et al. 1983). Elevations range from sea level near the coast to about 91 m (300 feet) along the Citronelle Escarpment (Kovacik and Winberry 1989).

The Upper Coastal Plain is an ancient sand dune system which extends southeast from the Fall Line to the Citronelle Escarpment. These dunes have been shaped by erosion into a belt of sandhills extending from Georgia through North Carolina. Known locally as the Carolina Sand Hills, these topographic features are moderately sloped, irregularly shaped and generally rounded (Snyder et al. 1983).

The Middle Coastal Plain is located between the Citronelle and Surry escarpments. Further east, the Lower Coastal Plain extends from the Surry Escarpment to the present day coastline. The Middle and Lower Coastal Plain have been sculpted by a series of Pleistocene Epoch sea level fluctuations linked to world wide patterns of glacial advance and retreat. These cyclic sea level transgressions and regressions left behind a series of terraces (Brandywine, Coharie, Sunderland, Wicomio, Penholoway, Talbot, Pamlico and Recent) across the region (Cooke 1936).

The influence of river systems on the physiography of the study area and the culture of its people cannot be overestimated. In the southern Piedmont water has acted as the principal erosive agent sculpting well rounded hills and long relatively flat topped ridges. Over the millennia, running water in streams and rivers has dissected the Piedmont plateau, cutting down through the basement rocks of the region. This has produced a complex dendritic system of northwest to southeast trending rivers and tributary streams. In the Coastal Plain, relic terraces and sand dune ridges often divert rivers for short stretches along their route to the sea (Kovacik and Winberry 1989).

People, game and goods have moved along North and South Carolina's rivers since prehistoric times and continue to do so today. The northwest to southeast trending river valleys allowed uninterrupted access from the coast to the interiors of both states. Movement up and down the regions river valley corridors appears to have been a major component of prehistoric adaptation to the post Pleistocene environment (Coe 1964; Anderson and Hanson 1988). The archaeological implications of a adaptive strategy based on hunter-gatherer transhumance within and across specific drainage basins forms the principal focus of this research effort.

The Piedmont and Coastal Plain is drained by seven major river systems: the Tar, the Nuese, the Cape Fear, the Yadkin-Pee Dee, the Catawba-Santee, the Ashepoo-Combahee-Edisto and the Savannah (Figure 2.1). The northern most Piedmont is drained by the Dan River and its tributary streams. Further south the Tar, Nuese and Cape Fear systems drain the central portions of the North Carolina Piedmont.

The Piedmont sections of south central North Carolina and northeastern South Carolina are drained by the Yadkin-Pee Dee River systems. Central South Carolina is dominated by the Catawba, Broad and Saluda Rivers which join to form the massive Santee drainage basin. The head waters of the Ashepoo, Combahee and Edisto Rivers originate in the southeastern portion of the South Carolina Piedmont. The final drainage system affecting the study area is the Savannah River and its tributaries. The Savannah River watershed includes the southwestern section of the South Carolina Piedmont.

GEOLOGIC FORMATIONS

Because this thesis examines the procurement and utilization of lithic resources, the origin and nomenclature of the research areas geologic formations is explained in some detail. Today, the geologically passive landscapes of the Carolina Piedmont obscure the violent nature of the province's origin. About 750 to 700 million years ago, during the Precambrian Epoch, tectonic forces began to rift the Laurentian continental mass (Horton and Zullo 1991). This initiated a process of faulting and folding which resulted in the formation of the Appalachian Mountains about 470 million years ago.

Between 330 to 270 million years ago, the protocontinent of Larentia drifted eastward colliding with Gondowanaland to form the ancient land mass of Pangea (Horton and Zullo 1991). The massive pressures which characterized this cycle of continent building transformed the region's igneous and sedimentary rocks into metamorphic types. The region was again geologically active during the Mesozoic, about 225 million years ago, when rifting formed a series of sedimentary basins (Horton and Zullo 1991). The sedimentary and igneous rocks that filled these Triassic basins are discontinuously exposed across the North Carolina Piedmont and South Carolina Coastal Plain (Olson et al. 1991).

The geology of the South Carolina Coastal Plain province is dominated by beds of shallow-marine, estuary, shoreline, and fluvial sediments and sedimentary rocks (Feiss et al. 1991:339). Since the Cretaceous, cycles of sea level rise and fall has resulted in the deposition of sands, silts and clays over crystalline and sedimentary basement rocks of pre-Mesozoic and Mesozoic age (Horton and Zullo 1991:6).

Geologically the Piedmont of North and South Carolina is a complex zone of igneous and metamorphic rocks altered by dislocation and contact metamorphism at a regional scale (Overstreet and Bell 1965). Dislocation metamorphism is associated with faults lines and fracture planes in the earth's crust. Movement along fault lines generates the heat and pressure which alters the chemistry, mineralogy and structure of the parent materials. Regional metamorphism is a geologic process usually associated with episodes of orogeny (Horton and Zullo 1991). During this process deeply buried rocks are metamorphosed by the high pressures and temperatures generated by crustal warping and faulting. Finally, contact metamorphism alters the chemical composition, mineralogy and texture of parent material in contact with, or under the influence of, magmatic intrusions.

The geologic descriptions of the Piedmonts' primary rock formations contain many references to different types of gneiss and schist. These terms are associated with metamorphism which accounts for their frequent use as a descriptive prefix in front of common Piedmont rocks and rock formations (Overstreet and Bell 1965). The name gneiss is used to identify medium to coarse grained crystalline rocks in which granular minerals are more abundant than those characterized by a platy structure (Dietrich and Skinner 1979:258). Schistose rocks are dominated by minerals with a platy structure. Both types of rock are common within the metamorphosed rock formations of the Carolina Piedmont (Horton and Zullo 1991).

The basement rocks of the Carolina Piedmont are arranged in a series of northeast trending belts which gradually slope to the east at a rate of about 20 feet per mile near the edge of the Coastal Plain (Secor and Wagener 1968) (Figure 2.3.). Between the Appalachian Mountains and the Coastal Plain, these structures are: the Blue Ridge Belt, Brevard Belt, Inner Piedmont Belt, Kings Mountain Belt, Charlotte Belt and Carolina Slate Belt (Overstreet and Bell 1965).

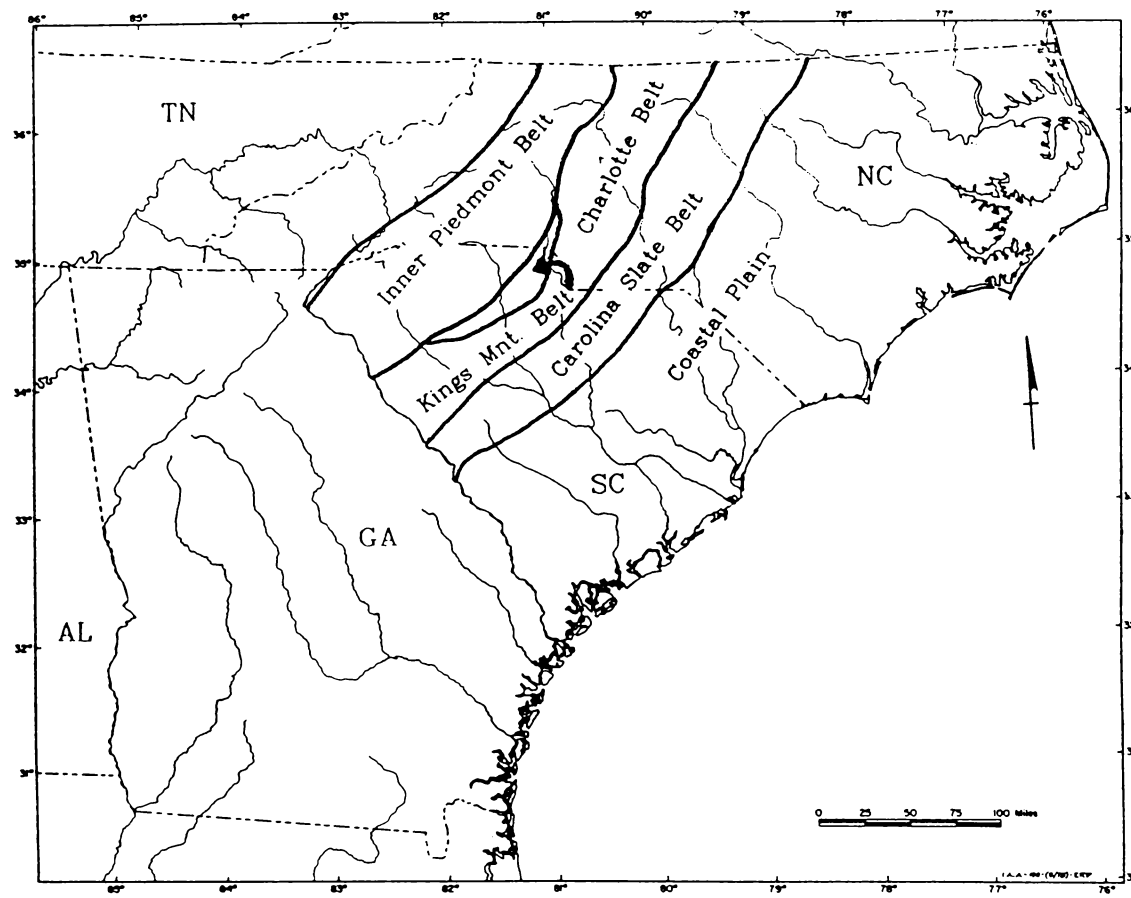


Figure 2.3. Location of the Principal Geologic Formations in North and South Carolina.

At the Fall Line, the rocks of the Carolina Slate Belt are unconformably overlain by Cretaceous sediments of marine origin (Secor and Wagener 1968).

The Inner Piedmont, Charlotte and Carolina Slate belts are characterized by rocks of the green schist and Amphibolite facies (Overstreet and Bell 1965). Both facies describe rocks which have been altered from their original igneous and sedimentary mineralogical and structural states.

The rocks of the Amphbolite facies were produced under the higher temperatures and pressures characteristic of medium to high grade metamorphism. Hornblende, plagioclase and biotite are included in the mineral assemblage which characterizes the Amphibolite facies (Dietrich and Skinner 1979:236). Surface investigation of outcrops and exposures along the Inner Piedmont and Charlotte belts has revealed extensive deposits of muscovite schist, mica gneiss, granitoid gneiss, hornblende gneiss and amphibolite (Overstreet and Bell 1965).

The greenschist facies refers to rocks produced under low grade metamorphism. The minerals quartz, albite, biotite, chlorite and epidote are abundant in these rocks which accounts for the color and schistosity of the facies (Secor and Wagener 1968). Greenstone is an old geological term used to describe rocks typical of the greenschist facies (Matthews and Boyer 1976).

Mesozoic magmatic plutons and dikes invaded these Precambrian and Paleozoic metamorphic belts about 200 million years ago (Horton and Zullo 1991). Magmatic intrusion initiated periods of contact metamorphism which have added to the array of minerals and rock types occurring throughout the Piedmont. For example, the fine grained crystalline hornfels and hornblendes of the Carolina Slate belt were produced by the alteration of parent material in contact with magmatic intrusions (Secor and Wagener 1968).

The Carolina Slate Belt contains dark (mafic) to light (felsic) colored metavolcanic and metasedimentary rocks of Late Proterozoic to Cambrian age (Butler and Secor 1991). The belt extends from Virginia to Georgia along a northeast to southwest trending line reaching its maximum width of approximately 140 km (87 miles) in central North Carolina (Butler and Secor 1991:66). Geologists estimate that the stratigraphic sequence may be as much as 13 km (8 miles) thick (Butler and Secor 1966:66). Slate Belt rocks have been identified in lithic material assemblages from prehistoric sites throughout North and South Carolina (Coe 1964; Claggett and Cable 1982; Goodyear et al. 1979; House and Ballenger 1976; Taylor and Smith 1978; Weisenfluh 1978; Wetmore and Goodyear 1986).

The metavolcanic rocks of the Carolina Slate Belt primarily consist of rock fragments mechanically deposited (epiclastic) and\or aerially ejected (pyroclastic) and deposited at the surface during periods of active volcanism (Butler and Secor 1991; Dietrich and Skinner 1979). It is estimated that lava flows constitute less than 10 percent of the belt (Butler and Secor 1991:66). However, Butler and Secor (1991) note that lava flows are common near centers of volcanic activity like the Albermarle-Asheboro geologic region of North Carolina.

The Albermarle-Asheboro region represents one of the most intensely studied areas of the Carolina Slate Belt (Daniel 1992: personal communication). The region includes the Uwharrie Mountains which are well known for their prehistoric rhyolite quarries (Daniel and Butler 1990). A series of stratigraphic units have been identified in the Albermarle-Asheboro region including the Morrow Mountain Rhyolite and Badin Greenstone members of the Tater Top Group (Butler and Secor 1991:68). A revision of the local sequence based on chronostratigraphic analysis has placed the Badin Greenstone and Morrow Mountain units in the Albermarle Group. They are bracketed by dates of ca. 586 my and ca. 540 my (Butler and Secor 1991:69).

The age, stratigraphic position and exposures of the Morrow Mountain Rhyolite unit is of prime importance to archaeologists interested in lithic material distribution and its relationship to Archaic hunter-gatherer mobility on the South Atlantic Slope (Anderson and Hanson 1988; Anderson and Schuldenrein 1983; Blanton 1983; Daniel 1991; Sassaman 1991; Sassaman et al. 1988). In addition to rhyolite, extensive beds of ash-fall tuffs, welded vitric tuffs and devitrified volcanic glass, are exposed in the Asheboro-Albermarle region (Butler and Secor 1991:69). There is evidence to suggest that, like rhyolite, these materials were quarried and utilized during the Early and Middle Archaic periods (Charles 1992: personal communication; Daniel 1992:personal communication). The percentages of Palmer\Kirk Corner Notched and Morrow Mountain hafted bifaces made from different types of metavolcanic stone are presented in Chapter V below.

The Triassic basins of North and South Carolina are encountered east of the Carolina Slate Belt. Major outcrops of sandstone and siltstone are associated with the Dan River and Deep River Basins in North Carolina (Olson et al. 1991). In South Carolina, these Mesozoic rift basins have been buried by more recent Cretaceous and Cenozoic deposits. Limited exposures has resulted in a less well understood lithology for these buried geologic formations (Olson et al. 1991).

The identification and correlation of Coastal Plain stratigraphic units is complicated by a series of upwarps (arches) and downwarps (basins) in the underlying basement rocks (Horton and Zullo 1991:6). These structural elements control regional patterns of sedimentation resulting in major stratigraphic facies across the Coastal Plain (Horton and Zullo 1991). The study of Cretaceous and Tertiary Coastal Plain sediments has been made more difficult by a lack of major outcrops due in part to Holocene soil development and modern land use practices (Horton and Zullo 1991).

This discussion of Coastal Plain geologic formations will be limited to those containing significant quantities of lithic material known to have been utilized during the Early and Middle Archaic periods (Anderson et al. 1979; Anderson et al. 1982; Anderson and Schuldenrein 1983; Caldwell 1952; Goodyear 1979; Goodyear et al. 1979; Goodyear and Charles 1984; Hanson et al. 1981; Michie 1977; Stoltman 1974; Waring 1968). Potential sources of lithic material have been identified by geologists and archaeologists in several Coastal Plain formations including the Barnwell, Black Mingo, Flint River, Hawthorne, Pee Dee and Santee (Anderson et al. 1979; Anderson et al.

1982; Cooke 1936; Goodyear and Charles 1984; Michie 1977; Upchurch 1984). Each of these formations is characterized by surface exposures in the South Carolina Coastal Plain and it is likely that chert and orthoquartzite pebbles and cobbles were procured in minor quantities from all of them (Cook 1936; Horton and Zullo 1991). However, major prehistoric quarrying activity appears to be primarily associated with the Flint River, Black Mingo and Santee formations (Anderson et al. 1979; Anderson et al. 1982; Goodyear and Charles 1984).

The Flint River Formation outcrops are located in Allendale County, South Carolina . This lithostratigraphic unit is Oligocene in age and is characterized by the presence of a yellow vitreous chert (Cooke 1936:98; Upchurch 1984:10). Intense quarrying activity during the prehistoric period is associated with the exposures in Allendale County and immediately across the Savannah River in Georgia (Brockington 1971; Goodyear and Charles 1984) (Figure 2.4).

The Black Mingo Formation identified by Sloan (1908) and Cooke (1936) has recently been raised to group status in recognition of a lithostratigraphy that is regional in character (Colquhoun and Muthig 1991). Based on surface and subsurface data from Williamsburg, Georgetown and Berkeley Counties, the Black Mingo Group is subdivided into the Danian Rhems Formation associated with the Lower Paleocene; the Williamsburg Formation associated with the Upper Paleocene and an as yet unnamed unit associated with the Lower Eocene (Colquhoun and Muthig 1991:242). Significant quarrying of orthoquartzite in close proximity to outcrops of the Black Mingo Group has been reported from Berkeley County (Anderson et al. 1982) (Figure 2.4). In addition the

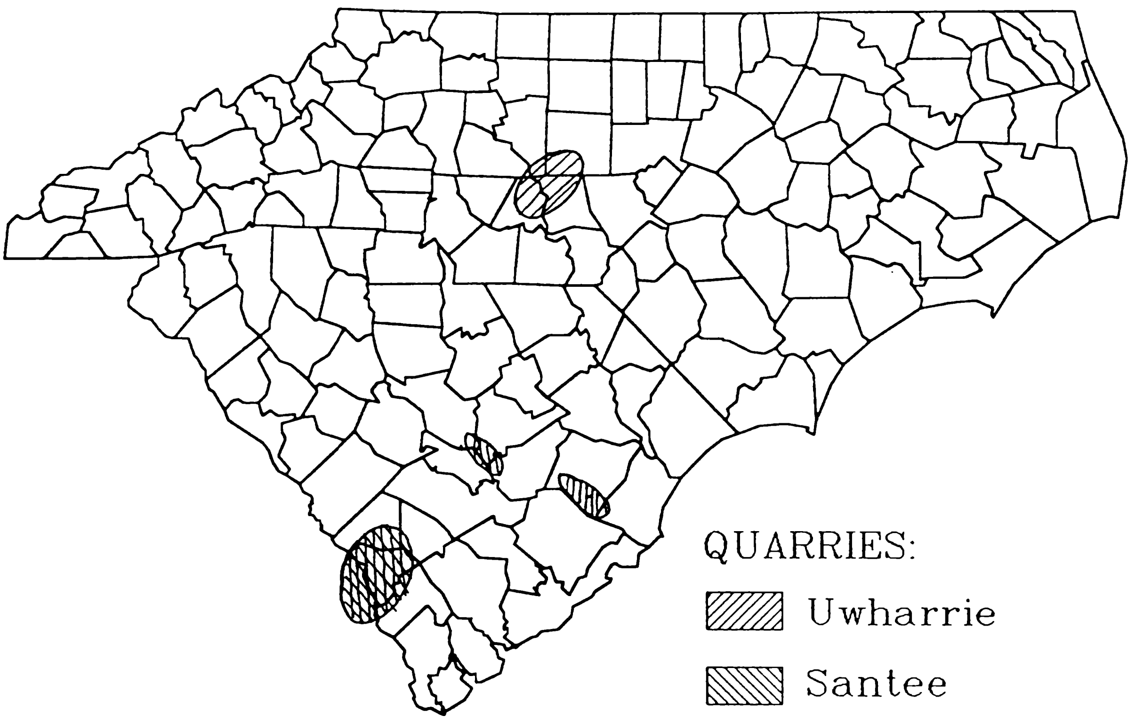


Figure 2.4. Location of the Principal Lithic Quarries in North and South Carolina.

Black Mingo Formation has been associated with the Buyck's Bluff (38CL17) chert outcrop on the Congaree River in Calhoun County (Upchurch 1984). A highly fossiliferous chert was quarried from this location in prehistoric times (Goodyear and Charles 1984).

In the past, the Santee Limestone Formation has been associated with the Paleocene Black Mingo Group (Harris and Zullo 1991). However, a recent revision of Paleocene and Eocene stratigraphic units in the lower Coastal Plain has resulted in the separation of the Middle Eocene Santee Limestone from the Black Mingo Group (Harris and Zullo 1991). Additional investigations have determined that the Santee Limestone contains a distinct lithologic unit known as the Cross Formation. Harris and Zullo (1991:) note the Cross Formation has formed outcrops at several locations just south of the Santee River in Berkeley, Orangeburg and Dorchester Counties. This suggests that the chert recovered from the Mattassee Lake sites may have originated from the Middle Eocene Cross Formation rather that the Paleocene Black Mingo Group sediments (Anderson et al. 1982).

LITHIC RESOURCES

This general overview of the lithic materials procured and utilized during the prehistoric period in North and South Carolina relies heavily on the work of Anderson et al. (1982), Goodyear and Charles (1984), Novick (1978), Upchurch (1984) and Weisenfluh (1978). For the purposes of this thesis, the discussion of specific Piedmont and Coastal Plain lithic materials is limited to those utilized during the Early and Middle Archaic periods. It is assumed that lithic resource procurement was predetermined by a combination of factors. Important considerations would have included access to point specific outcrops and the desired physical properties of the stone itself. The limitations of prehistoric technology and social organization made the pursuit of deeply buried rocks and minerals difficult if not impossible. In the research area, the exploitation of rock and mineral resources by Early and Middle Archaic hunter-gatherer groups was limited to surface residuum and outcrops.

Cognitive influences on the selection of lithic materials during the prehistoric period is based on ethnoarchaeological studies (Gould 1977). For example, the selection of quartz crystal for the manufacture of stone tools may have had esthetic or even religious meaning for Early and Middle Archaic hunter-gatherers (Blanton 1983; Hudson 1976; Swanton 1979). Unfortunately, archaeologists can only speculate about the ideational aspects of lithic resource selection during the prehistoric period.

Aside from the deposits of soapstone found in the Inner Piedmont Belt, Native American exploitation of lithic resources during the prehistoric period appears to have been focused on those rocks which have the property of concoidal fracture. In the research area quartz, metavolcanic tuff, argillite and rhyolite were utilized for the production of stone tools. The Coastal Plain cherts and orthoquartzites of the Black Mingo, Flint Ridge and Santee Limestone formations were widely utilized. Dark colored chert from the Ridge and Valley province has also been identified in local assemblages.

The fine grained metavolcanic rocks of the Carolina Slate Belt have found their way into the archaeological record in the form of formal and expedient stone tools. Rhyolite is a primary constituent of the metavolcanic Carolina Slate Belt group. Its popularity as a material for the manufacture of stone tools during the prehistoric period has been demonstrated at many sites in the study area (Anderson and Schuldenrein 1983; Goodyear et al. 1979; House and Ballenger 1976; House and Wogaman 1978; Tippitt and Marquardt 1984; Wetmore and Goodyear 1986).

Rhyolite is an igneous rock formed by the cooling and solidification of viscous magma containing high amounts of silica. It has a fine grained groundmass which fractures in predictable and manageable ways, enhancing its value as a lithic knapping material (Dietrich and Skinner 1979). Rhyolite can be partitioned into nonporphyritic and porphyritic types. These types are distinguishable macroscopically based on the presence or absence of phenocrysts and\or flowbanding (Daniel 1992: personal communication).

Flowbanding is attributed to the movement of magmas across the ground surface. This action tends to separate the magma into alternating bands of differing mineral composition, crystallinity or texture (Matthews and Boyer 1976). Novick (1978:427) notes that the flowbanding characteristic is clearly visible to the unaided eye in weathered specimens.

It is interesting to note, that despite Novick's optimism, heavily patinated rhyolitic specimens were often consigned to the indeterminate category during the North Carolina projectile point classification project (Daniel 1992: personal communication). According to Daniel, patinated specimens are typically greyish-white to tan and chalky in texture. He suggests that fresh breaks in the stone will often reveal the presence of previously undetected flowbanding.

Porphyritic rhyolite in the Carolina Piedmont is identified by the presence of large, well formed phenocrysts of quartz, feldspar and or plagioclase (Novick 1978). These crystals are typically set in a finer grained groundmass. Like flowbanded rhyolite, this material is produced by lava or magma flows.

