A Cultural Resource Survey of the Continental Shelf from Cape Hatteras to Key West

Final Report

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Prehistoric Archaeology

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4.2.1.1 Introduction

The purpose of this presentation is to develop a model for the prediction of the occurrence of prehistoric archeological sites on the now submerged Outer Continental Shelf of the South Atlantic coast of the United States. Background data on the rationale behind the development of this model is also presented. An underlying assumption is that archeological sites reflect past culture and cultural behavior. Since archeological sites occur in association with certain variables, an understanding of those variables is necessary to predict the location of sites. The predictive models allow a certain amount of space to be excluded from consideration since there will not be, or are not likely to be, any sites occurring in that space. The ultimate test of any predictive model is whether it works, that is, its reliability. The greater its reliability, the greater its power. As will be noted, this model seems valid in the present terrestrial environment and there is no reason to assume it would not be valid on the Outer Continental Shelf since that area of space is nothing more or less than a now submerged portion of the present day Coastal Plain. The alternative approach is to include all space on the Outer Continental Shelf as possibly containing prehistoric archeological sites and to ignore the development of predictive models. This seems unreasonable and requires negation of the basic theory of anthropology/archeology that cultural behavior follows certain regularities and is therefore predictable.

In the development of predictive models pertaining to the location of prehistoric sites, one of the initial steps is to review, collate, and synthesize data pertinent to the cultural and environmental history of the area of concern and, where necessary or instructive, adjacent areas. The use of data from contiguous or nearby areas is especially fruitful when attempts are made to generate models concerning an area in which there is, at best, only minimal data available such as

the submerged Continental Shelf. Accordingly, it is necessary to develop an overview of the prehistoric cultural history and the history of the late Pleistocene and Holocene environment of the contiguous terrestrial areas; and once this has been accomplished to define the possible areas of settlement and the adaptive strategies which would have been used on the now submerged portion of the landmass. Because of a paucity of information within the study area regarding specific time periods and geographic areas, it was necessary in some cases to collect data from areas which are outside of the project location in order to develop a predictive model.

The approach used here, then, is to review the prehistoric cultural history of the project area, and adjacent areas, for the period from 20,000 to 2,000 years ago. The earlier time limit corresponds with the earliest suggested occurrence of human habitation in Eastern North America, while the latter limit corresponds to the temporal limits of concern for this portion of the study. Data and interpretations are drawn from the Middle and South Atlantic portions of the eastern United States including the Ridge and Valley, Piedmont and Coastal Plain physiographic provinces. The focus throughout, however, is on the Atlantic Coastal Plain between Cape Hatteras, North Carolina and Key West, Florida. Discussions will center on defined time periods which will initially treat the area as a whole, and will be followed with a state by state discussion. Following this, pertinent aspects of the paleoenvironment will be discussed from the cultural ecological and man-environment perspective. After this is completed, the predictive model, which is totally dependent on the terrestrial model, will be developed and discussed. The reliability of the data used to generate the model will be dealt with, as will an assessment of the reliability of the model.

Regional syntheses are useful for overviews of culture history. Generally such syntheses suffer from major limitations. Most of the problems stem from the researcher's focus on the subregions which are known best, and a failure to consider specifics from other areas, including data drawn from recent works. This latter problem has

become especially acute with the tremendous amount of information being accumulated for cultural resources management purposes. The problems with syntheses tend to be further compounded as writers draw on their own results and focus on data drawn from narrow theoretical perspectives and poor methodological techniques.

It should be noted that any attempt at compiling a regional synthesis is bound to suffer shortcomings. The problems which arise from this compilation stem not so much from restricted access to recent information, but from the plethora of data and new interpretations resulting from innovative methodologies, research orientations and theoretical viewpoints. Another set of difficulties arises from having to deal with the culture history of an area that cross-cuts several cultural and natural boundaries, none of which can be assumed to be static. Further, in spite of all the archeological work being done in the South Atlantic, there are still areas in which minimal information is available.

The theoretical stance taken in this study is oriented toward cultural ecology approached from the viewpoint of a dynamic interaction between changing cultural systems, adaptive patterns and a changing environment. Culture history, or a detailing of events through time, is only a minor focus. The necessity for chronological controls is recognized, but the assigned task of predicting archeological sites in what is essentially an unknown landscape forces the consideration of more than simply time and space. Like any synthesis, this overview will deal with selected data, and will, like most models (Clarke, 1972), be information-poor.