Nonporphyritic rhyolite lacks flowbanding and phenocrysts (Dietrich and Skinner 1979). Interestingly, this type of rhyolite dominates the lithic assemblage at the Hardaway Site (31ST4) on the Yadkin River in North Carolina (Daniel and Butler 1990:65). Research designed to pin point the exact source and chemical composition of this material is currently underway. Preliminary results indicate that the Hardaway material was obtained from the nearby Morrow Mountain quarries (Daniel and Butler 1990) (Figure 2.4).

Archaeologists working in the Piedmont have identified felsic tuff and welded vitric tuff in their collections (Novick 1978:430). These pyroclastic rocks were utilized by Native Americans for the manufacture of stone tools. The term pyroclastic refers to rocks that are violently expelled from volcanoes during times of increased seismic activity (Dietrich and Skinner 1979:159). Typically, these rocks are deposited in the form of ash falls and ash flows.

A tuff is a volcanic ash which has undergone lithification due to compaction or cementation (Dietrich and Skinner 1979:162). In the Carolina Slate Belt, the felsic tuffs are interbedded and grade into the epiclastic and metasedimentary rocks of the argillite unit (Overstreet and Bell 1965:23). Metavolcanic tuffs are easily confused with other igneous rocks and argillite when considered on the basis of color and gain size. Fortunately for the analyst, felsic tuffs often contain glass fragments or larger pyroclastic fragments not normally found in fine grained rhyolite or argillite (Dietrich and Skinner 1979:162).

Welded vitric tuff is composed of at least 75 percent glass fragments which gives it several chert like characteristics. Like chert, it is cryptocrystalline in grain size and translucent (Novick 1978:430). Novick indicates that the material is similar in texture and composition to the local rhyolites with which it is interbedded in the argillite unit of the Carolina Slate Belt.

Argillite is described as a rock composed of clay minerals whose degree of induration is somewhat higher than mudstone but less than shale (Matthews and Boyer 1976:20). This material can be formed under either sedimentary or metamorphic conditions. Argillite is essentially identical to slate with the exception that it lacks fissility and slaty cleavage (Dietrich and Skinner 1979:266). Based on its macroscopic characteristics, it is often difficult to distinguish argillite from fine grained igneous rocks like rhyolite.

It should be apparent from the statements made above that archaeologists who approach lithic material identification armed with a hand lens and a stack of munsell cards do so at their peril. Macroscopic discrimination of tuffs, rhyolites and argillites is certainly possible. However, caution and skepticism are warranted when these Carolina Slate Belt material types are identified in archaeological reports without the use of a comparative collection or consultation with a qualified lithic specialist.

Quartz is one of the most common minerals in the earth's crust (Dietrich and Skinner 1979:32) In the Carolina Piedmont, quartz is hydrothermally deposited in parent rock masses under high temperatures and pressures (Matthews and Boyer 1976:216). Hydrothermal alteration is described as a process which changes the chemical and mineralogical composition of rocks by the addition and removal of materials in a hot aqueous solution (Matthews and Boyer 1976:26).

Quartz is usually found in veins surrounded by a metamorphosed rock mass (Novick 1978). In the Piedmont, quartz occurs as outcrops and forms a weather resistant residual component of the soil mantle. Quartz cobbles are found in the Coastal Plain and especially at the Fall Line where stream velocity drops and deposition of the bed load occurs.

Archaeologists typically partition quartz into two types based on color (Novick 1978:433). The color results from the absence or presence of impurities in the mineral mass. White quartz derives its color from the presence of water bubbles formed when the mineral was in solution (Novick 1978:433). Crystal quartz is largely free of impurities. This material played a special role in the belief systems of some protohistoric and historic southeastern Native Americans

(Hudson 1976, Swanton 1979). For example, crystals of quartz were used ritualistically for divination by several southeastern tribes including the Cherokee (Hudson 1976).

Chert is described as a cryptocrystalline form of quartz composed of microorganisms or precipitated silica grains (Matthews and Boyer 1976:72). Archaeologists have demonstrated a reliance by Paleoindian groups on cryptocrystalline rocks for the manufacture of their bifacial and unifacial tools (Gardner 1977; Goodyear 1974, 1979; Wilmsen and Roberts 1978). Goodyear (1979) has pointed out the importance of this material to the first inhabitants of the South Carolina Piedmont and Coastal Plain.

Outcrops of Flint River Formation chert occur along the Savannah River in Allendale County, South Carolina (Goodyear and Charles 1984) (Figure 2.4). These localities were intensively quarried during prehistoric times. Goodyear and Charles (1984:5) suggest that Allendale chert can be readily identified on the basis of the following macroscopic characteristics: (1) a lack of fossils which improves the isotropy of the specimens; (2) colors that are typically earthy in hue ranging from dark brown to tan and white; (3) the property of translucency; (4) devitrification when weathered accompanied by the formation of a tan, yellow and\or white cortex.

Anderson (1979a) notes the prevalence of thermal alteration which, in the case of Allendale chert, increases its vitreousness, resulting in a glossy patina. Significant changes in color also accompany thermal alteration. Colors ranging form red to blue have been observed on thermally altered specimens. Upchurch (1984:142) classified Allendale chert as a "silicified grainstones" characterized in thin section by presence of chalcedony and\or microcrystalline quartz.

Black Mingo Formation chert outcrops along the Congaree River in Calhoun County at the Buyck's Bluff site (38CL17) (Figure 2.4). This chert is described as highly fossiliferous and poorly cemented (Novick 1978:432). Upchurch (1984:138) describes a sample of Buyck's Bluff chert as a coarse pelecypod "coquina" or grainstone.

Dark colored vitreous cherts from the Ridge and Valley Province of eastern Tennessee have been identified in lithic assemblages from South Carolina (Anderson and Schuldenrein 1983; Goodyear et al. 1979; Taylor and Smith 1978; Tippitt and Marquardt 1984). These specimens probably belong to the Knox "group" which range in color from black to dark gray (Cridlebaugh 1981:39).

Novick (1978:433) describes orthoquartzite as composed of quartz sand grains cemented by silica. Orthoquartzite specimens from the Mattassee Lake sites (38BK226 and 38BK229) were thin sectioned, revealing a chert cemented sandstone characterized by fine, well sorted and subangular quartz grains cemented by chert and chalcedony (Anderson et al. 1982:122). The Mattassee Lake orthoquartzites are believed to be associated with the Black Mingo Formation which outcrops along the Middle Santee (Anderson et al. 1982:122) (Figure 2.4).

SOILS

Over the millennia, the region's igneous and metamorphic rocks have been broken down by chemical and mechanical weathering to form the medium acidic soils of the Piedmont uplands. These soils are generally classified as Ultisols (Kovacik and Winbury 1989). The Piedmont Ultisols are characterized by a compact and clayed texture with poor internal drainage characteristics (Ellerbe 1974)).

The soils of the South Carolina Coastal Plain are primarily derived from marine deposited sands of Cretaceous and Cenozoic age. These soils are classified as Entisols and Ultisols (Kovacik and Winberry 1989). Entisols dominate the Sandhills region of the Upper Coastal Plain while Ultisols characterize the Middle and Lower Coastal Plain. In general the soils of the Upper Coastal Plain are well to excessively drained (Snyder et al. 1983). The drainage characteristics of soils in the Middle and Lower Coastal Plain areas are dependent on the relative percentages of sand silt and clay at depth in the soil profile.

Historic land use practices combined with climate and clayed subsoils produced a very high rate of erosion in the Carolina Piedmont from the late eighteenth century until the late 1930's. The economic dislocation and human suffering caused by this ecological catastrophe is still with us today. Paradoxically, the collapse of southeastern agriculture and the planting of pine plantations across the Piedmont has created a massive carbon sump which may be acting to reduce the rate of global warming.

From an archaeological perspective, the loss of from one to three feet of topsoil has profoundly affected the integrity and visibility of Piedmont and Coastal Plain archaeological sites (Trimble

1974). Upland multicomponent sites are typically truncated and plowed. Sites occupying alluvial land forms have become deeply buried under recent sediment. The archaeological literature abounds with examples of the effect which these accelerated rates of erosion and sedimentation have had on our ability to locate and interpret the regions prehistoric past (Coe 1964, Chapman 1973, 1975; Claggett and Cable 1982; Cridlebaugh 1981; Tippitt and Marquardt 1984).

THE BIOTIC COMMUNITY

The focus of this section is the identification of the extant flora and fauna of the Carolina Piedmont and South Carolina Coastal Plain. The potential natural vegetation of the study area includes the oak-pine region of the North and South Carolina Piedmont (Braun 1950). Under natural conditions free from modern silvicultural management, the vegetation of the South Carolina Coastal Plain is characterized as an oak-hickory-pine forest in the uplands and a Southern Floodplain forest in the lowlands (Kuckler 1964).

Arbitrary boundaries between forest types do not exist in nature (Gleason and Cronquist 1964). Changes in regional vegetation are typically gradational rather than abrupt. This principle is reflected in the southern Piedmont where the oak-pine and oak-hickory-pine forests are considered to be a zone of overlap between the northern hardwood oak-hickory forests and the southeastern evergreen forest (Braun 1950).

The study areas position astride a broad regional ecotone suggests that forest dynamics and spatial distribution are best understood by the analysis of local forest composition (Claggett and Cable 1982:132). Local variation in the canopy is controlled by soils, slope, aspect and drainage. Based on these characteristics, it is possible to partition Piedmont localities into three forest types.

In the Piedmont, bottomland forests occur on well drained sand bars and terraces along the margins of rivers and streams. A community of sweet gum, ash, sycamore, box elder, hackberry and maple dominates the bottomland canopy. Modern silvicultural practices have radically changed the character of both bottomland and upland Piedmont forests.

In those areas not managed for timber production, oaks and hickories are the primary constituents of late successional upland forests. In old growth timber, pines are limited to areas with unfavorable conditions for the growth of hardwoods. They also dominate the canopy in early successional stands throughout the Piedmont. Intermediate between these two forest types are the mesic forest communities associated deep ravines and north facing slopes. The highly dissected topography of the Carolina Piedmont offers many refuges for a variety of northern hardwood species including beech, sugar maple and tulip poplar.

In the sandy upland areas of the South Carolina Coastal Plain the vegetation is dominated by short leaf pine, loblolly pine, white oak and post oak. Less well drained Coastal Plain localities, including floodplains, are characterized by tupelo, oak and bald cypress.

Shelford (1963) includes the Piedmont of North and South Carolina and the Coastal Plain of South Carolina in the Southern Temperate Deciduous Forest Biome. In the oak-hickory and magnolia evergreen forests of the research area, Shelford (1963) reports the presence of a suite of dominant terrestrial animal species including wolves, bobcats, bears, white tailed deer, squirrels, raccoons, opossums and skunks.

This list of large carnivores, herbivores and omnivores reflects present day conditions in a pristine environment. Shelford's (1963) observations are inconsistent with the reports of the early explorer-naturalist (Adair, DuPratz, Bartram and Lawson) who visited the southeast during the early colonial period and reported a more diverse faunal assemblage for the region (Larson 1980; Swanton 1979). Based on their accounts, several additional species were present in the Piedmont and Coastal Plain prior to significant European and African-American settlement (Swanton 1979). According to Lawson (1976), "the beasts of Carolina" also included the buffalo, panther, elk and beaver. This suggests a considerable loss of diversity within the large animal communities of the southeast since the eighteenth century.

PALEOENVIRONMENT

A review of the literature suggests that the first human occupation of the South Atlantic Slope occurred sometime between 13,000 and 9500 BP (Anderson and Schuldenrein 1985; Anderson and

Hanson 1988; Claggett and Cable 1982, Goodyear et al. 1979). The late Pleistocene to early Holocene environmental transition was marked by significant paleohydrologic and biotic change. At the beginning of this period, the late glacial ice sheets still retained much of the earths water and sea level was as much as 320 m (200 feet) below its current still stand. The coasts of North and South Carolina were many miles seaward of their present locations.

By the end of the late glacial period at approximately 9500 BP the retreating ice sheets had recharged the ocean basins, returning sea level to within a few meters of its present stand. The rapid rise in sea level during the early Holocene inundated river valleys and embayments along the coast, destroying marsh and estuary environments. The implications of these environmental changes on the prehistoric human ecology of the Coastal Plain has become a major area of study for local archaeologists (Depratter and Howard 1977, 1980; Colquhoun and Brooks 1986).

Palynologists have documented a sequence of changes in the regional distribution of major forest constituents from ca. 25,000 B.P. to 5000 B.P. along the South Atlantic Slope (Watts 1975, 1980; Whitehead 1965, 1973). The reconstruction of past climatic and environmental conditions requires the presence of pollen deposited and preserved in datable contexts. Sites meeting these criteria are rare in the Piedmont. Most of our information on past climatic conditions is derived from a series of Coastal Plain lakes, ponds and Carolina bays (Watts 1975, 1980; Whitehead 1965, 1973). Nevertheless, the trends in vegetational history demonstrated by these studies are recognized as broadly applicable to the research area (Carbone 1983; Delcourt and Delcourt 1981, 1987).

During the full glacial (25,000-15,000 B.P.), climatic conditions across the region were cold and dry. The analysis of pollen samples has disclosed the presence of a closed canopy boreal forest composed of spruce and jack pine during that period (Watts 1975 ,1980; Whitehead 1965, 1973). By 15,000 B.P., northern hardwoods (hickory, oak, beech, elm and hemlock) were rapidly replacing the pine and spruce of the full glacial boreal forests of the southeast region (Watts 1975, 1980; Whitehead 1965). Pollen samples from White's Pond in central South Carolina and Bladen Lake in North Carolina provide evidence that these northern hardwood species dominated the forest canopy between 13,000 and 9500 B.P. (Watts 1980).

During the early Holocene from 9,500 to 7,000 B.P. many of the northern hardwood species walnut, hemlock, beech and ironwood retreated into the deep ravines and north facing slopes of the Carolina Piedmont where they have persisted into the modern era. The Piedmont uplands were dominated by oak-hickory communities throughout the Holocene period (Watts 1971; Delcourt and Delcourt 1981 and Davis 1983). On the Coastal Plain, oaks were largely replaced by southern pine communities between 8,000 and 5,000 B.P. (Delcourt and Delcourt 1987). During this interval, extensive coastal marshes and interior wetlands developed across the South Atlantic Slope, suggesting that climatic conditions may have been warm and moist (Brooks et al. 1986; Colquhoun and Brooks 1986; Delcourt and Delcourt 1985, 1987).

This period roughly coincides with a warmer and drier climatic interval identified in the Midwest and midsouth as the Hypsithermal event (Delcourt 1979; King 1981; Wright 1976). The effect of the mid-Holocene climatic interval on the ecological systems of the South Atlantic Slope is unclear at the present time (Blanton and Sassaman 1989). It is important to note that significant changes in elevation occur on an west to east line from the Appalachian summit to the Lower Coastal Plain in the research area. This decent of approximately 1830 m (6,000 feet) profoundly affects the biogeography of the area (Blanton and Sassaman 1989). The causes of variation in vegetative patterns independent of climate should be considered before assigning cultural causality to long term climatic trends. Consequently, models of Archaic Period adaptational change based on the onset of the Hypsithermal interval are primarily speculative (Blanton 1983; Claggett and Cable 1982).

It is estimated that North America lost 32 genera of large mammals during the late glacial period between 15,000 and 10,000 B.P. (Mead and Metzler 1985:147). No species of Pleistocene megafuana are known to have survived past 10,000 B.P.. The mass extinctions of the terminal Pleistocene are believed to have been caused by either climatic change linked to environmental reorganization or intense predation by Paleoindians (Mead and Metzler 1985:166). Some combination of these factors may prove to be the case.

Paleohydrologic research along the middle reaches of the Savannah River indicates that rising sea level during the Holocene altered the gradient of the river initiating changes in river channel patterns and depositional landforms (Sassaman et al. 1990:23). The lowering of the rivers base level during the early Holocene gradually shifted the river from a pattern of channel downcutting to an aggrading depositional regime. Landforms changed in response to these hydrological and depositional trends as the river shifted from a braided stream channel pattern to a meandering pattern with well defined terraces (Sassaman et al. 1990).

It has been argued that most upland streams were incising their channels during the Holocene with appreciable deposition limited to microtopographic settings (Coe 1964:11). This view has been largely discredited by geomorphological research on the Haw River in North Carolina and along the Savannah River in Georgia and South Carolina (Brooks et al. 1986; Segovia 1985; Claggett and Cable 1982; Foss et al. 1985). These studies indicate that Piedmont river valleys have experienced alternating episodes of erosion and infilling in response to base level adjustments superimposed on regional geologic patterns and structures.

Goodyear (1991) points out the lack of insitu Paleoindian deposits along major river channels in the southeastern United States. In a synthesis of geoarchaeological data from across the region, he suggests that the Paleoindian period (ca. 11,500-10,000 B.P.) coincided with a period of net channel degradation and incision (Goodyear 1991). Erosion is believed to have truncated late Pleistocene and Early Holocene terraces, scouring the A horizon and eliminating in situ evidence of Paleoindian occupation. Goodyear (1991) ends with a series of recommendations for better documenting

Paleoindian stratigraphic contexts and possible Pleistocene\Early Holocene alluvial contact zones.

This concludes my environmental characterization of the North and South Carolina Piedmont and Coastal Plain. The focus is on the geology and lithic resources of the study area. Spatial incongruity in the distribution of lithic resource bearing geologic formations and outcrops is emphasized. The difficulty of distinguishing between metavolcanic specimens that have been subjected to varying degrees of recrystallization are pointed out. This introduction to the study area's geology provides a point of departure for the discussion of the units of analysis (lithic material categories) presented in Chapter IV.

CHAPTER III

ARCHAIC PERIOD CHRONOLOGY AND SETTLEMENT MODELS

The analysis and description of stone tools is a defining characteristic of North American archaeology (Willey and Sabloff 1979). Because of their durability under all but the most unusual depositional circumstances, stone tools provide a primary source of information about prehistoric Native Americans. This is certainly true of the southeastern United States where humidity and soil acidity severely limits the sample of prehistoric material culture available for study (see Hudson 1976; Swanton 1979).

In spite of their ubiquity, stone tools remained a poorly documented aspect of the archaeological record along the South Atlantic Slope until the post World War II era (Hudson 1976). This apparent lack of interest can be explained in part by an analysis of the issues which dominated archaeology during the last decades of the nineteenth century and the first decades of the twentieth century (Willey and Sabloff 1979). The literature from the period has documented a deeply entrenched preoccupation with the late prehistoric mound building cultures of the region. Research east of the Mississippi River was directed towards the goals of classification in support of theoretical positions about the origins of the "mound builders" (Willey and Sabloff 1979).

Archaeologists of the period were generally unaware of the great time depth involved in the initial movement of people into North America. The lack of empirical evidence about hunter-gatherers and the drive to document the indigenous origins of the "mound builders" combined to eclipsed any interest in exploring the earlier nonagricultural prehistoric cultures that had once occupied the eastern woodlands. Holmes (1897) investigation of stone tools from the Potomac-Chesapeake Bay area represented a significant exception to this generalization.

It was not until the World War Two era that serious attention was given to the chronology and culture history of these earliest occupants of the region (Richie 1944; Griffen 1967). Archaeologists seeking to understand culture change in the eastern woodlands recognized the importance of organizing hafted stone tools into temporally sensitive types (Willey and Sabloff 1979). The analysis of hafted stone tools from stratigraphic contexts provided the principal means for partitioning early Native American prehistory into discrete temporally meaningful units. Archaic period research in the southeastern United States is largely dependent on the chronological framework developed for the region during the 1960's and 1970's (Chapman 1975, 1977; Coe 1964; DeJarnette et al. 1962; Griffin 1974).

CHRONOLOGICAL CONTEXT: EARLY AND MIDDLE ARCHAIC HAFTED BIFACES

This chronological overview of the Early and Middle Archaic periods in the study area relied heavily on the research of Anderson and Shuldenrein (1985), Claggett and Cable (1982), Coe (1964), Chapman (1973, 1975, 1977) Tippitt and Marquardt (1984) and Wetmore and Goodyear (1986). The cultural sequence and typological syntheses provided by Anderson and Joseph (1988), Oliver (1985) and Ward (1984) were especially helpful.

Needless to say, this thesis would not have been possible without the pioneering chronostratigraphic research of Joffre Coe (1964). The first typological studies of Early and Middle Archaic hafted bifaces were conducted by Coe (1964) to support cultural sequence observed at stratified sites in the North Carolina Piedmont. Hafted bifaces characteristic of the Early Archaic and Middle Archaic periods were first identified in stratified alluvial deposits at the Hardaway (31ST4), Doerscuk (31MG22) and Gaston sites (31HX7) (Coe 1964).

The general validity of the North Carolina sequence has been demonstrated by excavations along the Haw River in North Carolina, the Broad River in central South Carolina and the Savannah River in Georgia and South Carolina (Anderson and Schuldenrien 1985; Clagett and Cable 1982; Tippitt and Marquardt 1984; Wetmore and Goodyear 1986). Portions of the North Carolina sequence have been identified at other stratified South Carolina sites including but not limited to the Cal Smoak site (38BM4), the Mattassee Lake sites (38BK226, 38BK229, 38BK246), and the G.S. Lewis site (38AK228) (Anderson et al. 1979; Anderson et al. 1982; and Sassaman et al. 1990)

During the Early Archaic period (ca. 10,000-8,000 B.P.) hunter-gatherer populations adapted to a new set of environmental challenges brought about by the post-glacial conditions of the Holocene. It is assumed that the period was characterized by a change in adaptive strategy from a focal pattern dependent on the hunting of large game to a more diffuse hunting and gathering economy (Anderson and Joseph 1988). The end of the Early Archaic coincided with the initiation of the Hypsithermal episode at about 8,000 B.P.. The effects of this climatic warming trend on the environment of the Carolina Piedmont is poorly understood (Blanton and Sassaman 1989; Claggett and Cable 1982; Ward 1984).

The placement of the Pleistocene\Holocene boundary at 10,000 B.P. is an international convention to facilitate world wide mapping of this chrono-stratigraphic unit (Goodyear et al. 1989:19). In the Piedmont of North and South Carolina, this temporal demarcation correlates with a technological shift from lancelote hafted biface forms to diagnostic side, corner notched and bifurcate based projectile points (Anderson and Joseph 1988:110). The period begins with the Dalton and Hardaway-Dalton types, dating ca. 10,500-9,900 B.P. (Coe 1964; Goodyear et al. 1979). They are followed in the sequence by the Taylor, Big Sandy, Bolen and Hardaway side notched types which date ca. 10,000-9,500 B.P. (Anderson and Joseph 1988).

In general, the Early Archaic on the South Atlantic Slope begins with the replacement of lancelote hafted bifaces by side and corner notched forms. The side notched types cross the Pleistocene\Holocene boundary and are considered to be transitional between the Paleoindian and Early Archaic periods.

A considerable amount of taxonomic variation exists between North and South Carolina for this period (Anderson and Joseph 1988; Coe 1964; Claggett and Cable 1982; Goodyear et al. 1989). It has been suggested that regional specialization in the manufacture of hafted bifaces occurred during the Paleoindian\Early Archaic transition (Anderson 1990; Goodyear et al. 1989). This may account for the different side notched types prevalent in North and South Carolina.

The Early Archaic period begins with the Kirk Complex ca. 9,500-8,800 B. P. (Anderson and Joseph 1988; Chapman 1985; Ward 1984). The complex is delimited by the Palmer and the Kirk Corner Notched hafted biface types first identified by Coe (1964) at the Hardaway site (31ST4). Palmer and Kirk Corner Notched hafted bifaces have been identified in stratigraphic contexts at sites in East Tennessee, North and South Carolina (Anderson et al. 1979; Anderson and Shuldenrien 1985; Chapman 1975, 1977, 1978; Claggett and Cable 1982; Tippitt and Marquardt 1984; Wetmore and Goodyear 1986).

Based on specimens recovered from the Hardaway site, Coe (1964:67) described the Palmer type as having "a small corner notched blade with a straight, ground base and pronounced serrations." The Palmer Corner Notched type has been recognized as transitional between the earlier Hardaway Side Notched type and the later Kirk Corner Notched type (Oliver 1985). The Kirk Corner Notched type is described as having "a large triangular blade with a straight base, corner notches, and serrated edges" (Coe 1964:69). Oliver (1985:200) regards both the Palmer and Kirk Corner Notched types as belonging to the "Piedmont Tradition" of stemmed hafted biface manufacture (Oliver 1985:200).

In the absence of clear stratigraphic separation, many investigators have encountered difficulty separating the Palmer and Kirk types based on the criteria offered by Coe (Anderson et al. 1979;

Chapman 1977; Claggett and Cable 1982; Goodyear et al. 1979). In East Tennessee the recognition that significant morphological variation exists among corner notched hafted bifaces lead to the development of the Kirk Corner Notched Cluster (Chapman 1975, 1977). Recently, Sassaman (1991) has suggested that much of the variation between the Palmer and Kirk Corner Notched types may be based on raw material which affects the size of the specimens.

The dependence of Early Archaic hunter-gatherer groups on highly siliceous cryptocrystalline materials for the manufacture of hafted bifaces and other formal tool types has been documented at many sites across the South Atlantic Slope (Anderson et al. 1979; Anderson et al. 1982; Anderson and Schuldenrein 1985, Claggett and Cable 1982; Goodyear et al. 1979; Sassaman et al. 1990; Wetmore and Goodyear 1986). The presence of these materials at significant distances from their geologic source areas has caused some investigators to posit expansive band ranges for Early Archaic hunter-gatherer groups (Anderson and Schuldenrein 1983; Anderson and Hanson 1988; Goodyear et al. 1979).

The chronology of the Bifurcate Tradition in the Little Tennessee River sequence spans just over 1,000 years dating from ca. 8,900-7,800 B.P. (Chapman 1985:146). Based on hafted biface morphology, the Bifurcate Tradition is partitioned into the St. Albans, LeCroy and Kanawha phases (Chapman 1975). Unfortunately, the Little Tennessee River sequence has yet to be fully documented in the Carolina Piedmont (Anderson 1991:94). Bifurcates are rare in the western Piedmont of South Carolina (Anderson 1991:95). In the eastern

Piedmont of South Carolina bifurcate types appear to be concentrated along the Broad River in Lancaster and Kershaw Counties (Charles 1992: personal communication).

The transition from the corner notched and bifurcate types of the Early Archaic to the square and contracting stemmed types of the Middle Archaic period occurred around 8,000 B.P. The Stanly type along with the preceding Kirk stemmed type, mark the boundary between the Early Archaic and Middle Archaic periods in the study area (Anderson and Joseph 1988; Claggett and Cable 1982). Unfortunately, no absolute dates for the Kirk stemmed and Stanley phases have been secured from sites in the Carolina Piedmont (Blanton and Sassaman 1989:54). Based on radiocarbon assays from Tennessee, it appears that the Kirk stemmed phase dates from ca. 8,000-7,800 B.P. (Chapman 1985:146).

The Stanly phase was originally identified by the excavation of alluvial deposits located at the Doerschuk site on the Yadkin River in the North Carolina Piedmont (Coe 1964). Stanly components at Middle Archaic sites in the Carolina Piedmont have failed to yield absolute dates for the phase. Radiocarbon dates from Alabama and Tennessee indicate a temporal span for the phase from ca. 7,800-7,400 B.P. (Chapman 1985:146; Blanton and Sassaman 1989:57).

The Stanly phase is poorly represented in the Piedmont of South Carolina (Blanton and Sassaman 1989; Goodyear 1978; Taylor and Smith 1978). For example, excavations along the upper Savannah River in the western Piedmont of South Carolina revealed 12 Stanly components compared to 135 later Middle Archaic components associated with Morrow Mountain hafted bifaces (Anderson and Joseph 1988:137).

Subregional variation in the distribution of Stanly hafted bifaces has been noted for the South Carolina Piedmont (Charles 1981). An analysis of raw material type used in the manufacture of Stanley hafted bifaces indicates a strong preference for Carolina Slate Belt metavolcanics (Blanton and Sassaman 1989:65).

The Morrow Mountain phase is by far the best documented Middle Archaic cultural complex in the Carolina Piedmont (Anderson and Joseph 1988; Claggett and Cable 1982; Coe 1964; Goodyear 1978; House and Ballenger 1976; Wetmore and Goodyear 1986). Originally identified from stratified alluvial deposits at the Doerschuk site (31MG22), the phase is characterized by Morrow Mountain I and Morrow Mountain II hafted bifaces (Coe 1964:37).

The temporal relationship between these two types is less than clear (Coe 1964:43). It appears that both types co-occur in the same stratigraphic units at the Doerschuk site (Coe 1964:35). Additional excavations in the Carolina Piedmont and the Ridge and Valley Province of East Tennessee have failed to demonstrate a clear stratigraphic difference between the Morrow Mountain I and II types (Claggett and Cable 1982; Chapman 1977; Cridlebaugh 1977). This has lead to suggestions that the differences between the two types may be technological rather than temporal (Claggett and Cable 1982:486-488; Cridlebaugh 1977:46; Blanton and Sassaman 1989:65).

Absolute dates for the Morrow Mountain phase are derived principally from the midsouth and Ridge and Valley (Blanton and

Sassaman; Cridlebaugh 1977; Chapman 1985). The phase persists over an 1,800 year period dating from ca. 7,250-5,500 B.P. (Blanton and Sassaman 1989:57). The latest date for the phase, ca. 5,500 comes from a Fall line site (38LX5) in central South Carolina (Anderson 1979b:90).

Raw material selection during the Morrow Mountain phase was dramatic. Local lithic resources were heavily utilized for the production of hafted bifaces (Blanton 1983). Quartz dominates the lithic assemblages from the Piedmont of South Carolina suggesting expediency in procurement and use (Blanton and Sassaman 1989:67). The focus on local raw material procurement during the Middle Archaic period has also been reported from Tennessee (Chapman 1977; Cridlebaugh 1977). This issue will be revisited with additional data from North and South Carolina in Chapter V.

The Guilford phase is easily the most problematic cultural complex occurring in the research area. The phase was originally defined by Coe (1964) based on excavations at the Doerschuk and Gaston sites in the North Carolina Piedmont. A hafted biface identified as the Guilford Lanceolate type is associated with the phase (Coe 1964:43-44). Stratigraphically, the Guilford Lanceolate type is observed above the Morrow Mountain complex and below the Savannah River complex at the Doerschuk site (Coe 1964). The Guilford complex represents the basal cultural deposit at the Gaston site where it is stratigraphically beneath by the Halifax side notched type (Coe 1964:123). No absolute dates have been secured for the Guilford phase in the southeast. A single radiocarbon date ca. 5,500 B.P. from the succeeding Halifax complex at the Gaston site is generally used to fix the phase in time.

In South Carolina, two forms of Guilford hafted bifaces have been identified (Blanton and Sassaman 1989:67). The first is almond shaped in cross-section and lanceolate in outline following Coe's (1964:43-44) classic description of the type. A planoconvex to biconvex cross-section typifies the second variety (Blanton and Sassaman 1989:67). The second type also appears to be more crudely executed. Blanton and Sassaman (1989) suggest that these two forms may have served different functional roles within the Guilford phase tool kit.

A third hafted biface similar in many respects to the Guilford Lanceolate has been identified primarily in the South Carolina Coastal Plain. The Brier Creek Lanceolate first described by Michie (1968) has also been observed at the Nipper Creek site on the Fall Line in central South Carolina (Wetmore and Goodyear 1986:83). The relationship between the Guilford Lanceolate and the Brier Creek Lanceolate types has yet to be fully explored.

The spatial distribution of the Guilford complex is circumscribed. Extensive excavations in the lower Little Tennessee River Valley of the Ridge and Valley Province has failed to identify the Guilford Complex in stratigraphic contexts (Chapman 1985:149). Significant Guilford phase deposits are missing from Middle Archaic deposits excavated along the upper Savannah River in the Richard B. Russell Reservoir (Anderson and Joseph 1988). As mentioned earlier, Guilford Lanceolate specimens are largely absent from the South

Carolina Coastal Plain. Based on these observations, it appears that the core area for the distribution of Guilford Laceolates falls within the research area of this thesis.

Blanton and Sassaman (1989) suggest that the selection of lithic raw materials in South Carolina during the Guilford phase represents a continuation of the earlier Morrow Mountain focus on local resources. Their position is supported by an analysis of selected assemblages from Piedmont sites which indicates a continued reliance on quartz during the Guilford phase.

The selection of hafted biface, raw material and spatial variables reflects a complex interaction between the specific needs of the study and the limitations of the data base. These decisions are consistently influenced by the issues of sample size, typological consistency and relevance to the research questions. The concept of typological consistency is based on the ability of archaeologists to agree on the morphological characteristics and utility of specific hafted biface and raw material types.

Revisiting partisan arguments about the validity of certain typological constructs would add little to a research program whose goals are synthetic and inclusive. Furthermore, it was recognized that simplistic appeals to a single taxonomic authority would not serve the purposes of an analysis designed to document patterning in the procurement of lithic resources over a relatively large geographic area.

This research does not represent a typological review of Early and Middle Archaic hafted bifaces nor is it a manual for the identification of lithic raw materials. It is an attempt to use these tools to further our understanding of hunter-gatherer adaptive behavior through the documentation of lithic raw material variability.

Consequently, certain hafted biface types have been grouped as a matter of convenience when it was determined that this procedure would increase sample sizes without doing violence to the overall goals and aims of the study. The warranting arguments used to select specific taxonomic units for the analysis are presented on a case by case in the next section of this chapter.

Of the Paleoindian\Early Archaic transitional types only the Hardaway-Dalton type appears in both the North and South Carolina data bases. The Hardaway-Dalton type was infrequently encountered in the collections from both states yielding a relatively small sample for the analysis. Given these conditions it was decided to initiate the study using the Palmer\Kirk Corner Notched category.

The Palmer\Kirk Corner Notched types constitute the first of two artificial hafted biface categories. The decision to collapse these two types into one category was based on the following analysis.

The stratigraphic record at the Hardaway site indicates some vertical segregation between the Palmer and Kirk Corner Notched types (Coe 1964:63). A close examination of figure 55 in Coe's (1964:63) volume suggests that the Palmer Corner Notched type is associated with level III and the Kirk Corner Notched type with level II. Even so the temporal relationship between these two types remains unclear.

The morphological discrimination of the two types depends heavily on size and the presence or absence of basal grinding of the haft element (Coe 1964:67, 69). It is broadly recognized that the size of a hafted biface is affected by raw material type, manufacturing trajectory and use life. These factors render size a poor typological discriminator (Oliver 1985).

It also appears that basal grinding has been observed on specimens that otherwise fit the classic Kirk Corner Notch description (Chapman 1975:117, Chapman 1977:48). Claggett and Cable (1982:36) have proposed that the Palmer type represents a minor regional Kirk variant or stage in the use life of the more typical Kirk Corner Notched type.

According to Daniel (1992: personal communication) the partitioning of corner notched specimens may be possible based on the size of the haft element. He suggests that the Palmer type may be identified by a haft width to haft length ratio of 2:1. This is in contrast to Kirk corner notched specimens which maintain a 1:1 ratio between these two attributes. To date, there has been no attempt to systematically test the validity of this observation (Daniel 1992: personal communication).

The decision to collapse the Palmer and Kirk Corner Notched types into a single category was made in part because of the difficulty of distinguishing between these two types. In addition all of the specimens included in this study were derived from surface contexts. The lack of stratigraphic control over the specimens increases the probability that classification problems exist between the North Carolina and South Carolina data sets. The effect on the thesis of collapsing these two types into a single category is assumed to be minimal.

The Morrow Mountain II type is clearly either a temporally meaningful variant of the Morrow Mountain I form or a product of technological variation possibly related to raw material or functional differences within the hafted biface population (Blanton and Sassaman 1989:65; Claggett and Cable 1982:486-488; Cridlebaugh 1977:46). The stratigraphic relationship of the two types documented by Coe (1964) has not been replicated at other southeastern sites (Anderson and Joseph 1988; Blanton and Sassaman 1989; Cridlebaugh 1977). Consequently, for the purposes of this research the Morrow Mountain I and II types are grouped into a single category.

EARLY AND MIDDLE ARCHAIC PERIOD SETTLEMENT MODELS

For decades, Southeastern archaeologists have commented on lithic raw material procurement during the Early and Middle Archaic periods (Caldwell 1954; Coe 1964; Chapman 1975, 1977). This research has resulted in some broad generalizations about the kinds of lithic raw materials procured by Native Americans at different points along this temporal continuum (Anderson 1979; Blanton 1983; Goodyear et al. 1979; Sassaman 1983).

The procurement and utilization of lithic raw material for the manufacture of stone tools has generated patterns of lithic resource variability in the archaeological record from North and South Carolina. This variability has been linked to specific hunter-gatherer adaptive strategies through a series of settlement system models (Anderson and Hanson 1988; Blanton 1983; Claggett and Cable 1982; O'Steen 1991; Sassaman 1983).

Early and Middle Archaic period researchers have utilized the archaeological record to create a series of settlement models which constitute the framework for this thesis. Ecological theory and ethnoarchaeological empiricism have been united in these models which share similar theoretical principles and operating assumptions (Binford 1980; Gould 1977; Jochim 1976 and Pianka 1978).

The reconstruction of late Pleistocene and Early Holocene environments through interdisciplinary research has played a major role in the development of these models by allowing the archaeological record to be placed into an appropriate ecological context. The ability to reconstruct the salient features of paleolandscapes and to measure environmental changes at a scale relevant to the study of human adaptation has presented archaeologists with a powerful explanatory tool. All of the models presented in this discussion depend on paleoenvironmental reconstructions to warrant arguments about shifting trends in technological and spatial organization.

In the early 1980s, archaeological research along the Haw River in the Piedmont of North Carolina generated a model of hunter-gatherer mobility which linked Post Pleistocene environmental change to time transgressive shifts in technological organization. In general the model suggests that temperature increase during the Holocene influenced the distribution of floral and faunal resources eliciting an organizational response from Early and Middle Archaic hunter-gatherer societies.

It is postulated that the structure of biotic resources at the close of the Pleistocene favored a collector adaptive strategy. Collector groups exploited an environment in which resources were incongruent in time and space. The problem of heterogeneous resource structure was solved by logistical mobility, a positional strategy in which the group benefits from the procurement of critical resources by task groups operating away form the main residential encampment (Binford 1980). Technological organization was focused on highly curated tools especially hafted bifaces.

The increase in "effective temperature" during the course of the Holocene created a more homogenous resource structure associated with a mature deciduous forest cover (Claggett and Cable 1988:684). Middle Archaic hunter-gatherer groups responded by adopting a foraging strategy tied to high levels of residential mobility. These mobile foragers utilized an expedient situational technology which results in high ratios of expedient to formal tools, a condition reflected in the artifact assemblages recovered from the Haw River sites (Claggett and Cable 1982:686-687, 764).

Just outside the study area along the upper Oconee River in the eastern Georgia Piedmont, the Wallace Reservoir research project has resulted in an alternative model of Early Archaic hunter-gatherer mobility (O'Steen 1983). Utilizing data from 248 sites yielding 363 Early Archaic hafted bifaces, O'Steen (1983) demonstrated that site density varies with resource density. Population densities were estimated using data derived from modern hunter-gatherers suggesting that between 80 and 200 people may have occupied the upper basin at any one time during the Early Archaic (O'Steen 1983:110).

An argument is made that Early Archaic groups were relatively sedentary with base camps located on river terraces at the confluences of minor streams with the main channel of the river. Territories were circumscribed, cutting off direct access to extra local raw materials. It is postulated that the extra local raw materials appearing in the Wallace Reservoir assemblages may have been secured by trade (O'Steen 1983:115-116).

The third and final Early Archaic settlement model suggests that "four limiting factors strongly conditioned the structure and operation of Early Archaic adaptations on the South Atlantic Slope" (Anderson and Hanson 1988:280). The authors believe that environmental structure affecting the distribution of critical resources both geographically and seasonally influenced the settlement-subsistence system of Early Archaic groups on the South Atlantic Slope.

The model also takes into account the biological and informational needs of populations existing in a low density demographic environment. Finally, Anderson and Hanson (1988:280) suggest that population size and spacing were important factors influencing the spatial organization of Early Archaic groups in the study area.

Scholars investigating the Archaic period in the Carolina Piedmont have advanced two settlement models for the area (Blanton and Sassaman 1988; Goodyear et al. 1979; House and Ballenger 1976; House and Wogaman 1978; Sassaman 1983). The earlier of the two models proposed a dichotomous settlement system with primary residential base camps located on terraces along major streams and smaller extractive settlements in the interriverine uplands (Goodyear et al. 1979; House and Ballenger 1976; House and Wogaman 1978).

Major floodplain excavations in the Richard B. Russell Reservoir largely failed to find evidence of intensively occupied Middle Archaic terrace sites (Anderson and Joseph 1988:137). Middle Archaic components excavated at the Greg Shoals (9EB259) and Rucker's Bottom (9EB91) sites on the Georgia side of the Savannah River yielded low diversity assemblages similar in content to the surrounding upland sites (Anderson and Schuldenrein 1985; Tippitt and Marquardt 1984).

The analysis of site distribution and assemblage content data from the Piedmont has demonstrated a Middle Archaic settlement pattern characterized by diffuse lithic scatters with little interassemblage variability (Sassaman 1983). Site density was high across environmental gradients suggesting little correlation between functional site types and specific topographic settings (Blanton and Sassaman 1989:64). In general the evidence from surface scatters and excavated sites failed to substantiate the riverine\interriverine model (Anderson and Joseph 1988:137).

During the 1980s, new ideas concerning Archaic period settlement systems began to emerge. Taking advantage of an increased data base, ecological concepts, and the research of ethnoarchaeologists, local investigators developed a new model of hunter-gatherer mobility specifically targeting Middle Archaic groups (Blanton 1983; Blanton and Sassaman 1989; Sassaman 1983). This model proposes a high level of residential mobility by hunters and gatherers practicing a foraging adaptive strategy. The settlement pattern was characterized by frequent relocation of small coresident groups utilizing a simple lithic technology geared to meeting the needs of the moment (Blanton and Sassaman 1989:68). Support for the model is abundant in the Middle Archaic archaeological record from the Piedmont where sites tend to be small and numerous with low artifact densities, few diagnostics and little intersite assemblage variability (Blanton 1983; Canouts and Goodyear 1985; Sassaman 1983).

The propositions addressed in this thesis can be grouped into two categories: those that are time transgressive and those that are synchronic in nature. The first set touches on technological change through time by addressing the issue of time transgressive trends in the selection of lithic raw material for tool production. The second set of propositions link lithic raw material variability in the archaeological record with aspects of hunter-gatherer adaptive behavior, specifically mobility and social organization.

Early Archaic and Middle Archaic settlement system models agree that the utilization of extralocal lithic raw material decreases through time in response to population increase and reduced hunter-gatherer mobility (Anderson and Hanson 1988; Blanton 1983; Sassaman 1983). This proposition is generally accepted for both the North and South Carolina Piedmont (Claggett and Cable 1982). The archaeological implication is time transgressive and amenable to evaluation through an analysis of lithic raw material selected for the manufacture of

Palmer\Kirk Corner Notched, Bifurcate, Kirk Stemmed\Serrated, Stanly, Morrow Mountain I\Morrow Mountian II and Guilford hafted bifaces.

Synchronic implications about lithic raw material distribution and hunter-gatherer spatial organization are embedded in each of the models examined in this thesis. For example, during the Early Archaic period on the South Atlantic Slope, it is proposed that band ranges and activities were largely contained within specific water shed systems. This argument is supported with data that shows a clinal fall-off in the use of extralocal raw material with distance from the source. The authors infer "minimal social boundaries" within the Savannah River watershed and direct access to chert outcrops via residential mobility (Anderson and Hanson 1988:280).

The ability of this model to explain the pattern of lithic resource variability within other drainages on the South Atlantic slope has recently been challenged (Daniel 1991). An analysis of the geographic distribution of extralocal lithic raw material used in the manufacture of Early Archaic Palmer\ Kirk Corner Notched, Bifurcate and Kirk Stemmed hafted bifaces from the Carolina Piedmont addresses this problem.

Early Archaic residential base camps are proposed for the fall line region of the South Atlantic Slope (Anderson and Hanson 1988; Wetmore and Goodyear 1986). It is postulated that the aggregation of hunter-gatherer bands was necessary for the exchange of subsistence information. The coalescence of bands into larger social entities was also necessary for the maintenance of a biologically viable population. Logistically organized base camps would have facilitated the exchange of mates between different bands (Anderson and Hanson 1988:267).

The archaeological implications for the seasonal aggregation of hunter-gatherers at fall line base camps are "high lithic raw material and possibly assemblage diversity" (Anderson and Hanson 1988:280). A high incidence of extralocal material in fall line samples of diagnostic hafted bifaces would confirm this expectation. In addition to the high incidence of extralocal material, a spike in the number of hafted bifaces is anticipated in fall line counties. This proposition is based on the premise that macro-ecotones would have been preferentially exploited by hunter-gatherer populations. It is assumed that high levels of exploitation would have generated high levels of tool discard and loss. Evidence supporting this argument is available from fall line sites "characterized by atypical concentrations of formal tools" (Anderson and Hanson 1988:270). This proposition is open to evaluation through comparison of hafted biface counts from counties along the fall line and those from the interior Piedmont.

A settlement system comprised of highly mobile foragers has been proposed for the Middle Archaic period in the Piedmont of North and South Carolina (Blanton and Sassaman 1889; Claggett and Cable 1982; Sassaman 1983). In these models, increased residential mobility during the Middle Archaic period is accompanied by a shift in technological organization from curated to expedient tool forms. The proposed pattern of residential mobility occurs against a backdrop of circumscribed band range. In South Carolina, a reduction in band range is supported by the almost exclusive use of local lithic raw material for the manufacture of hafted bifaces (Blanton 1983; Canouts and Goodyear 1985; Sassaman 1983).

It is postulated that these same adaptive strategies were employed by Middle Archaic hunter-gatherers in the Piedmont of North Carolina (Claggett and Cable 1982). This proposition is evaluated by a comparison of the relative frequency of extralocal and local raw materials used in the manufacture of Morrow Mountain hafted bifaces from each state.

The existence of discrete band ranges within different parts of a single drainage system during the Middle Archaic is suspected. If this is true and social boundaries existed between bands, then the fall off in the use of extralocal lithic raw material will covary with distance from the geologic source in a stepwise manner. A gradual fall off in the use of extralocal materials will support the proposition that hunter-gatherer societies were organized around the principle of social fluidity and reciprocity (Sassaman 1983:283). This problem is considered through the analysis of lithic raw material frequencies from counties representing a within drainage spatial transect.

The analysis focuses on the spatial distribution of selected lithic material categories, especially those characterized by spatially circumscribed source areas. It is assumed that the distribution of these materials reflects the range and orientation of Early and Middle Archaic hunter-gatherers on the landscape of North and South Carolina. Expectations about hunter-gatherer mobility derived from current settlement models are tested and the results described in Chapter V.

CHAPTER IV

THE DATA BASES AND METHOD OF PATTERN RECOGNITION

THE NORTH AND SOUTH CAROLINA DATA BASES

Archaeologists interested in broad scale adaptive patterns have been presented with a body of data that is unique, irreplaceable and of great interpretive value. The North Carolina projectile point classification project combined with the South Carolina private collector's survey are robust sources of data about the distribution Early and Middle Archaic period hafted bifaces on the South Atlantic Slope (Charles 1979, 1981, 1983, 1985, 1986; Davis and Daniel 1990). The opportunities and limitations of these two data sets for addressing questions of hunter-gatherer mobility are presented in this chapter.

For archaeologist working on Paleoindian, Early and Middle Archaic settlement patterns, the South Carolina collector's survey project is an extremely useful source of data on the spatial distribution of diagnostic artifact types (Anderson 1991; Anderson and Schuldenrein 1983; Blanton and Sassaman 1989; Goodyear et al. 1989; Sassaman 1991; Sassaman et al. 1988). In addition, data secured from the comparative collections of the the North Carolina Research Laboratory of Anthropology at Chapel Hill, is available for study (Davis and Daniel 1990; Daniel 1991).

The North Carolina data base includes information on 22,349 artifacts collected from 1,313 archaeological sites in 50 of the state's counties (Davis and Daniel 1990:14). The projectile point component of the classification project focused on 22,244 hafted bifaces classified into 36 previously defined types and six general categories (Davis and Daniel 1990:4). Information on 105 diagnostic late Paleoindian and Early Archaic unifacial tools collected is included with the hafted biface data (Davis and Daniel 1990:15).