As noted, in order to understand events and processes in the study area, it has been necessary and beneficial to draw upon information and data from locales other than the immediate study area. Such an application of models from different regions to explain events in another area can be dangerous. This is not to take a particularistic view of culture, but is only to note that generalizations from one set of data to another set can be misleading, if numerous variables are not

considered. In this study the authors have drawn from their own experience in two regions: the Shenandoah Valley and the Middle Atlantic Coastal Plain. This is justifiable in that:

> The Paleoindian period throughout the entire East is essentially homogeneous.
>
> Subsequent periods in the Middle and South Atlantic, while somewhat heterogenous, maintain a basic homogeneity that is manifest in a number of areas.
>
> The most complete working models, especially vis-a-vis site prediction, result from the work of Gardner and his associates in the Shenandoah Valley and Middle Atlantic.
>
> With the exception of latitudinal differences and some variation in resources, the Middle Atlantic Coastal Plain is environmentally similar to the South Atlantic Coastal Plain.
>
> The basic Middle Atlantic and Shenandoah Valley models proposed by Gardner and his associates (various citations throughout) were found through the course of the literature review and interviews to be directly applicable, to have been used in part or in toto by others, and to have been independently developed in a more or less similar form.

It is thus possible to criticize this presentation by suggesting that too much attention is being paid to the Shenandoah Valley and Middle Atlantic models, and to interpretations developed in other areas. We have noted the reasons why this has been done, and have consciously tried to avoid overcommitment to this model in the face of data which does not fit, or fits poorly.

4.2.1.2 The Culture Area/Ethnography

The area covered consists of the South Atlantic Coastal Plain from Cape Hatteras, North Carolina to Key West, Florida. There is general agreement that this region can be included in one broad culture area -- that of the Eastern Woodlands. There is also general consensus on further subdivision (Figure 4.2.1).

The subsistence pattern at the historic contact and late prehistoric periods in the Eastern Woodlands area is generally agricultural