The projectile point classification project was designed to provide much needed information about the early archaeological surveys conducted in North Carolina (Davis and Daniel 1990). It was determined that the projectile point classification project would begin with an analysis of the collections from Piedmont counties and be extended, if time and funds allowed (Davis and Daniel 1990:3). The decision to focus on the Piedmont was predicated on the high levels of activity which characterized early efforts to identify and document archaeological sites in the region, especially the south-central Piedmont which contains the Uwharrie Mountains area (Davis and Daniel 1990). Not all of the sites collected from the Piedmont were included in the hafted biface analysis. Those sites lacking clear provenience data were omitted, as were the excavated assemblages from sites such as Town Creek (31MG2, 31MG3), Doerschuk (31MG22), Hardaway (31ST4), and the Wall site (31OR11) (Davis and Daniel 1990:3).

Paraphrasing Davis and Daniel (1990:3) the hafted biface analysis was limited to the following categories of information: (1) the identification of provenience data (eg. State site number and UNC-RLA catalog number), (2) the classification of the hafted biface type, (3) the determination of general raw material type, (4) the recording of subsequent hafted biface modification excluding resharpening or breakage. These data were numerically coded, computerized and compiled using an MS-Dos based personal computer system and Dbase Four data management software. The North Carolina Archaeology Branch which funded the project, through a survey and planning grant, now houses and distributes the data base to scholars upon request.

The South Carolina data base was compiled between 1979 and 1986 under the direction of Mr. Tommy Charles of the South Carolina Institute of Archaeology and Anthropology. The collector survey project was funded in part by a survey and planning grant from the South Carolina Department of Archives and History (Charles 1986). Although similar in content and research potential, the North and South Carolina projects were radically different in approach. While the North Carolina data base is limited to a single vast collection held in trust by a research institution, the South Carolina collector's project focused on privately held collections from across the state.

The main purpose of the South Carolina effort was the documentation of collections and their associated sites. Secondary objectives included the identification of who is currently in possession of the collections, the location and physical condition (Charles 1981, 1983, 1984, 1985, 1986). A concern with collector behavior, attitudes and education was present throughout the history of the project.

The methods used to record the collections was severely constrained by the limitations of time, money and collector cooperation. It can be said that limited resources were brought to bear on a task that is practically limitless. Fortunately, a considerable amount of ingenuity and organizational skill was brought to the project by its principal investigator, resulting in the examination of 323 collections associated with 805 archaeological sites in all 46 of the states counties (Charles 1986).

Faced with the challenge of characterizing collections which in some cases numbered in excess of one hundred thousand specimens, a decision was made to focus on those artifact classes with the most research potential. Numeric data was collected on hafted bifaces, "miscellaneous implements" (eg. ground and chipped stone axes, abraders, hammer stones, etc.), and bone tools (Charles 1985). The metric and nonmetric attributes of Paleoindian lanceolate hafted bifaces were recorded on the spot.

The hafted biface analysis focused on classification and raw material type (Charles 1986). A total of 31 well documented types were used to classify the hafted biface samples. In general, the classification system conformed to the typological framework erected by Coe (1964) for the North Carolina Piedmont (Charles 1984). Local late Paleoindian\Early Archaic side notched (Taylor) and late Middle Archaic lanceolate (Brier Creek) forms were also classified. The lithic raw materials used to manufacture the hafted bifaces were finely discriminated into six categories and seven sub categories (Charles 1984). This data has been partially computerized using a character code format on a Macintosh personal computer system using the Excel data base management software.

Computerization, conversion and standardization of the North Carolina and South Carolina data bases proved to be problematical. A completely satisfactory solution to the compatibility problem had not been obtained at the time of this writing.

It would be amiss to leave this subject without pointing out similarites and differences between the North and South Carolina data bases. In the North Carolina case, following a time honored tradition established by the Research Laboratories of Anthropology director emeritus, Dr. Joffre Coe, each specimen in that institution's collection has received an individual catalog number. This means that every specimen can be associated with a site provenience. The South Carolina data lacks this level of spatial control because private collectors rarely maintain site level provenience over their material (Charles 1992: personal communication). This means that only an insignificant number of the hafted biface specimens classified and included in this research can be associated with its place of origin.

Fortunately, all of the specimens classified by Charles have been associated with clusters of sites within county boundaries. As a result, it is possible to determine the number and kinds of archaeological components identified at specific sites by general association with specific hafted biface types rather than individual specimens. In this thesis, the comparison of categorical data is resolved at the county level of provenience. Consequently, the loss of site specific association did not have a detrimental effect on the interpretation of the data.

The North Carolina data base has also been influenced by the activities of private collectors (Coe 1992: personal communication). This is especially true of the Yadkin River Valley where many sites were identified and collected by Mr. H. M. Doerschuk and the Reverend Douglas Rights. The collections amassed by these men included many thousands of specimens reflecting not only their own efforts but also those of family, friends, parishioners and co-workers (Coe 1992: personal communication).

Fortunately, much of this material was donated to Wake Forest University and the University of North Carolina at Chapel Hill. Many of the Palmer\Kirk Corner Notched and Morrow Mountain specimens collected by Doerschuk and Rights were included in the North Carolina projectile point classification project.

SAMPLING BIASES

The data derived from the North and South Carolina data bases is not a random sample of the variability present in the archaeological record of the two states. Collector bias and research selectivity has created uneven sample sizes within the counties chosen for the analysis. In the South Carolina data base, low levels of collector activity coupled with a lack of access to existing collections has resulted in counties with low numbers of hafted bifaces available for analysis. In the North Carolina data base, low numbers result from a combination of factors including a lack of survey activity in certain counties and the exemption of selected sites from the published results of the analysis (Daniel 1992: personal communication).

In addition to the uneven cell sizes in the contingency tables, the use of proportional frequency polygons for comparative purposes can be misleading (Zar 1984). Proportional frequency polygons are susceptible to mathematical interactions. Interpretations drawn from the shape of the curve must be tested against the numeric data. This cautionary practice is designed to ensure that the observed variation reflects a real increase or decrease in proportional representation and not a purely mathematical function. All of these unwelcome factors must be known and addressed before the results can be interpreted in terms of Early and Middle Archaic hunter-gatherer group mobility.

It is recognized that both the North and South Carolina data sets are vulnerable to the effects of collector behavior. The selective acquisition of by hafted bifaces by private collectors is one potential source of sample bias. The failure of collectors to recover imperfect, routine or broken specimens could bias the proportional representation of certain raw material classes. This belief is predicated on the physical characteristics which govern the fracturing patterns of different stone materials.

Asymmetry in the recovery of raw material classes because selective acquisition is regarded as a minor component of the observed lithic raw material variability for the following reasons. First, broken specimens were consistently recovered in the field by both professional and avocational archaeologists. This statement is supported by the presence of hafted biface fragments in the North Carolina data base. During the analysis undifferentiated mid-sections and distal ends were placed in the unidentified category of the hafted biface classification study (Davis 1992: personal communication). Unidentified hafted biface fragments were classified by raw material category. Those broken bifaces retaining a haft element were classified by type and raw material category (Davis 1992: personal communication).

Second, in South Carolina collector selectivity was identified in the display of hafted bifaces rather than in their field recovery rates (Charles 1992: personal communication). Collections consisting of only whole specimens on display were excluded from the hafted biface analysis. The presence of broken specimens in a collection was a precondition for its inclusion in the hafted biface classification part of the study (Charles 1992: personal communication).

Third, the sample sizes are large and provide robust data for the analysis. The samples used in the analysis include a total of 13,389 Early and Middle Archaic specimens classified by hafted biface type and raw material category. These specimens were recovered from 277 sites located in 36 North and South Carolina counties. It is assumed that the large sample sizes used in this research have acted to even out biases in the samples that can be attributed to collector selectivity.

Because two investigators were involved in the classification of the combined North and South Carolina data base, interobserver error cannot be excluded as a potential source of sampling bias. This issue has been addressed in part by the selection of analytical units which reflect categories of raw materials rather than specific types and by the combination of closely related hafted biface forms into individual sampling strata.

The scale and goals of the research become important considerations when determining the effect of sampling biases on data interpretation. In this case, the interpretation of the relationship between hunter-gatherer group mobility and the spatial dimension of lithic raw material variation is based on an analysis of frequency distributions. This data has been drawn from many sites within the area of interest. It is assumed that these large sample sizes have evenly distributed the existing sampling biases so that the remaining variation can be interpreted in ways that are meaningful to an investigation of prehistoric hunter-gatherer group mobility.

METHODS OF PATTERN RECOGNITION

A two way sampling procedure secured the data for the analysis. Step one of the procedure involved the selection of temporally meaningful sampling strata. The Palmer and Kirk Corner Notched hafted biface types have been combined into a single diagnostic artifact category on the basis of morphological similarity. This hafted biface category is assigned to the Palmer-Kirk phase of the Early Archaic Period on the basis of chrono-stratigraphic position. A combined Morrow Mountain I and Morrow Mountain II diagnostic artifact category has been created to represent the Morrow Mountain phase of the Middle Archaic Period. The reader is referred to Chapter III for a discussion of the morphological and stratigraphic characteristics of

Palmer, Kirk Corner Notched, Morrow Mountain I and Morrow Mountain II hafted bifaces.

The second part of the sampling design involved defining the attribute or variable under study. In this case, raw material categories rather than raw material types were used in the analysis for the following reasons: First, the North Carolina lithic raw material classification system is based on raw material categories rather than specific types (Davis and Daniel 1990:13). Second, research compatibility demands that comparisons only occur between like classificatory units. This means that the South Carolina lithic raw material classifications had to be reorganized at a lower level of specificity so that the two data bases could be combined for the analysis.

For example, the metavolcanic category includes: rhyolite, argillite, welded tuff, vitric tuff, felsic tuff, porphyry and unidentified matavolcanics. Coastal Plain chert represents the other major category of interest in this research. This category includes chert from the Black Mingo, Flint River and possibly the Santee Limestone formations. However, for the purposes of this thesis, it is assumed that the majority of this material was obtained from quarries near the Savannah River in Allendale County, South Carolina and Burke County, Georgia (Goodyear and Charles 1984).

Quartz, Ridge and Valley chert and orthoquartzite account for most of the lithic variation exclusive of the metavolcanic and Coastal Plain chert materials. A sixth category named "other" captures hafted bifaces made from schistose rocks, basalts, diorite and jasper. The patinated material from North Carolina was also included in the "other" category.

The county is the basic sampling unit used to maintain spatial control over the data for the purpose of tracking the movement of lithic raw materials across the landscape. County by county comparisons of proportional data are made to address specific questions about Early and Middle Archaic hunter-gatherer group mobility and its archaeological correlates. These county by county comparisons are organized by linear transects.

The irregular sizes of the county sampling units posed a potential problem for the analysis. Obviously, there is a correlation between the size of a sampling unit and the number of specimens it contains. This generalization operates independently of scale and can affect the interpretation of archaeological data at any point along the comparative continuum from site excavation unit to physiographic region.

Geographers have struggled with this problem and have found ways to standardize observations collected from irregular sampling units (Haggett et al. 1977). These techniques include: (1) aggregating many and irregular sampling units into larger (fewer) but more regular areas; (2) elimination of aberrant areas; (3) transformation of the sampling units into a regular grid pattern (Haggett et al. 1977:352).

In part, the aggregation of counties into transects standardizes the sampling units, which helps to smooth the data. However, this research entails the comparison not only of the transects but also the counties which make up these larger areas.

Consequently, the analysis depends on the use of proportional data to mute the effects of uneven cell sizes and irregular sampling units.

A two step pattern extraction method was used to analyze the spatial dimension of lithic raw material variation in selected portions of North and South Carolina. Step one involved the measurement of raw material variability within counties using nominal scale data. The enumerated data was drawn from samples of hafted bifaces which have been classified by type and raw material category. Following Wilmsen and Roberts (1978:25), the term category is defined as a subset of artifacts that share specific characteristics.

This data is presented in a series of frequency distribution contingency tables. The contingency table data containing raw counts has been standardized by converting the enumerated values to percentages. Step two involved transforming the information content of the contingency tables into a series of graphs showing proportional frequency polygons.

The use of generic lithic material categories rather than types presents a problem for the analysis which warrants discussion. In the case of Uwharrie rhyolite, source areas can be pin-pointed with a high degree of accuracy (Daniel and Butler 1990). However, when raw material types are grouped by category, the size of the potential source area increases.

Under the circumstances, an assumption about the size and location of the lithic raw material source areas associated with the categories used in the analysis is necessary. It is assumed that the source area for much of the metavolcanic lithic raw material category is the Uwharrie Mountain region of south-central North Carolina.

The geology of the Piedmont supports this assumption. Although metaigneous rocks outcrop throughout the North and South Carolina Piedmont, much of this material has been exposed to medium and high grade metamorphism which has recrystallized these rocks (Overstreet and Bell 1965). The process of recrystallization reduces the isotrophic quality of the material making it a poor candidate for bifacial reduction (Daniel 1992: personal communication).

Because of the effects of recrystallization, exposures of meta-igneous stone capable of concoidial fracture are limited to the low grade metamorphic zone centered on the Uwharrie Mountain region of south-central North Carolina (Butler and Secor 1991:67). Further support for the assumption comes from the archaeological record. Daniel and Butler (1990) have documented the presence of a cluster of Uwharrie rhyolite quarries centered on the Badin-Asheboro area. This cluster of rhyolite quarries is unique to the south-central Piedmont region of North Carolina. No metavolcanic quarries of any kind have been identified from the South Carolina Piedmont (Charles 1992: personal communication).

The use of raw material categories rather than specific stone types in the analysis was dictated by the classification system used to code the North Carolina data. It is predicted that the use of categorical level data will efficiently and effectively track the movement of raw materials across the landscape from their source areas. Minor adjustments to the proportional frequency polygons are anticipated, when in the future, types rather than categories of metaigneous rocks are used in the analysis of specific cross drainage transects. The influence of these adjustments on interpretations of Early and Middle Archaic hunter-gatherer group mobility at the regional scale are predicted to be minimal.

The use of proportional data in archaeology facilitates comparisons and is a useful tool for the extraction of patterning in contingency tables (Zar 1984). Unfortunately, proportional relationships may be forced by mathematical interactions that are deterministic and unrelated to the enumerated data from which they are drawn. This problem may be mitigated by paying close attention to the raw counts. When the proportions fluctuate independently of the enumerated values, then the results cannot be interpreted in terms of human behavior.

A series of proportional frequency polygons are used to present the data for visual inspection. This method of presentation was selected because: (1) it allows the simultaneous comparison of data trends within and between multiple sampling units (counties); (2) the graph presents a summary profile of the lithic raw material variation found along the transect; (3) the proportional relationships of different raw material categories are available for direct visual comparison.

Zar (1984:11) suggests that proportional frequency polygons are designed to aid the eye in following the trends in frequency distributions. The polygon represents an alternative to the presentation of data using a histogram. Consequently, the relative proportions are only accurate at the mid-point of the interval on the horizontal axis (Zar 1984:11). It is stressed that proportions should not be estimated between the points on the polygon. Zar (1984:11) goes on to state that, when graphs are to be compared with one another, it is essential to standardize them by beginning the vertical axis (showing the proportional frequency scale) at zero.

These conventions and cautionary warnings about the potential misuse of proportional frequency polygons are exercised in Chapter V. Following (Amick 1984), the graphs are used as a hueristic device for the presentation of data trends. While conclusions may be drawn from them, the graphs in and of themselves do not provide a statistical test of the hypothesized relationships. These issues are further discussed on a case by case basis in the next chapter, as we explore patterning in lithic raw material variation across the landscape of North and South Carolina.

Late in the study, it was decided to take advantage of the resolution provided by the South Carolina classification system by refocusing on the distribution of specific raw material types subsummed under the matavolcanic category. This decision was opertionalized by the creation of county within transect contingency tables for rhyolite, tuff, argillite and undetermined metavolcanic raw material types.

A series of comparisons between transects and temporal phases based on this information produced unanticpated results in some areas and confirmed long held convictions in others. Unfortunately, the North Carolina data cannot support this level of analysis. By necessity, the conclusions drawn from this aspect of the analysis are limited to South Carolina.

CHAPTER V

RESULTS OF THE SPATIAL ANALYSIS

This chapter contains the description, analysis and discussion of the lithic material distribution patterns extracted from the North and South Carolina hafted biface classification projects. The chapter is organized into three sections. Each section presents a series of from two to four proportional frequency graphs. They are used here as a heuristic device to summarize and present the data for visual inspection.

The graphs document trends in the relative proportions of the targeted materials. Shifts in the relative proportions of the lithic material categories are graphically expressed as proportional frequency polygons, hence forth called curves. These curves are interpreted in terms of the transport of extralocal materials away from their source areas.

In general, it is often the case that the abundance of a material declines with distance from its source (Haggett et al. 1977:208). Energy drives this relationship, requiring an increase in input for each unit of distance travelled. The pattern of decrease with distance has been named the "Law of Monotonic Decrement" (Renfrew 1977:72) The validity of this concept as a heuristic device is recognized by geographers and archaeologists alike (Renfrew 1977). The curves presented in this chapter represent special cases drawn from this general model.

A decision was made to aggregate the counties into larger spatial constructs (transects) for ease of comparison. The geographic location and orientation of the transects links the distributional analysis to a series of expectations derived from current Early and Middle Archaic settlement models.

The distributional analysis creates an extralocal material pattern or signature for each of the transects under study. These signatures are believed to reflect the expansive nature of Early Archaic hunter-gatherer mobility. Early Archaic and Middle Archaic period extralocal lithic material patterns are contrasted transect by transect in search of diachronic trends in the displacement of these materials.

Recent studies of hunter-gatherers has demonstrated the importance of exchange as a mechanism of social integration (Ericson 1977). That some form of exchange operated during the Early Archaic is likely. Its impact on the archaeological record of the period is disputed (Anderson and Hanson 1988:280; Goodyear 1989:7; Meltzer 1989:26; O'Steen 1991:106; Sassaman 1991:73). The role of exchange as a potential causal agent for the observed patterning is recognized and incorporated into the discussion. In this case, exchange is viewed as an alternative mechanism for the transport of extralocal lithic material away form its source area.

What is not in dispute is the difficulty of distinguishing between archaeological patterns produced by exchange versus mobility (Renfrew 1977). Renfrew (1977:82) has identified the problem as one of equifinality, a general systems concept which states that the end result can be obtained under different boundary conditions and in different ways (Renfrew 1977:83).

Based on equifinality, it is apparent that no final conclusions may be drawn regarding the mechanisms of extralocal raw material transport (Meltzer 1989:30). As Daniel (1991:84) points out, the movement of Early Archaic extralocal lithic materials over the landscape may have been caused by either direct procurement, indirect procurement or a combination of both. In this regard, Meltzer's (1989) call for the evaluation of alternative mechanisms for the transport of extralocal stone has produced a useful foil for arguments that mobility accounts for these patterns.

Whatever the mechanism of transport, extralocal lithic material distributions are telling us about the geographical boundaries of adaptive systems (Sassaman 1991). The situation is not an atypical one for archaeologists who are often faced with the evaluation of alternative explanations for the same phenomenon. With this in mind, it seems appropriate to turn our attention once again to the potential which distributional analysis has for estimating the orientation and geographic extent of Early Archaic hunter-gatherer mobility.

As stated earlier, this chapter is organized into three sections. The first section examines lithic material variation along the Savannah and Yadkin-Pee Dee River Valleys. Both river valleys contain sources of tractable stone. The Savannah locality includes exposures of Flint River chert and ample evidence of quarrying activity (Figure 2.4). Approximately, 300 km to the north Early Archaic hunter-gatherer groups were procuring large quantities of

Uwharrie rhyolite for the production of Palmer and Kirk Corner Notched bifaces (Figure 2.4).

Anderson and Hanson (1988) supported their biocultural model of Early Archaic settlement on the South Atlantic Slope with an analysis of artifact assemblages and lithic material variation based on collections from the Savannah River Valley. They concluded that hunter-gatherer bands practiced a drainage wide mixed forager-collector adaptive strategy supplemented by multiband aggregation at sites along the Fall Line for the exchange of mates and information.

The Fall Line aggregation aspect of the Anderson-Hanson model is used to explain the incidence of extralocal stone in drainages away from their source areas. It is implied that social interaction between bands from different river drainages would have provided an opportunity for the indirect acquisition of extralocal lithic material. The exact mechanism of exchange either by groups or individuals is left unspecified.

The belief that band ranges were isomorphic with major river drainages is the most controversial aspect of the biocultural model (Daniel 1991:77). In a critique of the Anderson-Hanson position, Daniel (1991:78) suggests that the pattern of across drainage extralocal lithic material distribution may be the result of direct procurement either through an embedded or logistical acquisition strategy. This implies that Early Archaic hunter-gatherer groups included multiple drainage basins in their annual round of movement (Daniel 1991:78).

Many implications for Middle Archaic settlement systems are embedded in the biocultural settlement model. Anderson and Hanson (1988) frequently use generalizations about the Middle Archaic period as a contrasting data set to better define their conclusions about Early Archaic settlement. This comparative tactic is fully utilized throughout my discussion of the various transects.

The second set of graphs to be discussed in Chapter V represent linear transects drawn across a series of major Piedmont and Coastal Plain drainages. Following Sassaman (1991), a Middle Coastal Plain transect is used to establish an extralocal distribution signature for the province (Figure 2.2). In general, the lithology of the Coastal Plain contrasts strongly with that of the Piedmont in terms of the local availability of lithic material to replace exhausted tool kits.

A transect based on Piedmont counties is also presented in this section (Figure 2.2). The Piedmont is characterized by an abundant replacement material in the from of quartz. Significant differences in the incidence of extralocal lithics between the two transects reflect differences in the underlying lithology.

The Coastal Plain and Piedmont transects are linked to the propositions of Early Archaic hunter-gatherer mobility offered by Anderson and Hanson (1988) and Daniel (1991). Insufficient data is available to resolve these differences at the present time. However, I believe that the observations presented below may sharpen the image and contribute to the debate.

The final section discusses the implications of extralocal lithic material fall-off along a transect drawn from Stanly County, North Carolina to Allendale County, South Carolina (Figure 2.2). The ends of the transect are isometric with the primary source areas for Uwharrie rhyolite and Flint River chert (Figure 2.4). Both counties contain major prehistoric quarries. It is generally believed that the most intensive utilization of these quarries occurred during the Paleoindian and Early Archaic periods (Daniel 1991; Goodyear and Charles 1984).

The source area to source area transect acts as a standard of comparison for the along and across river drainage transects. With the exception of the Savannah River Valley transect all other units of comparison are characterized by asymmetry in the availability of lithic replacement materials. This transect controls for that potential effect.

THE SAVANNAH AND YADKIN-PEE DEE TRANSECTS

The Savannah River Transect

The Savannah River transect extends from the mountains to the sea separating the states of Georgia and South Carolina (Figure 2.2). The drainage system has been partitioned into an upper and lower basin by the South Carolina Water Resources Commission (Snyder et al. 1983). I have chosen to use their nomenclature for comparative purposes.

In general the Savannah River basin includes approximately 11,507.2 square km (7192 square miles) or 15 percent of the State's land area. It drains the western Piedmont and Coastal Plain provinces of the state. Parts of 13 South Carolina Counties fall within the boundaries of the basin (Snyder et al. 1983).

In recent years both the upper and lower basins have been the subject of intense archaeological scrutiny. Cultural resource management programs have been carried out by the United States Corps of Army Engineers, the United States Forest Service and the Department of Energy. Archaeological survey and data recovery programs in the Richard B. Russell Reservoir, the Sumter National Forest and the Savannah River Site have significantly increased our understanding of the prehistoric settlement systems that once operated in the valley. Local archaeologists have taken advantage of this wealth of data by developing a series of Early and Middle Archaic settlement models (Anderson and Hanson 1988; Sassaman et al. 1988; Sassaman 1991).

The Anderson-Hanson biocultural settlement model has proven to be a catalyst for research on Early Archaic hunter-gatherer group mobility. In part, the model rests on a fall-off curve which demonstrates the presence of Coastal Plain chert in the Piedmont counties of the upper basin. The presence of Coastal Plain chert in the Piedmont had been previously noted and its implications for hunter-gatherer group mobility speculated upon (Anderson et al. 1979; Anderson and Schuldenrein 1983; Goodyear et al. 1979). From 1983 until 1988 these ideas gestated until formally published in a set of papers which in retrospect have proven seminal (Anderson and Schuldenrein 1983; Anderson and Hanson 1988; Sassaman et al. 1988).

<u>The Early Archaic Graph</u>

The Savannah River Valley graph is reproduced here to provide a frame of reference for the discussion of the Anderson-Hanson model and its regional settlement implications (Figure 5.1). Beginning in

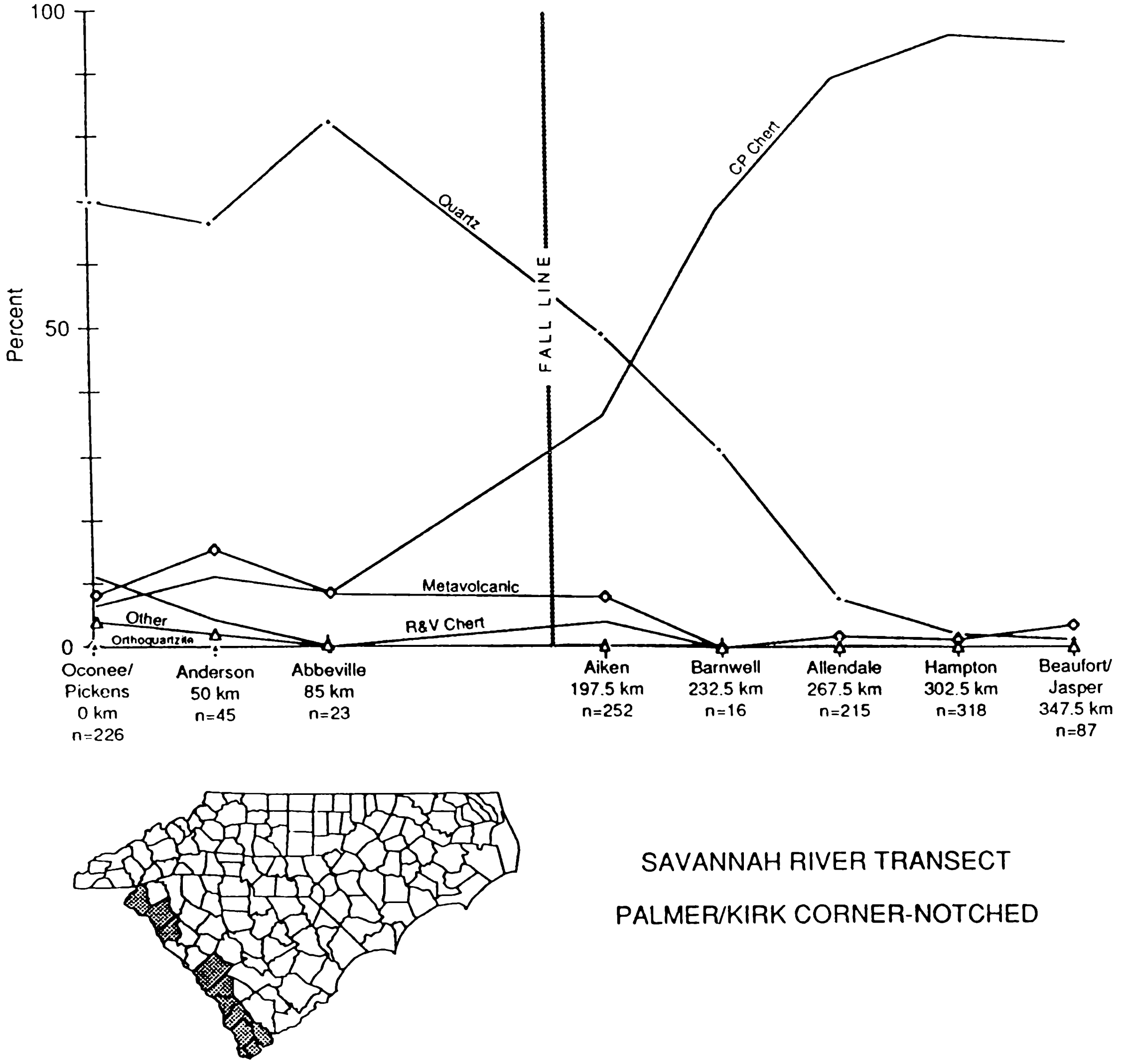


Figure 5.1. The Savannah River Transect-Early Archaic Graph (Following Anderson and Hanson 1988).

Pickens\Oconee counties, the transect extends for approximately 348 km (217.5 miles) terminating at the Atlantic Ocean in Beaufort\Jasper counties. Small samples sizes have resulted in the combination of county sampling units at either end of the transect. A lack of data on Early Archaic Palmer\Kirk Corner Notched hafted bifaces eliminated McCormick and Edgefield Counties from the analysis creating a gap in the transect along the Fall Line.

While unfortunate, this lack of data does not affect the overall shape of the curve which clearly shows the geographic range of the selected lithic material categories (Figure 5.1). Quartz dominates the upper basin attaining its highest relative frequency of 83 percent in Abbeville County (Table 5.1). The depressed values for quartz in Oconee\Pickens and Anderson Counties reflects the diversity of the stone materials which occur in the collections from the head waters of the Savannah River.

In the upper basin counties, metavolcanic materials constitute about 10 percent of the total specimens (Table 5.1). Within the metavolcanic category, approximately 78 percent of the material is rhyolite (Table 5.2). The remaining 22 percent is tuff. It is clear form these data that the metavolcanic stone sources of the Savannah River Valley were not being heavily exploited during the initial phases of the Early Archaic period. When metavolcanics were utilized, rhyolite was the preferred material. These observation coupled with the relatively high frequency of quartz in the collections suggests that the lithology of the upper basin is rhyolite poor. This conclusion is consistent with the relatively high levels of

Table 5.1: The Savannah River Transect-Early Archaic Lithic Materials: Counts and Percentages.

COUNTY	Km[1]	MVL[2] #\%	QTZ[3] #\%	CPC[4] #\%	R&V[5] #\%	OQTZ[6] #\%	OTH[7] #\%	TOTAL
OCONEE/PICKENS	0.0	19\8.4	158\69.9	15\6.6	25\11.1	0\0.0	9\4.0	226\100.0
ANDERSON	50.0	7\15.6	30\66.7	5\11.1	2\4.4	0\0.0	1\2.2	45\100.0
ABBEVILLE	85.0	2\8.7	19\82.6	2\8.7	0\0.0	0\0.0	0\0.0	23\100.0
AIKEN	197.5	21\8.3	125\49.6	93\36.9	11\4.4	2\0.8	0\0.0	252\100.0
BARNWELL	232.5	0\0.0	5\31.3	11\68.8	0\0.0	0\0.0	0\0.0	16\100.0
ALLENDALE	267.5	4\1.9	17\7.9	193\89.8	0\0.0	1\0.5	0\0.0	215\100.0
HAMPTON	302.5	4\1.3	7\2.2	307\96.5	0\0.0	0\0.0	0\0.0	318\100.0
BEAUFORT/JASPER	347.5	3\3.4	1\1.1	83\95.4	0\0.0	0\0.0	0\0.0	87\100.0

[1]kilometers along the transect
[2]metavolcanic lithic material
[3]quartz
[4]coastal plain chert
[5]ridge and valley chert
[6]orthoquartzite
[7]the other category includes patinated specimens, jasper, diorite and basalt

Table 5.2: The Savannah River Transect-Early Archaic Metavolcanic Materials: Counts and Percentages.

COUNTY	Km[1]	RHY[2] #\%	TUFF[3] #\%	ARG[4] #\%	UMETA[5] #\%	TOTAL #\%
OCONEE/PICKENS	0.0	12\66.6	4\22.2	0\0.0	2\11.1	18\100.0
ANDERSON	50.0	3\42.8	2\28.6	0\0.0	2\28.6	7\100.0
ABBEVILLE	85.0	2\100.0	0\0.0	0\0.0	0\0.0	2\100.0
EDGEFIELD	165.5	0\0.0	0\0.0	0\0.0	0\0.0	0\0.0
AIKEN/BARNWELL	215.0	19\90.5	1\5.3	1\5.3	0\0.0	21\100.0
ALLENDALE	267.5	3\75.0	1\25.0	0\0.0	0\0.0	4\100.0
HAMPTON	302.5	4\100.0	0\0.0	0\0.0	0\0.0	4\100.0
BEAUFORT/JASPER	347.5	3\100.0	0\0.0	0\0.0	0\0.0	3\100.0

[1] kilometers along the transect
[2] rhyolite
[3] metavolcanic tuff
[4] argillite
[5] unidentified metavolcanic lithic material

metamorphism reported from the area (Horton and Zullo 1991; Overstreet and Bell 1965).

An examination of the data for the Palmer-Kirk phase in Aiken and Barnwell Counties reveals an almost total dependence on Coastal Plain chert. Only eight percent of the collections from those two counties consist of metavolcanic stone (Table 5.1). A breakdown of the metavolcanic category is revealing. Approximately, 90 percent are classified as rhyolite of the metavolcanic Palmer\Kirk Corner Notched specimens (Table 5.2). The emphasis on lithic material capable of predictable concoidial fracture extends across material classes present in the same locality.

The diversity of stone material present in the collections from the upper Savannah River does not extend beyond Aiken County on the Fall Line. Coastal Plain chert utilization attains relative frequencies of from 90 to 95 percent along an 80 km stretch of the Savannah River Valley coinciding with Allendale, Hampton, Jasper and Beaufort Counties (Figure 5.1). The abundance of Coastal Plain chert in the collections from these counties is explained by the close proximity of the Allendale and Brier Creek quarries.

The salient points to be drawn from the Savannah River Valley Early Archaic transect are as follows. First, lithic material diversity exists in the upper basin. Second, Coastal Plain chert was transported from the Allendale County area into the upper basin. Third, the relationship between extralocal materials and distance from source area is expressed as an exponential distance decay curve for both quartz and Coastal Plain chert. Finally, the clinal shape of the fall-off curves for these two materials may be interpreted in terms of hunter-gatherer drainage wide mobility.

These generalizations form part of the basis for Anderson and Hanson's (1988) biocultural model of Early Archaic settlement on the South Atlantic Slope. The presence of Coastal Plain chert in the Piedmont portion of the Savannah River Valley was interpreted as evidence of drainage wide mobility during the Early Archaic period. Minimal social boundaries within the valley were inferred from the shape of the curve which is clinal rather than step-like (Figure 5.1). Data drawn from excavated assemblages was included to support the author's belief that extralocal raw material transport is greater along rather than across river drainages and that most group activities occurred within individual drainage systems (Anderson and Hanson 1988:280).

The Savannah River Early Archaic graph has been reproduced here for comparative purposes and to illustrate the discussion of the Anderson-Hanson settlement model. Over the course of this chapter, evidence will be presented which is at variance with certain parts of the Anderson-Hanson model. Specifically, the focus on activity within drainages in the Piedmont and the Fall Line aggregation aspects of the model are called into question.

The Middle Archaic Graph

Following Sassaman et al.(1988), a graph representing raw material variation along the Savannah River Valley during the Morrow Mountain phase is presented here (Figure 5.2). The transect for the Middle Archaic period includes Edgefield County. The inclusion of

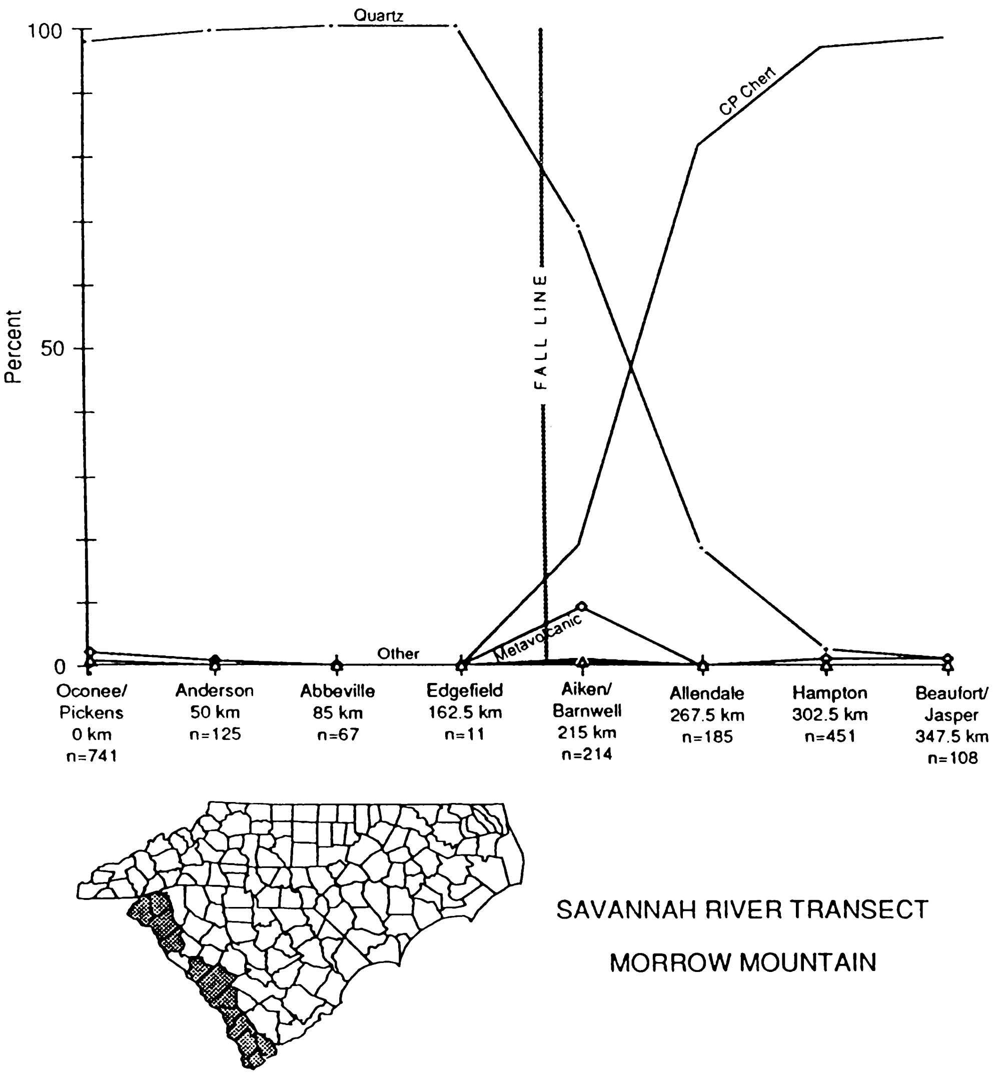


Figure 5.2. The Savannah River Transect-Middle Archaic Graph.

Edgefield in the analysis is based on the presence of a small sample of Morrow Mountain I\Morrow Mountain II hafted bifaces.

This graph is remarkable because it is consistent with many of our general conceptions about how Middle Archaic adaptive systems are reflected in the archaeological record. A reliance on the exploitation of local lithic materials is forcefully demonstrated in both the upper and lower basins during the Morrow Mountain phase (Figure 5.2). The relative percentage of quartz ranges from 97 percent to 100 percent over the course of approximately 163 km covering the Oconee\Pickens area down to Edgefield County (Table 5.3). The fall-off rate for Coastal Plain chert at the other end of the transect reflects the almost exclusive use of this material for the manufacture of hafted bifaces in the Jasper\Beaufort area and Hampton County (Figure 5.2).

A few variations in the proportional relationships of minority raw material categories disturb the pattern and are worthy of investigation. In particular, a spike in the incidence of metavolcanic material is noted for the combined Aiken\Barnwell Middle Archaic sample (Figure 5.2). A total of 214 Morrow Mountain I\Morrow Mountain II hafted bifaces are included in the analysis from these two counties suggesting that sample size does not account for this pattern.

I believe that the explanation should be sought in the lithology of the Fall Line portion of the Savannah River Valley. The lithology of the Fall Line in the vicinity of Edgefield and McCormick Counties is dominated by the rocks of the Carolina Slate Belt and the Charlotte

Table 5.3: The Savannah River Transect-Middle Archaic Lithic Materials: Counts and Percentages.

COUNTY	Km[1]	MVL[2] #\%	QTZ[3] #\%	CPC[4] #\%	R&V[5] #\%	OQTZ[6] #\%	OTH[7] #\%	TOTAL
OCONEE/PICKENS	0.0	14\1.9	721\97.3	0\0.0	0\0.0	0\0.0	6\0.8	741\100.0
ANDERSON	50.0	1\0.8	124\99.2	0\0.0	0\0.0	0\0.0	0\0.0	125\100.0
ABBEVILLE	85.0	0\0.0	67\100.0	0\0.0	0\0.0	0\0.0	0\0.0	67\100.0
EDGEFIELD	162.5	0\0.0	11\100.0	0\0.0	0\0.0	0\0.0	0\0.0	11\100.0
AIKEN/BARNWELL	215.0	21\9.8	148\69.2	41\19.2	1\0.5	2\0.9	1\0.5	214\100.0
ALLENDALE	267.5	0\0.0	34\18.4	151\81.6	0\0.0	0\0.0	0\0.0	185\100.0
HAMPTON	302.5	4\0.9	11\2.4	436\96.7	0\0.0	0\0.0	0\0.0	451\100.0
BEAUFORT/JASPER	347.5	1\0.9	1\0.9	106\98.1	0\0.0	0\0.0	0\0.0	108\100.0

[1] kilometers along the transect
[2] metavolcanic lithic material
[3] quartz
[4] coastal plain chert
[5] ridge and valley chert
[6] orthoquartzite
[7] the other category includes patinated specimens, jasper, diorite and basalt

Belt. Although pockets of rhyolite exist throughout the Slate Belt, recrystallization of this material under the influence of medium to high grade metamorphic processes may have limited its utility for the production of stone tools (Daniel 1992: personal communication). Based on the local geology, it is suspected that deposits of fine grained porphyritic and nonporhyritic rhyolite are not extensive in the Aiken Plataeu-Fall Line area.

This hypothesis is supported by the raw data collected by Charles from Aiken and Barnwell Counties. An analysis of the 21 metavolcanic hafted bifaces reveals that approximately 76 percent of the material has been classified as argillite (Table 5.4). The remaining four identified specimens fall into the rhyolite category. Very little metavolcanic material has been identified in the excavated assemblages from the Savannah River Site in Aiken and Barnwell Counties (Sassaman et al. 1990). This further supports the proposition that rhyolite is not locally abundant in the Middle Savannah River Valley.

In general, this pattern suggests local procurement and utilization in a part of the valley that may have been stone poor in terms of high quality raw materials. Limited access to quartz and Coastal Plain chert is implied. One possible explanation for this pattern is the existence of a social boundary along the Savannah River Valley in the vicinity the Aiken Plateau.

Spatial circumscription of hunter-gatherer ranges in the Savannah River Valley has been advanced by Sassaman et al. (1988). The step like fall-off in the relative frequencies of quartz and

Table 5.4: The Savannah River Transect-Middle Archaic Metavolcanic Materials: Counts and Percentages.

COUNTY	Km[1]	RHY[2] #\%	TUFF[3] #\%	ARG[4] #\%	UMETA[5] #\%	TOTAL #\%
OCONEE/PICKENS	0.0	4\30.8	0\0.0	5\38.5	4\30.8	13\100.0
ANDERSON	50.0	3\42.8	2\28.6	0\0.0	2\28.6	7\100.0
ABBEVILLE	85.0	0\0.0	0\0.0	0\0.0	0\0.0	0\0.0
EDGEFIELD	165.5	0\0.0	0\0.0	0\0.0	0\0.0	0\0.0
AIKEN/BARNWELL	215.0	4\19.0	0\0.0	16\76.2	1\4.8	21\100.0
ALLENDALE	267.5	0\0.0	0\0.0	0\0.0	0\0.0	0\0.0
HAMPTON	302.5	3\75.0	0\0.0	1\25.0	0\0.0	4\100.0
BEAUFORT/JASPER	347.5	1\100.0	0\0.0	0\0.0	0\0.0	1\100.0

[1] kilometers along the transect
[2] rhyolite
[3] metavolcanic tuff
[4] argillite
[5] unidentified metavolcanic lithic material

Coastal Plain chert has been interpreted as evidence for a possible boundary between hunter-gatherer groups (Sassaman et al. 1988). The diversity of materials and the replacement of quartz and Coastal Plain chert with nonrhyolitic metavolcanic stone at a point equidistant from the Piedmont and Allendale quarries is evidence in support of this position.

The Yadkin-Pee Dee Transect

The North Carolina segment of the Yadkin-Pee Dee drainage system empties the western and central portions of the North Carolina Piedmont before crossing into the Coastal Plain near the border with South Carolina (Figure 2.1). A total of six North Carolina counties have been incorporated into an analysis of the lithic raw material variation which exists within the Yadkin-Pee Dee Valley.

A few miles above the South Carolina line, the Yadkin River is joined by the Rocky River, from that point south, the main channel of the system is known as the Pee Dee River. In the interest of comparability, the Yadkin-Pee Dee system is divided into an upper and lower basin. The upper basin contains the main channel of the Yadkin River while the Pee Dee River drains the lower basin.

The Pee Dee River extends from the North Carolina border in a southeast direction to Winyah Bay (Figure 2.1). It drains approximately 3760 square km (2,350 square miles) (Snyder et al. 1983). A total of eight South Carolina Counties fall within the boundaries of the basin, five of which form the Yadkin-Pee Dee transect (Figure 2.2).

Davidson and Rowan Counties define the northern point of departure for the Yadkin-Pee Dee transect which extends for a distance of about 260 km (162.5 miles) terminating in Horry County, South Carolina. In North Carolina, the transect is composed of pairs of counties joined for analysis because the river forms a common border between them.

The Yadkin-Pee Dee transect includes data drawn from the North Carolina hafted biface classification project. A brief discussion of the classification system is necessary to resolve a series of effects that are more apparent than real. First, the suppressed values for metavolcanic stone ascending the river in Davidson, Rowan, Stanley and Montgomery Counties reflect the relatively high incidence of "patinated" Palmer\Kirk Corner Notched specimens in those collections (Davis and Daniel 1990). The patinated specimens from North Carolina were included in the "other" category for the purposes of this analysis. Daniel (1992: personal communication), however, believes that almost all of the patinated specimens are metavolcanic in origin.

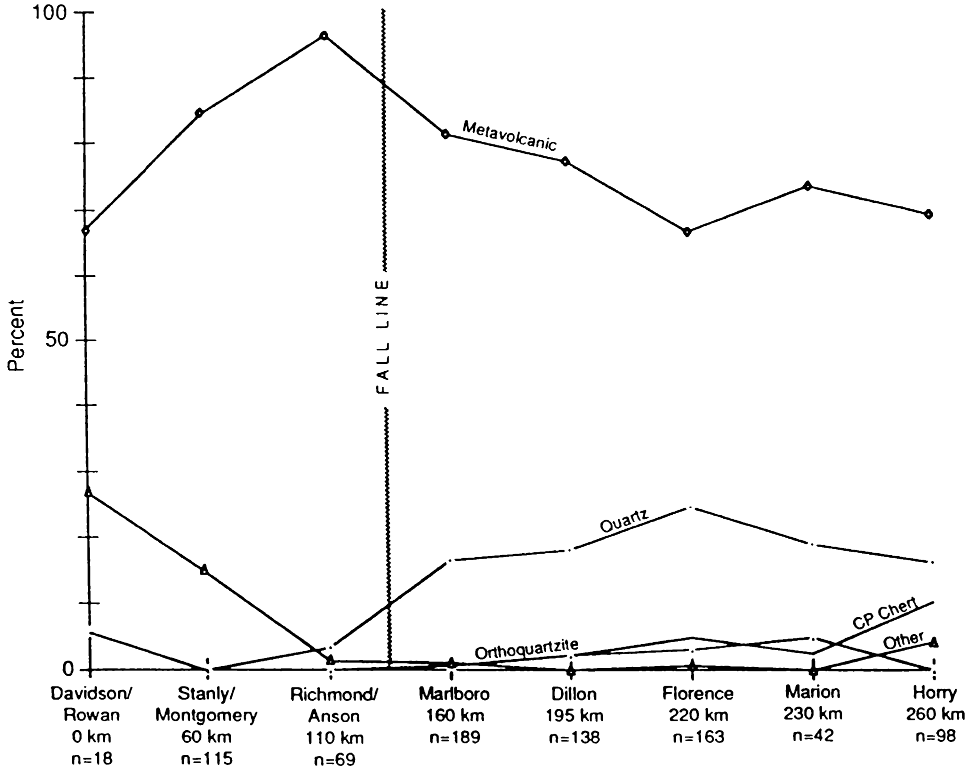
This leads directly to a second generalization about the North Carolina data base. Daniel (1992:81) states that "although the general stone category "metavolcanic" (e.g. rhyolite, tuff, argillite) was used in the study, the vast majority of the points of this group were made of Uwharrie rhyolite". In this case, Daniel is referring specifically to the North Carolina samples of Early Archaic Palmer\Kirk Corner Notched hafted bifaces.

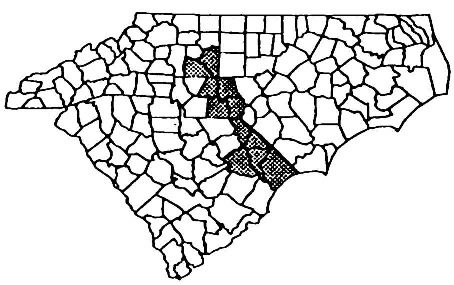
The Early Archaic Graph

Having discussed the nuances of the North Carolina data base, it is now appropriate to turn our attention to an analysis of the variation in the distribution of lithic material that exists along the Yadkin-Pee Dee transect (Figure 5.3). Sassaman (1991:61) has reported a high volume of metavolcanic material in the Pee Dee drainage as much as 200 km from its source. The range of proportional values for metavolcanic stone in the lower basin confirms Sassaman's (1991) findings. For example, in Marlboro County approximately 82 percent of the lithic raw materials are metavolcanic in origin (Table 5.5). At the coast line in Horry County the relative frequency of metavolcanic stone remains high at 69 percent.

When broken down by type, rhyolite dominates the lower basin collections. Approximately, 87 percent of the lower basin Palmer\Kirk Corner Notched specimens were manufactured from this material (Table 5.6). Metavolcanic tuff accounts for another 10 percent with the remainder falling into the unidentified category. It is strongly suspected that the rhyolite in the Coastal Plain was transported from the Uwharrie Mountains. The exact type and origin of the rhyolite identified in the Coastal Plain collections has not been demonstrated.

The incidence of Coastal Plain chert and orthoquartzite increases as one descends the drainage basin into the heart of the Coastal Plain while the incidence of quartz peaks in Florence County at 25 percent (Table 5.6). This is indicative of greater raw material diversity in the Coastal Plain as opposed to the Piedmont. Based on this analysis and that from Aiken and Barnwell Counties along





YADKIN-PEE DEE TRANSECT

PALMER/KIRK CORNER-NOTCHED

Figure 5.3. The Yadkin-Pee Dee River Transect-Early Archaic Graph.

Table 5.5: The Yadkin-Pee Dee River Transect-Early Archaic Lithic Materials: Counts and Percentages.

COUNTY	Km[1]	MVL[2] #\%	QTZ[3] #\%	CPC[4] #\%	R&V[5] #\%	OQTZ[6] #\%	OTH[7] #\%	TOTAL
DAVIDSON/ROWAN	0.0	12\66.7	1\5.6	0\0.0	0\0.0	0\0.0	5\27.8	18\100.0
STANLY/MONTGOM.[8]	60.0	97\84.3	0\0.0	0\0.0	0\0.0	0\0.0	18\15.7	115\100.0
RICHMOND/ANSON	110.0	66\95.7	2\2.9	0\0.0	0\0.0	0\0.0	1\1.4	69\100.0
MARLBORO	160.0	154\81.5	31\16.4	1\0.5	0\0.0	1\0.5	2\1.1	189\100.0
DILLON	195.0	107\77.5	25\18.1	3\2.2	0\0.0	3\2.2	0\0.0	138\100.0
FLORENCE	220.0	109\66.9	40\24.5	8\4.9	0\0.0	5\3.1	1\0.6	163\100.0
MARION	230.0	31\73.8	8\19.0	1\2.4	0\0.0	2\4.8	0\0.0	42\100.0
HORRY	260.0	68\69.4	16\16.3	10\10.2	0\0.0	0\0.0	4\4.1	98\100.0

[1] kilometers along the transect
[2] metavolcanic lithic material
[3] quartz
[4] coastal plain chert
[5] ridge and valley chert
[6] orthoquartzite
[7] the other category includes patinated specimens, jasper, diorite and basalt
[8] Montgomery County, N.C.

Table 5.6: The Yadkin-Pee Dee River Transect-Early Archaic Metavolcanic Materials: Counts and Percentages.

COUNTY	Km[1]	RHY[2] #\%	TUFF[3] #\%	ARG[4] #\%	UMETA[5] #\%	TOTAL #\%
MARLBORO	160.0	150\97.4	3\1.9	1\0.7	0\0.0	154\100.0
DILLON	195.0	83\79.0	22\20.9	0\0.0	0\0.0	105\100.0
FLORENCE	220.0	100\91.7	6\5.5	1\0.9	2\1.8	109\100.0
MARION	230.5	28\90.3	3\9.7	0\0.0	0\0.0	31\100.0
HORRY	260.0	44\64.7	17\25.0	1\1.5	6\8.8	68\100.0

[1]kilometers along the transect
[2]rhyolite
[3]metavolcanic tuff
[4]argillite
[5]unidentified metavolcanic lithic material

the Savannah River, it is possible that a correlation exists between raw material diversity and the lack of an abundant locally available replacement material.

The Middle Archaic Graph

In general raw material diversity and distribution during the Middle Archaic mimics the earlier period (Figure 5.4). The North Carolina Piedmont counties are characterized by high proportions of metavolcanic stone. The values range from a low of 86 in Davidson\Rowan County areas to 94 in Richmond\Anson County areas (Table 5.7). Quartz is a minor constituent of the North Carolina raw material assemblage reaching its highest relative frequency of seven percent in Davidson and Rowan Counties.

The flow of metavolcanic material into the northern Coastal Plain remained high during the Middle Archaic period (Figure 5.4). Proportional values range from 91 percent in Marlboro County to a low of 67 percent in Marion County (Table 5.7). The exponential decay with distance model is violated by an increase in the relative frequency of metavolcanic material at a distance of approximately 200 km from its nearest source area.

A finer grained analysis of the metavolcanic group reveals the following pattern. First, the proportion of rhyolite in the lower basin collections drops from its Early Archaic high of 87 percent to 63 percent (Table 5.8). Tuff, argillite and unidentified metavolcanic stone accounts for nearly 36 percent of the total metavolcanic raw material found in the lower basin during the Morrow Mountain phase.

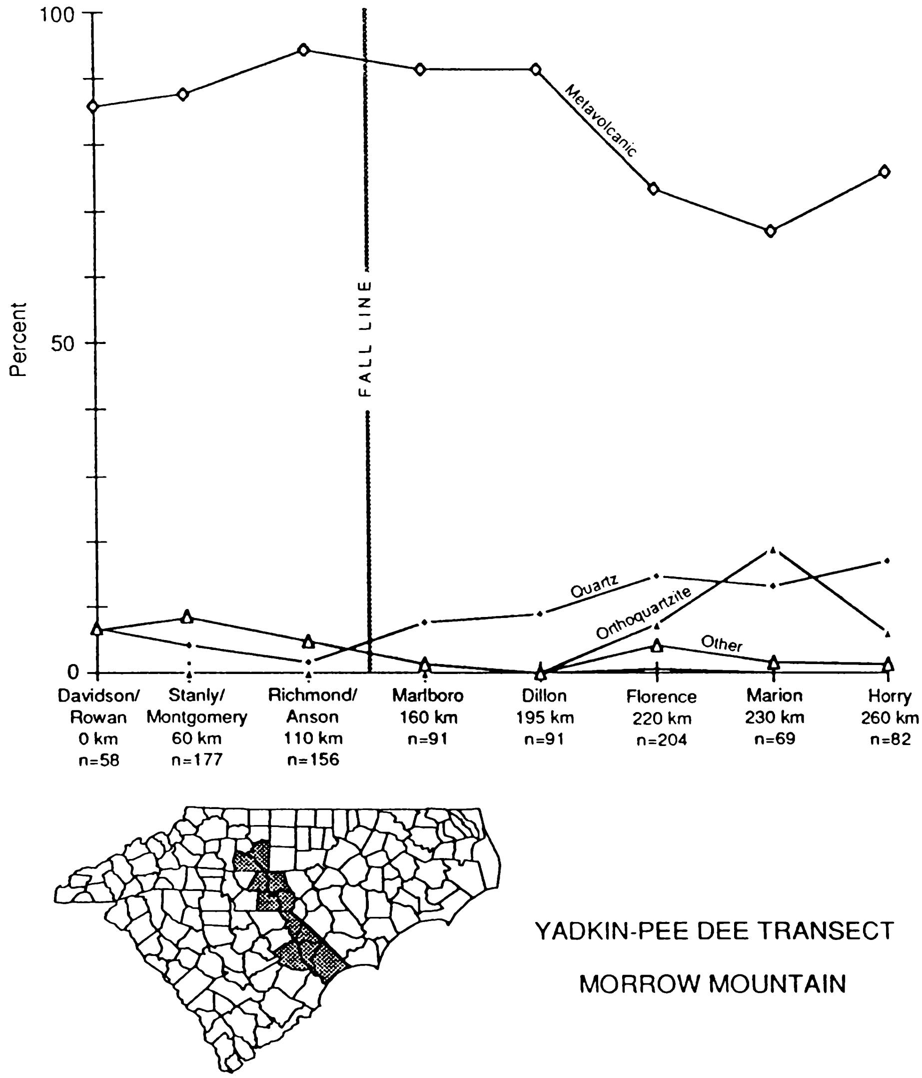


Figure 5.4. The Yadkin-Pee Dee River Transect-Middle Archaic Graph.

Table 5.7: The Yadkin-Pee Dee River Transect-Middle Archaic Lithic Materials: Counts and Percentages.								
COUNTY	Km[1]	MVL[2] #\%	QTZ[3] #\%	CPC[4] #\%	R&V[5] #\%	OQTZ[6] #\%	OTH[7] #\%	TOTAL
DAVIDSON/ROWAN	0.0	50\86.2	4\6.9	0\0.0	0\0.0	0\0.0	4\6.9	58\100.0
STANLY/MONTGOM[8]	60.0	155\87.6	7\4.0	0\0.0	0\0.0	0\0.0	15\8.5	177\100.0
RICHMOND/ANSON	110.0	147\94.2	2\1.3	0\0.0	0\0.0	0\0.0	7\4.5	156\100.0
MARLBORO	160.0	83\91.2	7\7.7	0\0.0	0\0.0	0\0.0	1\1.1	91\100.0
DILLON	195.0	83\91.2	8\8.8	0\0.0	0\0.0	0\0.0	0\0.0	91\100.0
FLORENCE	220.0	149\73.0	30\14.7	1\0.5	1\0.5	15\7.4	8\3.9	204\100.0
MARION	230.0	46\66.7	9\13.0	0\0.0	0\0.0	13\18.8	1\1.4	69\100.0
HORRY	260.0	62\75.6	14\17.1	0\0.0	0\0.0	5\6.1	1\1.2	82\100.0

[1]kilometers along the transect
[2]metavolcanic lithic material
[3]quartz
[4]coastal plain chert
[5]ridge and valley chert14
[6]orthoquartzite
[7]the other category includes patinated specimens, jasper, diorite and basalt
[8]Montgomery County, N.C.

Table 5.8: The Yadkin-Pee Dee River Transect-Middle Archaic Metavolcanic Materials: Counts and Percentages.

COUNTY	Km[1]	RHY[2] #\%	TUFF[3] #\%	ARG[4] #\%	UMETA[5] #\%	TOTAL #\%
MARLBORO	160.0	75\90.4	5\6.0	0\0.0	3\3.6	83\100.0
DILLON	195.0	57\68.7	21\25.3	0\0.0	5\6.0	83\100.0
FLORENCE	220.0	93\62.4	20\13.4	31\20.8	5\3.4	149\100.0
MARION	230.5	17\36.5	26\56.5	1\2.2	2\4.3	46\100.0
HORRY	260.0	24\38.7	19\30.6	1\1.6	18\29.0	62\100.0

[1]kilometers along the transect
[2]rhyolite
[3]metavolcanic tuff
[4]argillite
[5]unidentified metavolcanic lithic material

The first significant use of orthoquartzite as a raw material for the production of hafted bifaces occurs at this time (Figure 5.4). Approximately, 19 percent of the raw material from Marion County was classified as orthoquartzite (Table 5.7). The fall-off pattern is consistent with a source area located along the Santee River Valley (Anderson et al. 1982; Colquhoun and Muthig 1991). The increased utilization of orthoquartzite is a good indication of a greater emphasis on localized procurement within a reduced mobility strategy.

Perhaps the most salient characteristic of the Yadkin-Pee Dee transect is the flow of metavolcanic material into the South Carolina Coastal Plain counties during both the Early and Middle Archaic periods. This information is some of the best evidence we have for drainage wide mobility during the Early Archaic.

A comparison of the Yadkin-Pee Dee and Savannah River curves suggests that different mechanisms may have been responsible for the movement of these raw material groups. The Early and Middle Archaic curves from the Yadkin-Pee Dee Valley show a step-like decline in metavolcanic values that could be interpreted as "down the line" exchange between bands or individuals (Renfrew 1977). It is apparent that a program of interassemblage analysis focusing on artifact diversity and morphology will be required to resolve the equifinality question in the South Carolina Coastal Plain (Kelly 1988; Sassaman 1991).

At face value, the Middle Archaic curve appears to be tracking the movement of Uwharrie rhyolite into the Coastal Plain indicating some form of drainage wide mobility. In reality the increase in the proportion of nonrhyolitic metavolcanic stone in the Morrow Mountain phase collections from the lower basin is suggestive of localized procurement and reduced settlement range.

The following conclusion can be drawn from this example. First, the evidence supports the assumption that the rhyolite occurring in the Yadkin-Pee Dee Valley originated in at the Uwharrie quarries. Second, this does not appear to be the case during the Middle Archaic period when a greater diversity of metavolcanic raw materials were utilized for the manufacture of Morrow Mountain I\Morrow Mountain II hafted bifaces. Thus, any assumptions about the nature and origin of the materials within the Middle Archaic component of the North Carolina metavolcanic category could yield spurious results.

THE MIDDLE COASTAL PLAIN AND PIEDMONT TRANSECTS

<u>The Middle Coastal Plain Transect</u>

In a paper on the evidence available for modeling Early Archaic settlement on the South Carolina Coastal Plain, Sassaman (1991:52) points out that the relationship between raw material procurement and hunter-gatherer mobility can be most effectively studied in areas which lack a replacement material (Sassaman 1991:52). This proposition is based on the way in which raw material distribution may have affected hunter-gatherer technological organization (Kelly 1988:731). It is stated that much of the variation present in archaeological assemblages can be accounted for by the availability of replacement materials rather than the requirements of subsistence related tasks (Sassaman 1991:73). The stone poor South Carolina

Coastal Plain offers a laboratory for testing this model of Archaic Period interassemblage variability.

The Middle Coastal Plain transect is entirely contained within South Carolina (Figure 2.2). It extends in a southwest direction for a distance of approximately 240 km (150 miles). A total of seven Coastal Plain counties are included beginning with Dillon County and ending on the Savannah River in Allendale County. These seven counties include about 7,227 square km (4,517 square miles) or about 14 percent of the states land area.

The transect traverses three major drainage basins: the Pee Dee, the Santee and the Savannah River Basins. The Middle Coastal Plain transect is presented for the purpose of identifying trends in the transport of extralocal material across drainages in a part of the state perceived to be lacking in replacement materials.

The patterns of lithic diversity and movement across the Middle Coastal Plain will be compared with similar data from the Piedmont transect. Based on differences in lithology, the distribution and diversity of stone materials used in the manufacture of hafted bifaces is expected to vary between the two provinces.

<u>The Early Archaic Graph</u>

Following Sassaman (1991), a graph showing the relative proportions of Early Archaic raw material categories from the Middle Coastal Plain is presented for visual inspection (Figure 5.5). It is apparent from the curves that a variety of extralocal materials are moving into the Middle Coastal Plain during the Palmer-Kirk phase.

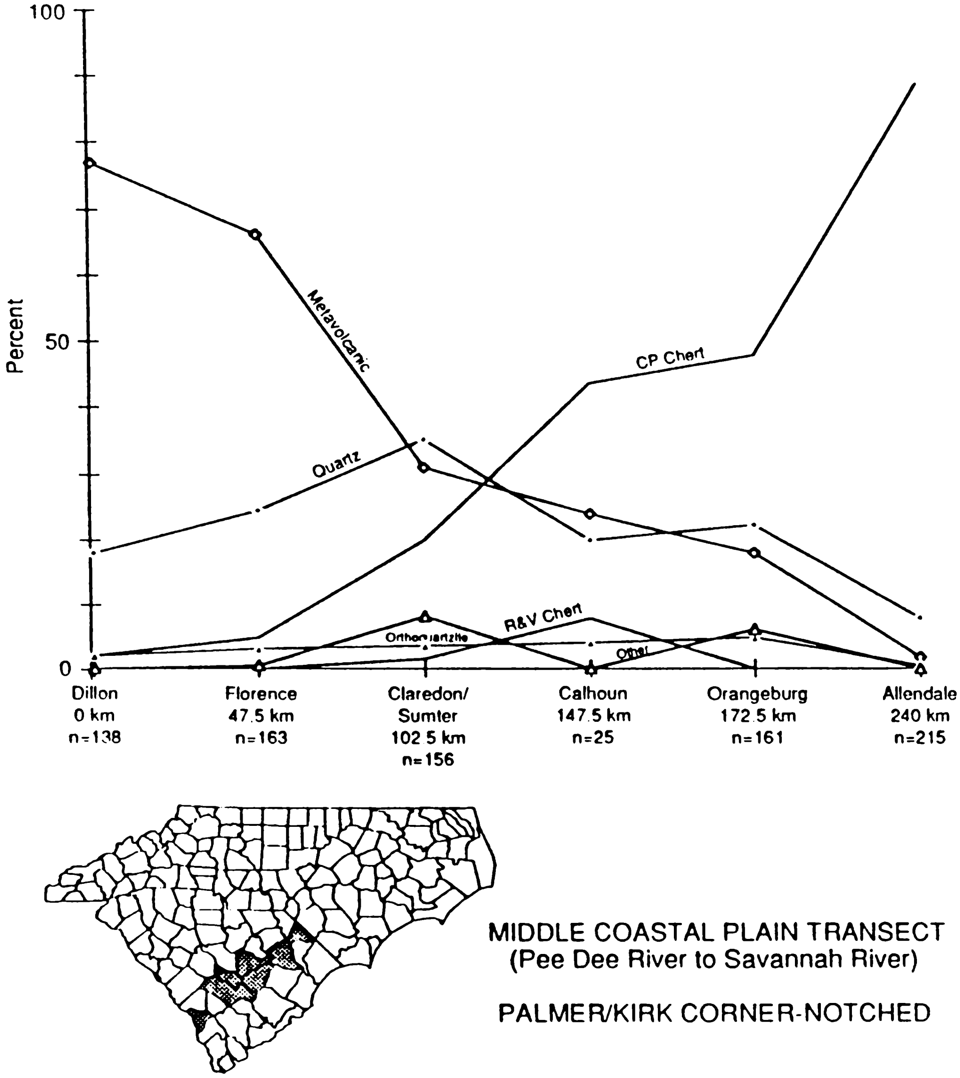


Figure 5.5. The Middle Coastal Plain Transect-Early Archaic Graph (Following Sassaman 1991).

Significant volumes of Coastal Plain chert were moving across drainages in the south-central sector of the Coastal Plain during the Early Archaic (Figure 5.5). The proportional values for this material range from approximately 90 percent in Allendale County to 19 percent in the Clarendon\Sumter area (Table 5.9). Metavolcanic stone constitutes from 78 to 67 percent of the collections from the northern end of the transect in Dillon and Florence Counties.

The incidence of both of these materials decreases after crossing the Santee River. Coastal Plain chert declines most rapidly, falling from about 19 percent in the Clarendon\Sumter collections to approximately five percent in Florence County (Figure 5.5). The shape of the metavolcanic curve reflects a more gradual decrease in the incidence of that material.

Sassaman (1991) has observed this fall-off in the proportional frequency of Coastal Plain chert at different points along the transect. Based on this observation, he has raised the possibility that the Santee River Valley may have formed a social boundary which restricted the northward flow of this extralocal raw material.

Using data drawn from additional transects and excavated site assemblages from the Aiken Plateau, Sassaman (1991) draws the following conclusions about the orientation and extent of Early Archaic hunter-gatherer mobility. First, evidence can be found in the excavated assemblages from the Department of Energy's Savannah River Site to support the hypothesis that small scale exchange between individuals or families was the operating mechanism for the lateral distribution of Coastal Plain chert in the Middle Coastal Plain

Table 5.9: The Middle Coastal Plain Transect-Early Archaic Lithic Materials: Counts and Percentages.

COUNTY	Km[1]	MVL[2] #\%	QTZ[3] #\%	CPC[4] #\%	R&V[5] #\%	OQTZ[6] #\%	OTH[7] #\%	TOTAL
DILLON	0.0	107\77.5	25\18.1	3\2.2	0\0.0	3\2.2	0\0.0	138\100.0
FLORENCE	47.5	109\66.9	40\24.5	8\4.9	0\0.0	5\3.1	1\0.6	163\100.0
CLARENDON/SUM.[8]	102.5	46\29.5	58\37.2	30\19.2	0\0.0	8\5.1	14\9.0	156\100.0
CALHOUN	147.5	6\24.0	5\20.0	11\44.0	2\8.0	1\4.0	0\0.0	25\100.0
ORANGEBURG	172.5	29\18.0	36\22.4	78\48.4	0\0.0	8\5.0	10\6.2	161\100.0
ALLENDALE	240.0	4\1.9	17\7.9	193\89.8	0\0.0	1\0.5	0\0.0	215\100.0

[1]kilometers along the transect
[2]metavolcanic lithic material
[3]quartz
[4]coastal plain chert
[5]ridge and valley chert
[6]orthoquartzite
[7]the other category includes patinated specimens, jasper, diorite and basalt
[8]Clarendon/Sumter Counties

(Sassaman 1991:73). This hypothesis is offered as an alternative to the Anderson-Hanson theory of social integration via Fall Line seasonal aggregation.

Second, spatial transects along multiple drainages consistently documented the movement of extralocal material from the Piedmont into the Coastal Plain. This evidence was interpreted as support for the Anderson-Hanson model of expansive drainage wide mobility during the Palmer-Kirk phase (Sassaman 1991:56).

A third generalization can be added to the list compiled by Sassaman. The distribution of orthoquartzite is believed to be spatially circumscribed based on our knowledge of Coastal Plain geology and the location of quarry sites. Yet, it consistently appears as a minority lithic raw material in the interior Middle Coastal Plain counties (Table 5.9). The even distribution of this material is presented here as further evidence of some form of across drainage mobility during the Palmer-Kirk phase (Figure 5.5).

The Middle Archaic Graph

The Middle Archaic graph is remarkable for the nearly identical fall-off patterns of Coastal Plain chert and metavolcanic stone (Figure 5.6). A rapid decline in the incidence of extralocal chert and metavolcanic stone characterizes the interior Coastal Plain counties. It coincides spatially with outcrops of the orthoquartzite bearing Black Mingo Formation and the chert bearing Santee Limestone Formation along the Santee River. The presence of these replacement materials accounts for the fall-off in the incidence of Flint River chert and Piedmont metvolcanic stone.

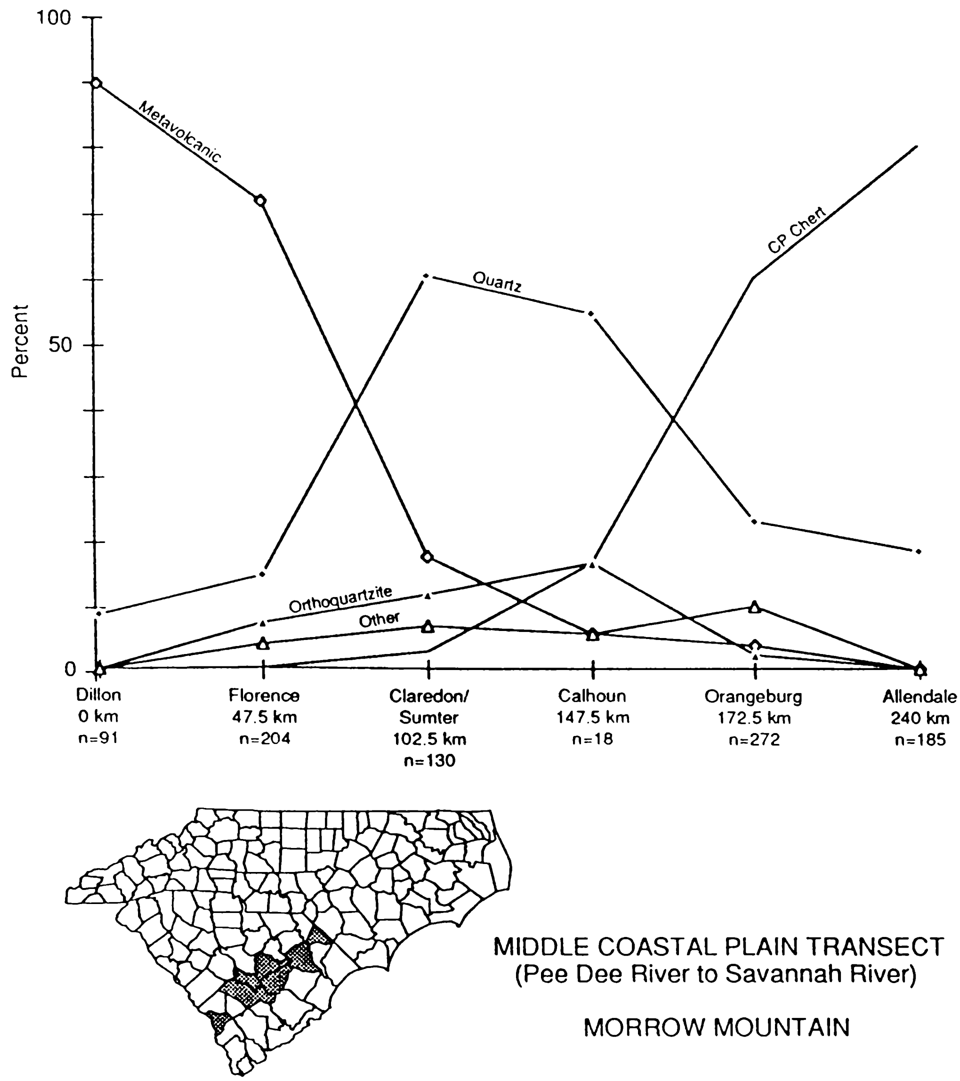


Figure 5.6. The Middle Coastal Plain Transect-Middle Archaic Graph.

Quartz and orthoquartzite raw material procurement and utilization increases dramatically in the Santee drainage (Figure 5.6). The proportional values for orthoquartzite reach 13 and 17 percent in the Clarendon\Sumter and Calhoun County areas (Table 5.10). A comparison of the Early and Middle Archaic graphs shows that the Ridge and Valley chert present in the Santee drainage during the Palmer-Kirk phase fails to appear in the Morrow Mountain phase collections (Figure 5.6). These two observations are interpreted as consistent with the general model of Middle Archaic technological and spatial organization which emphasizes localized lithic raw material provisioning within a limited settlement range.

The Piedmont Transect

The Piedmont transect cuts a swath cross the south-central North Carolina Piedmont beginning in Stanly County, North Carolina (Figure 2.2). It crosses into the South Carolina Piedmont at Chester County traversing the countryside for approximately 207.5 km (130 miles) before terminating at the McCormick County line. Chester, Newberry and Greenwood Counties account 2,712 square km (1695 square miles) or five percent of the states land area falls within .

Very little pertinent information on lithic resource variation is available from McCormick County. Less than 10 hafted biface specimens were available for study in each of the two phases under investigation. This resulted in the exclusion of McCormick County from the analysis. The loss of McCormick County truncates the transect one county short of the Savannah River Valley. Although it

Table 5.10: The Middle Coastal Plain Transect-Middle Archaic Lithic Materials: Counts and Percentages.

COUNTY	Km[1]	MVL[2] #\%	QTZ[3] #\%	CPC[4] #\%	R&V[5] #\%	OQTZ[6] #\%	OTH[7] #\%	TOTAL
DILLON	0.0	83\91.2	8\8.8	0\0.0	0\0.0	0\0.0	0\0.0	91\100.0
FLORENCE	47.5	149\73.0	30\14.7	1\0.5	1\0.5	15\7.4	8\3.9	204\100.0
CLARENDON/SUM.[8]	102.5	24\18.5	78\60.0	0\0.0	0\0.0	17\13.1	11\8.5	130\100.0
CALHOUN	147.5	1\5.6	10\55.6	3\16.7	0\0.0	3\16.7	1\5.6	18\100.0
ORANGEBURG	172.5	10\3.7	63\23.2	166\61.0	0\0.0	6\2.2	27\9.9	272\100.0
ALLENDALE	240.0	0\0.0	34\18.4	151\81.6	0\0.0	0\0.0	0\0.0	185\100.0

[1] kilometers along the transect
[2] metavolcanic lithic material
[3] quartz
[4] coastal plain chert
[5] ridge and valley chert
[6] orthoquartzite
[7] the other category includes patinated specimens, jasper, diorite and basalt
[8] Clarendon/Sumter Counties

falls short of the Savannah River, the Piedmont transects does capture portions of the Yadkin, Catawba, Broad and Savannah River basins.

This aspect of the analysis was specifically designed to track the movement of metavolcanic material from the Uwharrie Mountain area into the Piedmont of South Carolina during the Palmer-Kirk phase. The results are interpreted in terms of the ongoing discussion of Early Archaic mobility ranges in the Piedmont province.

<u>The Early Archaic Graph</u>

This graph documents the transport of metavolcanic material from its suspected source area in the Uwharries across the interior Piedmont counties of South Carolina (Figure 5.7). The proportional values for metavolcanic stone range from a high of approximately 100 percent in Stanly County to about 12 percent in Newberry County (Table 5.11). A combination of quartz and metavolcanic stone dominates the collections for the first 107 km (67 miles) of the transect accounting for nearly 100 percent of the variation (Figure 5.7). The increased incidence of Coastal Plain chert in Newberry and Greenwood Counties is attributed to the gravity or pull of the Allendale chert quarries.

The rapid fall-off in the incidence of metavolcanics from Stanly to Union County is partly an illusion created by sample clustering. The Catawba-Yadkin drainage divide splits Union County in half. The streams in the eastern half of the county drain into the Yadkin; while those across the divide drain into the Catawba. In this case, all of the sites from Union County contained in the North Carolina data base are located on tributaries of the Catawba River (Mathis 1992: personal communication). This accounts for the high proportion of quartz in an

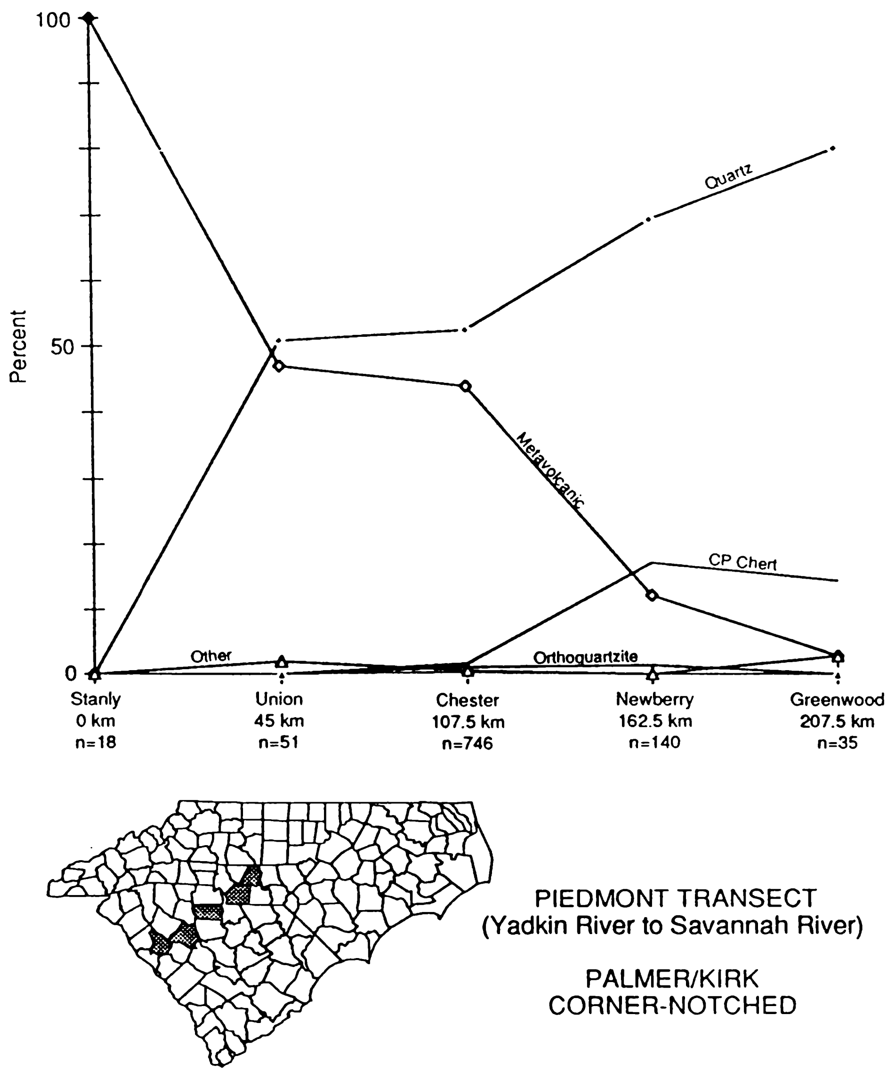


Figure 5.7. The Piedmont Transect-Early Archaic Graph.

Table 5.11: The Piedmont Transect-Early Archaic Lithic Materials: Counts and Percentages.

COUNTY	Km[1]	MVL[2] #\%	QTZ[3] #\%	CPC[4] #\%	R&V[5] #\%	OQTZ[6] #\%	OTH[7] #\%	TOTAL
STANLEY	0.0	18\100.0	0\0.0	0\0.0	0\0.0	0\0.0	0\0.0	18\100.0
UNION	45.0	24\47.1	26\51.0	0\0.0	0\0.0	0\0.0	1\2.0	51\100.0
CHESTER	107.5	328\44.0	391\52.4	13\1.7	8\1.1	2\0.3	4\0.5	746\100.0
NEWBERRY	162.5	17\12.1	97\69.3	24\17.1	2\1.4	0\0.0	0\0.0	140\100.0
GREENWOOD	207.5	1\2.9	28\80.0	5\14.3	0\0.0	0\0.0	1\2.9	35\100.0

[1]kilometers along the transect
[2]metavolcanic lithic material
[3]quartz
[4]coastal plain chert
[5]ridge and valley chert
[6]orthoquartzite
[7]the other category includes patinated specimens, jasper, diorite and basalt

area where a much higher percentage of metavolcanic stone should characterize Early Archaic assemblages. The danger of over-interpreting the slope of the curve in the absence of site specific locational data cannot be over-emphasized.

A breakdown of the metavolcanic category is possible using the data from the South Carolina Counties. It reveals an almost total dependence on rhyolite for the manufacture of Palmer\Kirk Corner Notched hafted bifaces. Approximately, 94 percent of the metavolcanic specimens were made from this raw material (Table 5.12).

In general, these data support Daniel's (1991) contention that Early Archaic hunter-gatherer mobility was not primarily limited to individual drainages as predicted in the Anderson-Hanson model. Although the mechanism driving this process is unknown, significant volumes of metavolcanic material, probably Uwharrie rhyolite, was moving across the Piedmont during the Palmer-Kirk phase.

Further evidence for multi-drainage mobility comes from Chester and Newberry Counties, both of which contain minor amounts of Ridge and Valley chert (Table 5.11). Sassaman (1991:56) has reported this material as present along the Broad and Catawba Rivers. The distribution of Ridge and Valley chert in South Carolina suggests limited hunter-gatherer interaction with the Ridge and Valley Province possibly via the Little Tennessee and Broad River Valleys of North Carolina.

Some investigators, commenting on the presence of this dark colored highly siliceous material, suspect a local origin in the Piedmont of South Carolina (Anderson et al. 1982). To my knowledge,

Table 5.12: The Piedmont Transect-Early Archaic Metavolcanic Materials: Counts and Percentages.

COUNTY	Km[1]	RHY[2] #\%	TUFF[3] #\%	ARG[4] #\%	UMETA[5] #\%	TOTAL #\%
CHESTER	107.5	104\96.3	3\2.8	1\0.9	0\0.0	108\100.0
NEWBERRY	162.5	14\82.4	1\5.90	2\11.8	0\0.0	17\100.0
GREENWOOD	207.5	1\100.0	0\0.0	0\0.0	0\0.0	1\100.0

[1]kilometers along the transect
[2]rhyolite
[3]metavolcanic tuff
[4]argillite
[5]unidentified metavolcanic lithic material

no outcrops or quarries of this material have been documented and investigated in South Carolina. The problem points out the need for a systematic program of geologic mapping at the local scale. It should be accompanied by the investigation of potential quarries through geological testing and archaeological excavation.

The Middle Archaic Graph

The curves presented in the Middle Archaic graph suggest a pattern of reduced hunter-gatherer group mobility (Figure 5.8). Almost all of the lithic material used in this analysis is quartz and metavolcanic stone (Table 5.13). These two lithic categories account for nearly 100 percent of the variability across the transect (Table 5.13). The range of variation in the proportional frequencies shows a strong association between the values and proximity to source areas (Figure 5.8). A comparison of the Early and Middle Archaic graphs shows a rapid fall-off in the proportion of metavolcanic stone over time (Figures 5.7 and 5.8). These observations suggest that hunter-gatherer group mobility was spatially restricted during the Middle Archaic period.

Further support for localized procurement of lithic raw materials is found within the metavolcanic category. During the Palmer-Kirk phase, approximately 94 percent of the metavolcanic material was composed of rhyolite (Table 5.12). This proportion falls to about 73 percent during the Morrow Mountain phase (Table 5.14). The remaining variation is fairly evenly spread between metavolcanic tuff and argillite which account for 12 and 15 percent of the raw materials represented in the Morrow Mountain phase collections.

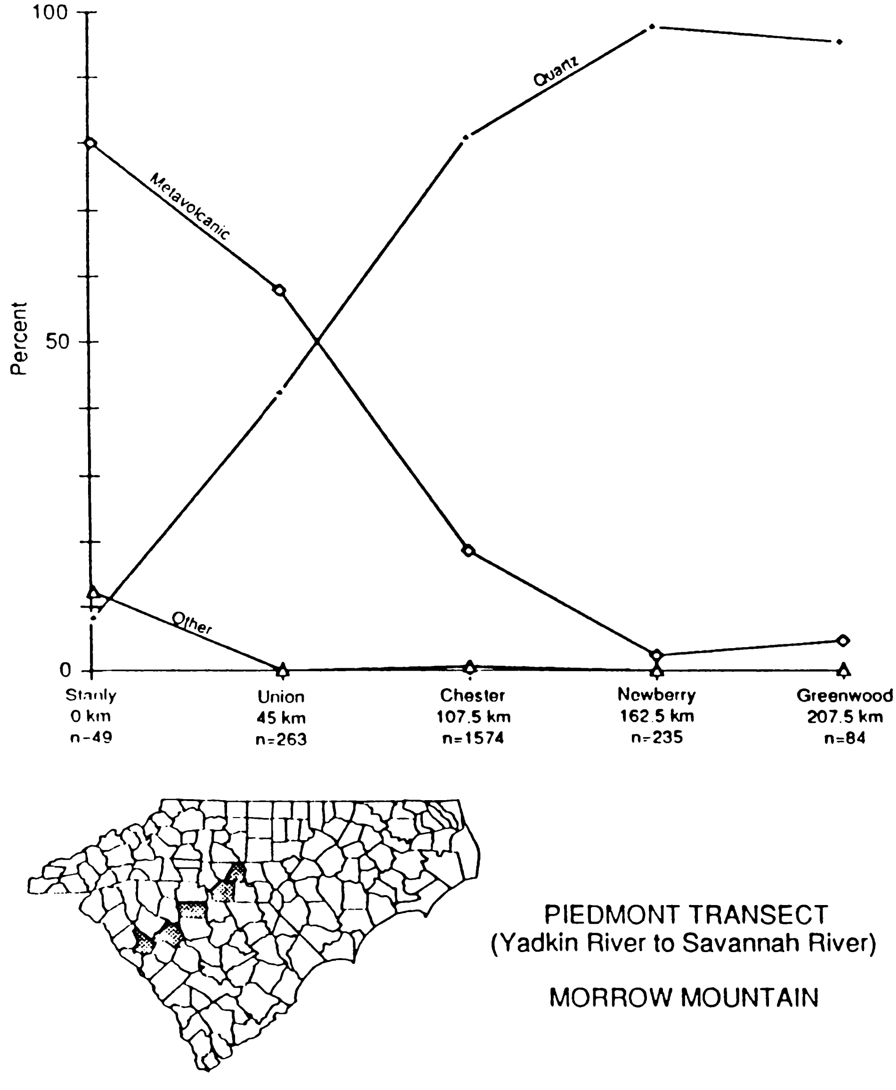


Figure 5.8. The Piedmont Transect-Middle Archaic Graph.

Table 5.13: The Piedmont Transect-Middle Archaic Lithic Materials: Counts and Percentages.

COUNTY	Km[1]	MVL[2] #\%	QTZ[3] #\%	CPC[4] #\%	R&V[5] #\%	OQTZ[6] #\%	OTH[7] #\%	TOTAL
STANLEY	0.0	39\79.6	4\8.0	0\0.0	0\0.0	0\0.0	6\12.2	49\100.0
UNION	45.0	152\57.8	111\42.2	0\0.0	0\0.0	0\0.0	0\0.0	263\100.0
CHESTER	107.5	292\18.6	1269\80.6	0\0.0	0\0.0	1\0.1	12\0.8	1574\100.0
NEWBERRY	162.5	6\2.6	229\97.4	0\0.0	0\0.0	0\0.0	0\0.0	235\100.0
GREENWOOD	207.5	4\4.8	80\95.2	0\0.0	0\0.0	0\0.0	0\0.0	84\100.0

[1]kilometers along the transect
[2]metavolcanic lithic material
[3]quartz
[4]coastal plain chert
[5]ridge and valley chert
[6]orthoquartzite
[7]the other category includes patinated specimens, jasper, diorite and basalt

Table 5.14: The Piedmont Transect-Middle Archaic Metavolcanic Materials: Counts and Percentages.

COUNTY	Km[1]	RHY[2] #\%	TUFF[3] #\%	ARG[4] #\%	UMETA[5] #\%	TOTAL #\%
CHESTER	107.5	120\74.1	20\12.3	20\12.3	2\1.2	162\100.0
NEWBERRY	162.5	5\55.6	0\0.0	4\44.4	0\0.0	9\100.0
GREENWOOD	207.5	4\66.7	0\0.0	1\16.7	1\16.7	6\100.0

[1] kilometers along the transect
[2] rhyolite
[3] metavolcanic tuff
[4] argillite
[5] unidentified metavolcanic lithic material

When the Coastal Plain and Piedmont transects are compared, the importance of access to replacement materials becomes apparent. In the Coastal Plain, where replacement materials are not abundant, extralocal material acquisition becomes more important as indicated by an increased amount of this material in the collections.

THE UWHARRIE AND ALLENDALE TRANSECT

Like the Piedmont transect to the west, the Uwharrie to Allendale transect includes collections from the North and South Carolina data bases (Figure 2.2). The purpose of this transect is to document the pattern of raw material variation which exists between the rhyolite quarries of the Uwharrie Mountains and the Flint River chert quarries located in Allendale County. It offers a third line of evidence for the orientation and extent of Early Archaic hunter-gatherer mobility across drainages that is largely independent of the replacement material effect which strongly influences lithic raw material distribution along the other two transects.

The transect extends for approximately 288 km (180 miles) between Stanly County and Allendale County (Figure 2.2). It incorporates data obtained from 12 different North and South Carolina counties. Approximately, 10,421 square km (6,513 square miles) or 20 percent of the South Carolina is contained within the boundaries of the 10 counties south of the North Carolina line. The transect intercepts portions of four major drainage basins including the: Yadkin, Catawba-Wateree, Broad-Congaree and Savannah.

The Early Archaic Graph

The most striking attribute of this graph is the difference in the shapes of the metavolcanic and Coastal Plain chert curves (Figure 5.9). The stepwise shape of the metavolcanic curve in the vicinity of Union and Lancaster\Chesterfield is based in part on sampling bias. As stated earlier in the discussion of the Piedmont transect, the Union County proportions are skewed by a cluster of sites located in the Catawba drainage. It is suspected that with improved sample dispersion, the sharp decrease in metavolcanic stone and corresponding increase in quartz would disappear, smoothing the curves.

Further to the southwest, the decay with distance model does not account for the shape of the metavolcanic curve between Richland and Orangeburg Counties (Figure 5.9). After declining from 39 percent in Kershaw County to 17 percent in Richland County, metavolcanic proportions are relatively stable, ranging from 14 to 18 percent in Lexington\Calhoun and Orangeburg Counties respectively (Table 5.15).

It is tempting to speculate that this segment of the Broad-Congaree drainage basin formed a boundary for Early Archaic bands occupying the Yadkin-Pee Dee and Savannah River drainages. While attractive, this proposition is not supported by the gradual decline in the proportion of Coastal Plain chert evident in the Broad-Congaree drainage system (Figure 5.9).

The Richland, Lexington\Calhoun and Orangeburg section of the Broad-Congaree River Valley coincides with the Fall Line in central South Carolina (Figure 5.9). The presence of significant proportions of metavolcanic stone and Coastal Plain chert in the collections from

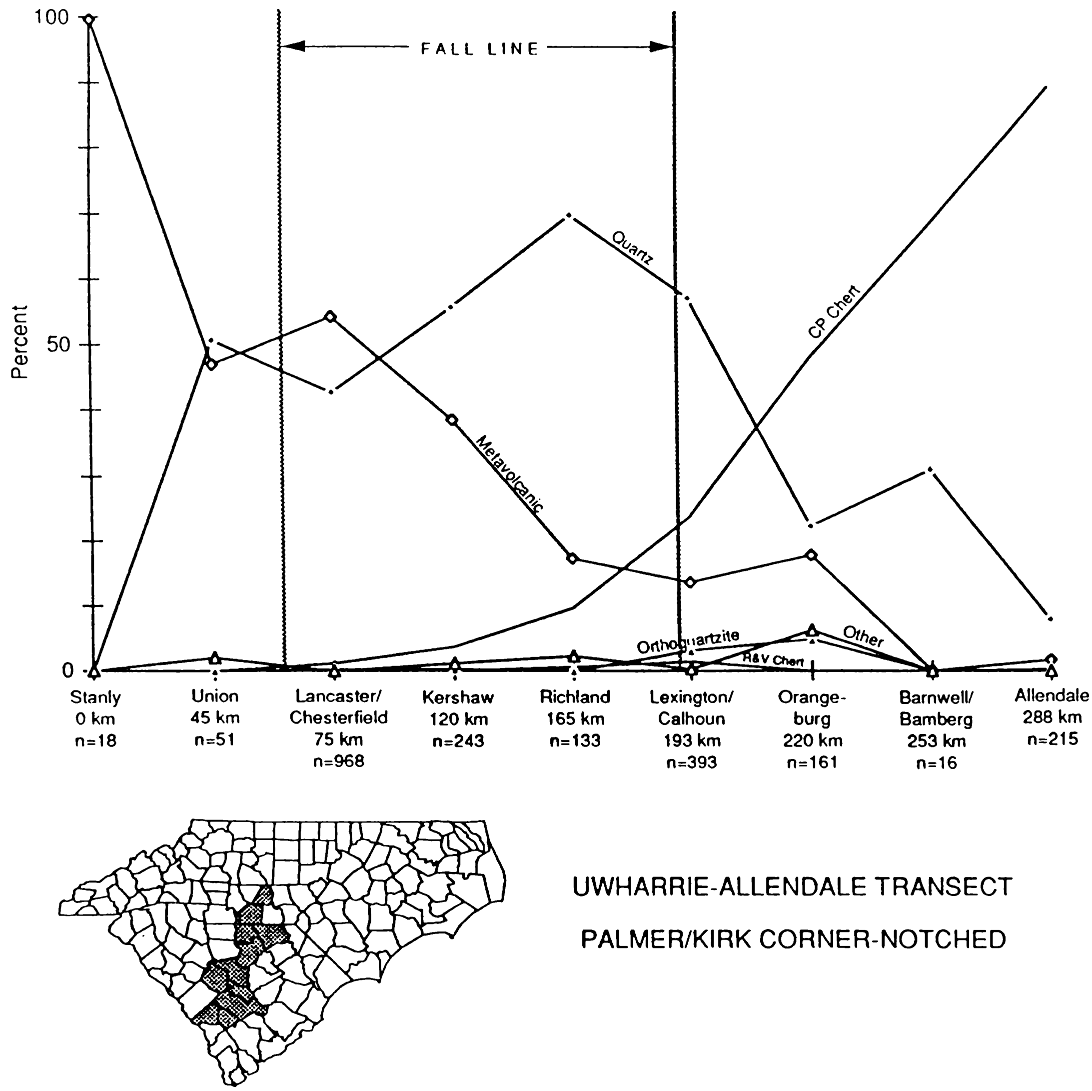


Figure 5.9. The Uwharrie-Allendale Transect-Early Archaic Graph.

Table 5.15: The Uwharrie-Allendale Transect-Early Archaic Lithic Materials: Counts and Percentages.

COUNTY	Km[1]	MVL[2] #\%	QTZ[3] #\%	CPC[4] #\%	R&V[5] #\%	OQTZ[6] #\%	OTH[7] #\%	TOTAL
STANLEY	0.0	18\100.0	0\0.0	0\0.0	0\0.0	0\0.0	0\0.0	18\100.0
UNION	45.0	24\47.1	26\51.0	0\0.0	0\0.0	0\0.0	1\2.0	51\100.0
LANCAS./CHESTER[8]	75.0	437\45.1	499\51.5	17\1.8	8\0.8	3\0.3	4\0.4	968\100.0
KERSHAW	120.0	94\38.7	136\56.0	9\3.7	0\0.0	1\0.4	3\1.2	243\100.0
RICHLAND	165.0	23\17.3	93\69.9	13\9.8	1\0.8	0\0.0	3\2.3	133\100.0
LEXINGTON/CAL.[9]	192.5	54\13.7	225\57.3	94\23.9	6\1.5	13\3.3	1\0.3	393\100.0
ORANGEBURG	220.0	29\18.0	36\22.4	78\48.4	0\0.0	8\5.0	10\6.2	161\100.0
BARNWELL/BAMBERG	252.5	0\0.0	5\31.3	11\68.8	0\0.0	0\0.0	0\0.0	16\100.0
ALLENDALE	287.5	4\1.9	17\7.9	193\89.8	0\0.0	1\0.5	0\0.0	215\100.0

[1] kilometers along the transect
[2] metavolcanic lithic material
[3] quartz
[4] coastal plain chert
[5] ridge and valley chert
[6] orthoquartzite
[7] the other category includes patinated specimens, jasper, diorite and basalt
[8] Lancaster/Chester Counties
[9] Lexington/Calhoun Counties

these counties is predicted by the Anderson-Hanson Early Archaic Fall Line aggregation model of social interaction (Table 5.15).

By returning to the Piedmont transect, we can see that the percentage of metavolcanic stone in Newberry County is well within the range of values from the Fall Line counties. Based on this comparison, the relative proportions of extralocal materials at Fall Line sites may not be as unique as once thought. If after additional analysis this is confirmed, then alternatives to the Fall Line aggregation theory should be sought to account for the distribution of this material.

One last characteristic of the Early Archaic graph remains to be discussed. The percentage of quartz attains its maximum value of 70 percent in Richland County adjacent to the Fall Line (Table 5.15). This represents a point almost equidistant from the metavolcanic and Coastal Plain chert sources in North and South Carolina. This pattern is repeated in the Middle Coastal Plain and Savannah River graphs suggesting that a spike in the incidence of replacement materials is a regular feature of the lithic procurement and utilization landscape as distance from localized source areas increases.

The Middle Archaic Graph

At least three salient points emerge from a visual inspection of the Middle Archaic graph (Figure 5.10). The incidence of metavolcanic stone and Coastal Plain chert collapses at the Fall Line in central South Carolina. Quartz is the dominant replacement material during the Morrow Mountain phase in this area. Raw material diversity is

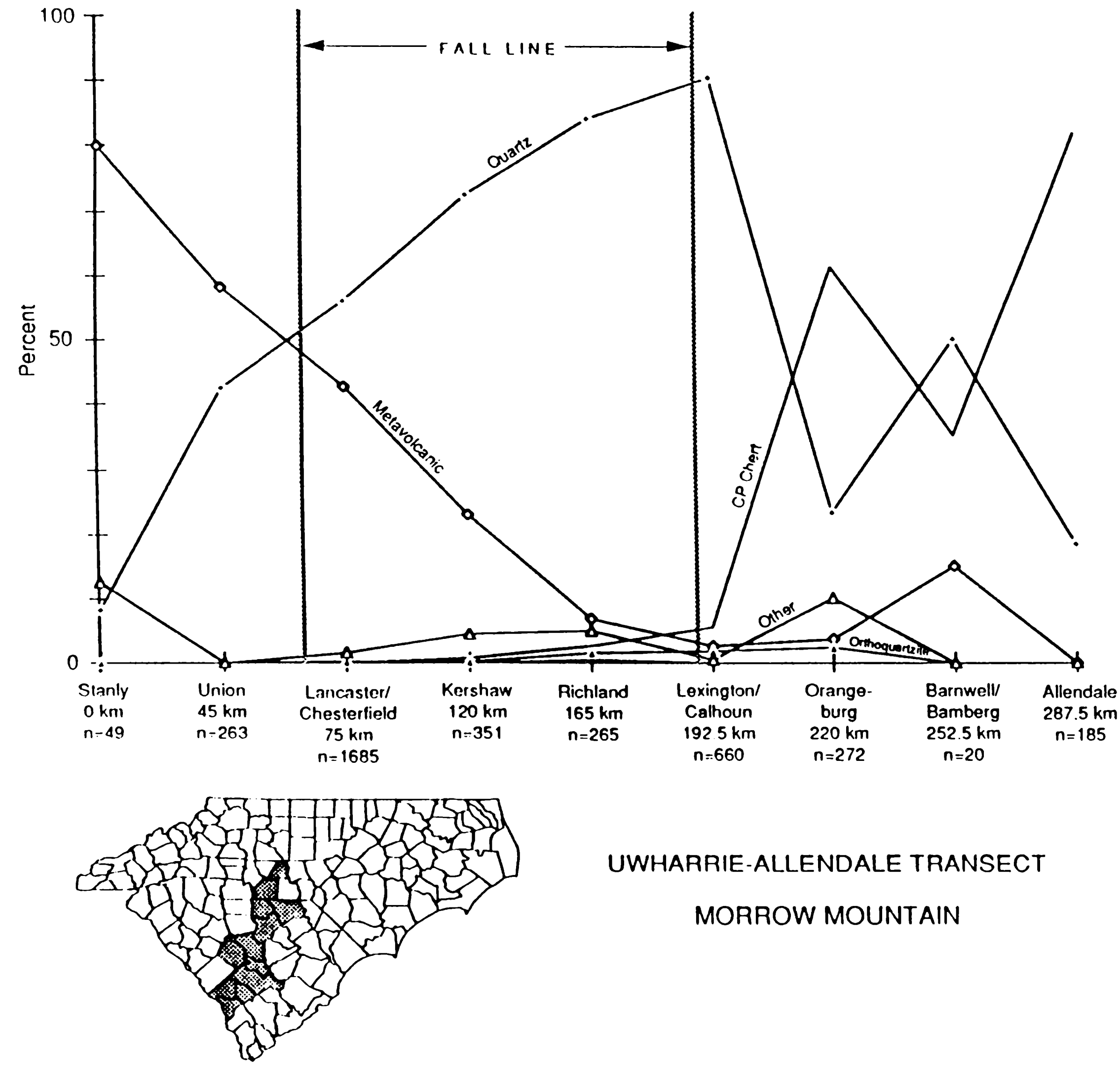


Figure 5.10. The Uwharrie-Allendale Transect-Middle Archaic Graph.

suppressed as quartz reaches its peak of 90 percent in the Lexington\Calhoun County area (Table 5.16).

The similar fall-off rates for metavolcanic stone and Coastal Plain chert are revealing when combined with the behavior of the quartz proportional frequency curve (Figure 5.10). Based on these data, it is possible to speculate that the South Atlantic Slope was occupied by three groups of hunter-gatherers during the Morrow Mountain phase. The presence of a group centered on the Yadkin-Pee Dee, another on the Broad-Congaree at the Fall Line and a third on Savannah is suspected.

Much additional fine grained lithic analysis will be necessary to move this idea out of the realm of speculation. A regional data base composed of potential point sources for metavolcanic stone including quarries and gravel bars would be a step in the right direction.

Finally, the erratic behavior of the Coastal Plain chert, metavolcanic and quartz curves in the Barnwell\Bamberg area is attributed to a small sample size (Figure 5.10). Only 20 specimens were available for the analysis from these two counties suggesting that these relationships could be spurious (Table 5.16). This interpretation is supported by the low proportion of metavolcanic material recovered from the Cal Smoak site (38BM4) in Bamberg County and excavations on the Aiken Plateau (Anderson et al. 1979; Sassaman et al. 1990).

Table 5.16: The Uwharrie-Allendale Transect-Middle Archaic Lithic Materials: Counts and Percentages.

COUNTY	Km[1]	MVL[2] #\%	QTZ[3] #\%	CPC[4] #\%	R&V[5] #\%	OQTZ[6] #\%	OTH[7] #\%	TOTAL
STANLEY	0.0	39\79.6	4\8.2	0\0.0	0\0.0	0\0.0	6\12.2	49\100.0
UNION	45.0	152\57.8	111\42.2	0\0.0	0\0.0	0\0.0	0\0.0	263\100.0
LANCAS./CHESTER[8]	75.0	313\18.6	1356\80.5	0\0.0	0\0.0	1\0.1	15\0.9	1685\100.0
KERSHAW	120.0	80\22.8	253\72.1	2\0.6	0\0.0	1\0.3	15\4.3	351\100.0
RICHLAND	165.0	18\6.8	222\83.8	7\2.6	1\0.4	4\1.5	13\4.9	265\100.0
LEXINGTON/CAL.[9]	192.5	16\2.4	595\90.2	36\5.5	0\0.0	11\1.7	2\0.3	660\100.0
ORANGEBURG	220.0	10\3.7	63\23.2	166\61.0	0\0.0	6\2.2	27\9.9	272\100.0
BARNWELL/BAMBERG	252.5	3\15.0	10\50.0	7\35.0	0\0.0	0\0.0	0\0.0	20\100.0
ALLENDALE	287.5	0\0.0	34\18.4	151\81.6	0\0.0	0\0.0	0\0.0	185\100.0

[1]kilometers along the transect
[2]metavolcanic lithic material
[3]quartz
[4]coastal plain chert
[5]ridge and valley chert
[6]orthoquartzite
[7]the other category includes patinated specimens, jasper, diorite and basalt
[8]Lancaster/Chester Counties
[9]Lexington/Calhoun Counties

DISCUSSION

The following generalizations are derived from this analysis of extralocal material patterning. The three across the grain transects are similar in that the proportion of rhyolite in the metavolcanic category for the Palmer-Kirk phase is uniformly high, never falling below 85 percent. If this material does not originate from the cluster of rhyolite quarries in the Uwharrie Mountains, then where is it coming from?

In the Piedmont of South Carolina, both soapstone and quartz quarries have been reported (Ferguson 1976; Charles 1986). However, not one rhyolite quarry has been identified in the province (Charles 1992: personal communication). This is despite extensive survey efforts in the Sumter National Forest and in the Richard B. Russell Reservoir both of which are underlain by Carolina Slate Belt rocks. The South Carolina private collections survey also failed to reveal any evidence of metavolcanic quarrying activity in the Piedmont.

Charles (1992: personal communication) suggests that in the Savannah River Valley, the material may be moving down river from the mountains as part of the bedload. He further notes that the rhyolite in the Savannah River Basin is typically less fine grained and less heavily patinated than the Uwharrie material.

Given that the relative percentage of metavolcanic stone in the Savannah River Basin never exceeds 15 percent during the Palmer-Kirk phase, this is a plausible explanation. However, it seems unlikely that river transported cobbles could account for the relatively high percentages of rhyolite in the Catawba and Broad River drainages. The proportion of metavolcanic stone in collections from Union and Chester Counties hovers around 40 percent of which about 85 percent is rhyolite.

It has been demonstrated that the level of past metamorphic activity increases from east to west across the Piedmont of North and South Carolina. I propose that the geologic history of the Piedmont accounts for the lack of significant rhyolite outcrops southwest of the Uwharrie Mountains. This contention is supported by the apparent lack of rhyolite surface exposures and quarrying activity in the central South Carolina Piedmont. Finally, there can be no resolution of these contending hypotheses in the absence of systematic comparative research on the origins and geological composition of these materials.

The weight of the evidence leads me to suspect that much of the rhyolite in the interior Piedmont collections from the Palmer-Kirk phase probably originated at the Uwharrie quarries. Given this premise, it follows that the presence of this extralocal material in the Catawba and Broad River Basins reflects transport across drainages from the source area. This suggests that the Anderson-Hanson settlement model does not fully account for Early Archaic hunter-gatherer mobility in the Piedmont Province.

In addition, when the South Carolina metavolcanic category is broken down by material type a pattern is revealed in the Morrow Mountain phase data which has not yet been discussed. Consistently, across all transects, the unidentified metavolcanic category which is suppressed during the Palmer-Kirk phase, comes to life in the Morrow

Mountain phase. Proportional values for unidentified metavolcanic stone ranges from about eight percent along the Uwharrie-Allendale transect to approximately four percent along the Piedmont transect.

I believe that the presence of unclassified metavolcanic stone in these collection reflects a pattern of local procurement in which poor quality material was collected as needed. As a corollary, it is predicted that in stone poor areas like the Coastal Plain, Middle Archaic hunter-gatherers compensated for the lack of local replacement material by scavenging and recycling stone tools. This practice has been noted in the Middle Archaic assemblages from central Tennessee (Amick 1984). Sassaman (1991: personal communication) is currently working on this problem using data from the Aiken Plateau area of South Carolina.

Further implications, derived from this analysis about the range and orientation of Early and Middle Archaic hunter-gatherers on the South Atlantic Slope are summarized and presented in Chapter VI. A direction for future research on the problem of hunter-gatherer mobility is presented in the chapter along with a conceptual model of private collector behavior and its influence on the archaeological record.

CHAPTER VI

SUMMARY AND CONCLUSIONS

A total of 13,389 Palmer\Kirk Corner Notched and Morrow Mountain I\Morrow Mountain II hafted bifaces from 277 archaeological sites in 36 North and South Carolina counties are used in this analysis of lithic resource spatial variation during the Early and Middle Archaic periods. The analysis was conducted by compiling nominal level data on the lithic material used to manufacture each specimen. The collected data is analyzed by means of contingency tables and visual representations.

A series of 10 frequency polygons are derived from the contingency tables. They demonstrate trends in the spatial distribution of lithic material categories for each of the two time periods under study. Each polygon forms a curve which shows the spatial distribution of lithic material within a county by county transect. Organizing the county data into larger spatial transects facilitates the spatial and temporal comparisons needed for a meaningful study of Early and Middle Archaic hunter-gatherer group mobility. Expectations about hunter-gatherer group mobility derived from current settlement models are tested by comparison with the observed trends in lithic material distribution.

HUNTER-GATHERER MOBILITY DURING THE PALMER-KIRK PHASE

The results of the analysis indicate that during the initial Palmer-Kirk phase of the Early Archaic period, hunter-gatherer groups practiced drainage wide mobility. The data from the Savannah River and Yadkin-Pee Dee transects confirms the findings of earlier investigations in this regard (Anderson and Hanson 1988; Sassaman 1991).

It is apparent from these transects and others that Early Archaic adaptive strategies were based on the exploitation of drainage wide resources. However, little support is found in the across drainage transects for the Anderson-Hanson (1988) hypothesis of single drainage hunter-gatherer band territories. Sassaman (1991) has demonstrated the presence of significant quantities of Coastal Plain chert up to approximately 100 km from its suspected Allendale source area. Speculating on this evidence, he suggests Early Archaic group mobility ranges which extended from the Savannah River to the Santee drainage of the central Coastal Plain.

Based on the findings presented here, it is evident that large volumes of rhyolite were being transported across the Catawba and Broad River drainages into central South Carolina during the Early Archaic. That represents a distance of over 100 km from its suspected source area in the Uwharrie Mountains of south-central North Carolina. These results support Daniel's (1991) hypothesis that Early Archaic mobility ranges extended across multiple Piedmont drainages.

In fairness to Anderson and Hanson (1988), it is important to point out that their band\macroband or biocultural model includes interriverine hunter-gatherer activities in the Piedmont as part of a hypothesized annual mobility cycle. However, it is clear that this model does not predict multiple river basin use by single hunter-gatherer groups on a large scale.

As part of the band\macroband model, Anderson and Hanson (1988) have proposed that the concentration of resources along the Fall Line ecotone supported multiband aggregation for the exchange of mates and information. This hypothesis is believed to account for the large and diverse stone tool assemblages which characterize the area. However, when Piedmont and Fall Line extralocal lithic resource patterns are compared, little difference is observed in the proportions of this category of material. It follows, that some other process may account for the presence of extralocal lithic materials at Fall Line sites.

In general, the evidence presented in this thesis supports extensive within drainage mobility during the Early Archaic period as predicted by the band\macroband model. Problems arise when the circumscribed across drainage aspect of the paradigm is considered in detail. It is clear from the evidence presented that hunter-gatherer bands located in the Savannah and Yadkin-Pee Dee River Valleys were transporting nonlocal lithic resources across adjacent drainages on a large scale. It is reasonable to speculate that they were also systematically exploiting the subsistence resources located within the Broad-Saluda-Santee River system.

It is tempting to call for a revision of the Anderson-Hanson model to accommodate the findings of Sassaman (1991) and those reported here. I believe that this action is premature, given the evidence in hand. While the evidence presented here is strongly suggestive of significant multidrainage occupation by mobile hunter-gatherer bands, it is far from conclusive. Before firm conclusions can be drawn about the range of Early Archaic hunter-gatherer mobility it will be necessary to accurately define the origins and chemical signatures of specific metavolcanic materials (eg. Amick 1984; Daniel and Butler 1990). In addition, interassemblage stylistic and technological variation between drainage systems should be documented. It is anticipated that these kinds of studies will produce a regional data base capable of supporting a meaningful revision of the Anderson-Hanson band\macroband settlement model.

HUNTER-GATHERER MOBILITY DURING THE MORROW MOUNTAIN PHASE

A reliance on local lithic resources is demonstrated throughout the research area during the Middle Archaic period. The incidence of rhyolite and Coastal Plain chert declines rapidly as distance from source areas increases. These materials are replaced by quartz, orthoquartzite and a mixture of metavolcanic stone including argillite and tuff. In general, the results of this study support a Middle Archaic settlement model that emphasizes increased mobility and heavy utilization of local lithic resources within circumscribed territorial boundaries.

Evidence is presented which suggests that drainage wide mobility was attenuated during the Middle Archaic period. The best evidence for this comes from the middle Savannah River Valley where little extralocal material is moving between the upper and lower basins (Sassaman et al. 1988). Additional data presented here, indicates that the incidence of local metavolcanic material increases in the middle Savannah River Valley. This evidence suggests that during the Middle Archaic a social boundary may have existed in the area.

Finally, a stepwise decline in the incidence of metavolcanic stone across Piedmont drainages is suggestive of a settlement system where mobility was contained within individual river valleys. The fall-off pattern seems to coincide with the Yadkin-Pee Dee, Broad-Saluda and Savannah River drainages. Based on this information, it is possible to speculate about the existence of discrete band ranges centered on the Yadkin-Pee Dee, Broad-Saluda and upper Savannah River Valleys during the Middle Archaic period.

MODELING THE SPATIAL DIMENSION OF PRIVATE COLLECTOR BEHAVIOR

In this thesis, the spatial dimension of lithic resource variability has been used as a source of data for inferences about Early and Middle Archaic hunter-gatherer group mobility. Because of the interpretive weight given to the spatial characteristics of the data, the spatial dimension of collector bias represented a potentially critical sampling problem. This issue far exceeded collector idiosyncrasy in its potential to influence the interpretation of the results.

The importance of identifying collector bias when interpreting patterns of prehistoric land use in South Carolina has been recognized by Anderson and Sassaman (1992). Their investigation suggested that site distributional data is heavily influenced by private collector behavior in the following ways: (1) collectors tend to visit and revisit large multicomponent sites with good surface visibility and (2) collectors gravitate towards easily accessible sites (Anderson and Sassaman 1992:265). In the Piedmont, these spatial biases mean that floodplain terrace sites are over-represented at the expense of small upland sites. The authors conclude that the site distributional data generated by the private collections project may be unsuited for studies of early Holocene land use patterns (Anderson and Sassaman 1992: 265).

While I agree with Anderson and Sassaman's (1992) assessment of the biases inherent in the collector survey data, I believe that it may be possible to retrieve the situation through a better understanding of private collector behavior. It may be possible to predict the influence of collector behavior on site distribution through the use of a movement minimization paradigm (Haggett et al. 1977:207). Geographers frequently apply movement minimization models to problems in commerce where transportation costs strongly influence the movement of commodities (Haggett et al. 1977:208). As the name implies, movement minimization models assume that distance has an attenuating effect on movement. This assumption appears to be valid at a number of different spatial scales (Haggett et al. 1977).

Based on this theory, a generalization about the spatial dimension of private collector behavior is offered. It is proposed that the number of sites visited and the number of revisits per site will decline as the distance from a private collector's residence increases. This relationship can be visualized as a frequency polygon with the number of sites visited or revisited arrayed along the y-axis and distance from the collector's residence expressed along the x-axis.

It is hypothesized that the shape of the curve will be: (1) convex, (2) continuous rather than stepped and (3) differentiated by the pull of specific sites (e.g. Hardaway site) and site clusters (e.g. Allendale chert quarries) remarkable for the quantity, quality and\or rarity of their contents.

The private collector survey files contain the addresses of dozens of avocational archaeologists as well as the number and locations of the sites they collected. This set of circumstances makes the formalization and testing of the generalization a distinct possibility.

The clustering of Early and Middle Archaic sites on the landscape as a function of collector behavior represents a form of sampling bias which cannot be controlled. Sampling biases that cannot be controlled must be understood before the data can be meaningfully interpreted in terms of hunter-gatherer group behavior. I believe that this model advances our understanding of the phenomenon, making the isolation and elimination of its effects on the interpretation of site location information probable.

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VITAE

J. Lee Tippett was born on April 20, 1954 in Raleigh North Carolina. He attended the University of North Carolina at Chapel Hill from 1975 until 1978, when he received a Bachelor of Arts degree in Anthropology. While at Chapel Hill, the author worked for the North Carolina Research Laboratory of Anthropology, then under the direction of Dr. Joffre Coe.

Following a two year period of service with the South Carolina Department of Highways and Public Transportation in the position of assistant staff archaeologist, Mr. Tippett moved to Knoxville, Tennessee for the purpose of attending graduate school. During this time, he assisted in the direction of field work at the James White House site, the Columbia Archaeological Project and the Shelby Bend Archaeological Project. The author is now employed by the South Carolina State Historic Preservation Office as a staff archaeologist in the environmental review and compliance program.