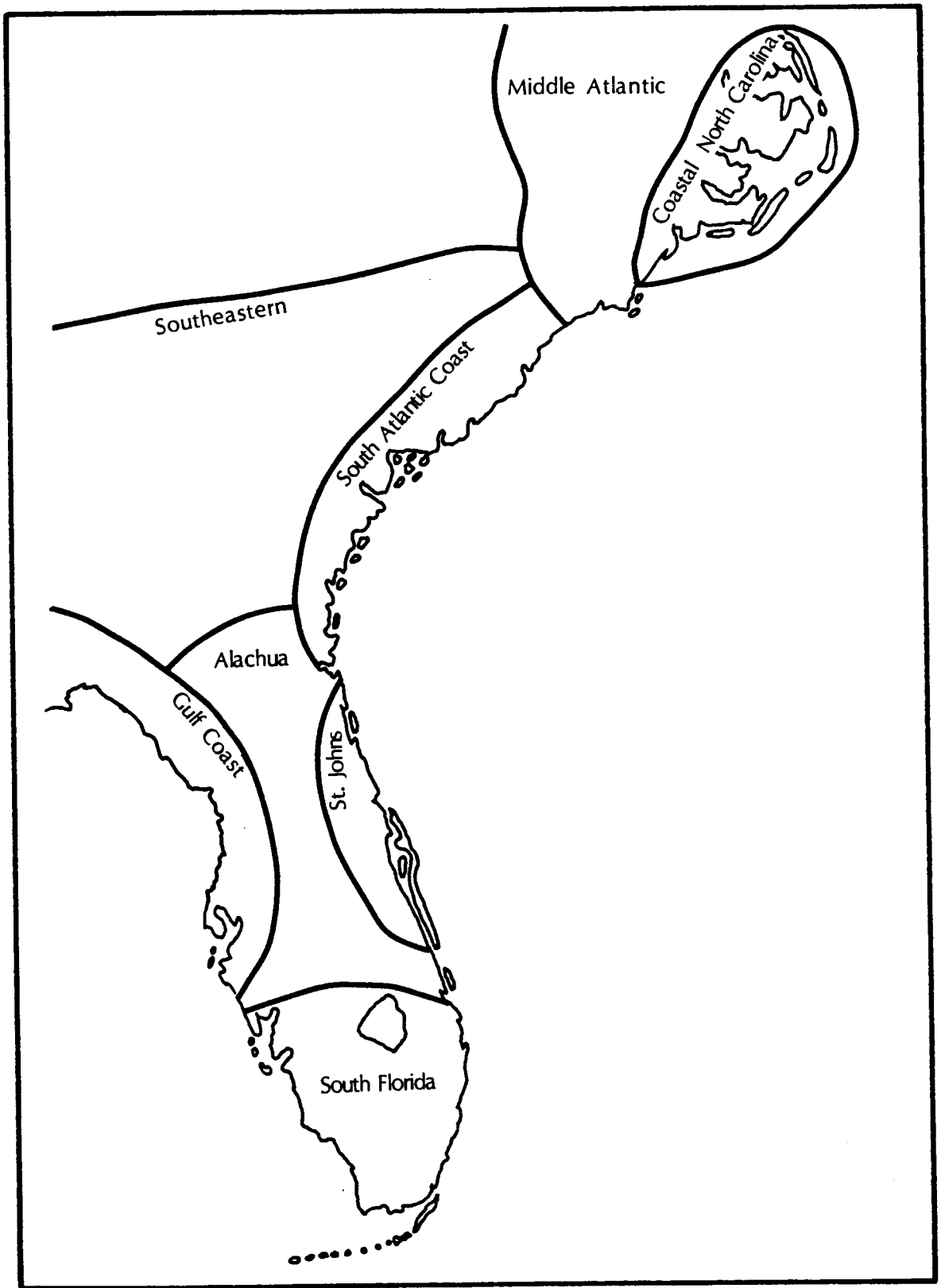


Figure 4.2.1 Potential Cultural Areas of the Southeast

or horticultural. Such a characterization, however, does not address the many alternative subsistence pursuits that supplemented the diet, nor does it address the question of coastal-versus-interior adaptations. In general, it may be said that, where agriculture was feasible, plants were cultivated. Where it was less feasible other alternatives were pursued. Nowhere in the area can agriculture be described as intense. Indeed, it is perhaps better to characterize the populations as general foragers who supplemented their diets with corn, beans, and squash horticulture. It is doubtful that cultivated crops in the study area provided more than 50 percent of the total food base, and most groups probably did not approach that level. The importance of agriculture to the food quest probably was greatest in the interior where more fertile soils were available, with decreasing importance toward the coastal zone. Even so, with the exception perhaps of portions of South Florida, both horticultural and some nonhorticultural groups can be viewed as sedentary with relatively permanent, fixed-villages. Seasonal treks, or perhaps even temporary abandonment of these villages occurred, as the food quest took populations into various habitats. Crop cultivation in the South Atlantic probably does not predate 1000 B.P.

Historically, the South Atlantic groups were matriarchal, matrilineal and matrilocal. Archeological remains such as burial mounds, and later, temple mounds, indicate that the Southeastern area attained a rather high level of sociocultural integration that included chiefdoms and perhaps even states (Sears, 1968). Inherent in this development is some degree of social stratification. Although interior areas seem to have undergone a transition to democratic organization by the time of European contact, certain elements of the earlier systems remained (compare Hudson, 1976; Spencer, Jennings et al., 1977). Monumental architecture, chiefdoms, stratification, and other indications of complexity remained relatively strong along the coastal margins. This is evident among such groups as the Natchez, Mabila, Appalachee, and Calusa of the Gulf Coast. The Cofitachequi of the South Atlantic and the Powhatan of the lower Chesapeake Bay, while lacking monumental architecture, show sociocultural traits indicative of chiefdoms and ranked societies.

Historic period population densities are difficult to evaluate. Kroeber (1939) suggests that the Chesapeake Bay had one of the more dense population distributions in North America at contact times. In general, most coastal regions in the eastern United States contained greater numbers of people than the interior areas. This is a reflection of the fact that in contrasting the total natural food productivity and options open to horticulturalists/general foragers in the 16th century, the situation would have been optimal in the littoral-estuarine zones of the coast, as compared to the adjacent Piedmont, Ridge and Valley, and Blue Ridge provinces.

4.2.1.3 Chronological Units

Table 4.2.1 shows the chronological cultural sequences by state. Major periods are denoted by Paleoindian, Archaic and Woodland. Each of these are further subdivided into Early, Middle and Late. Phases are even smaller temporal units which in turn have names like Palmer, Kirk, and Stanly. Through the end of the Late Archaic the principal diagnostic of each phase is a single projectile point style. During the Woodland period, ceramic styles are used as the key indices for phases. In general, each term within this hierarchy has other meanings. Implicit in the definition of Paleoindian, for instance, are unstemmed lanceolate points, a fairly specific toolkit, and a hunting emphasis. Phase definitions, e.g., Stanly, may be solely dependent on a single projectile point style. On the other hand, since the Stanly phase is included within the Middle Archaic, the term also connotes a general foraging pattern. There are theoretical weaknesses in this system, but it is functional for aspects of site distribution studies and chronological placement of site components.

The chronological chart (Figure 4.2.2) shows pan-regional similarity in projectile point styles throughout the Middle and South Atlantic through the Late Archaic period. Regionalization within the area starts during the Late Archaic, and becomes increasingly marked during the Woodland. Exactly what the earlier similarity indicates beyond recognition of a degree of interaction is

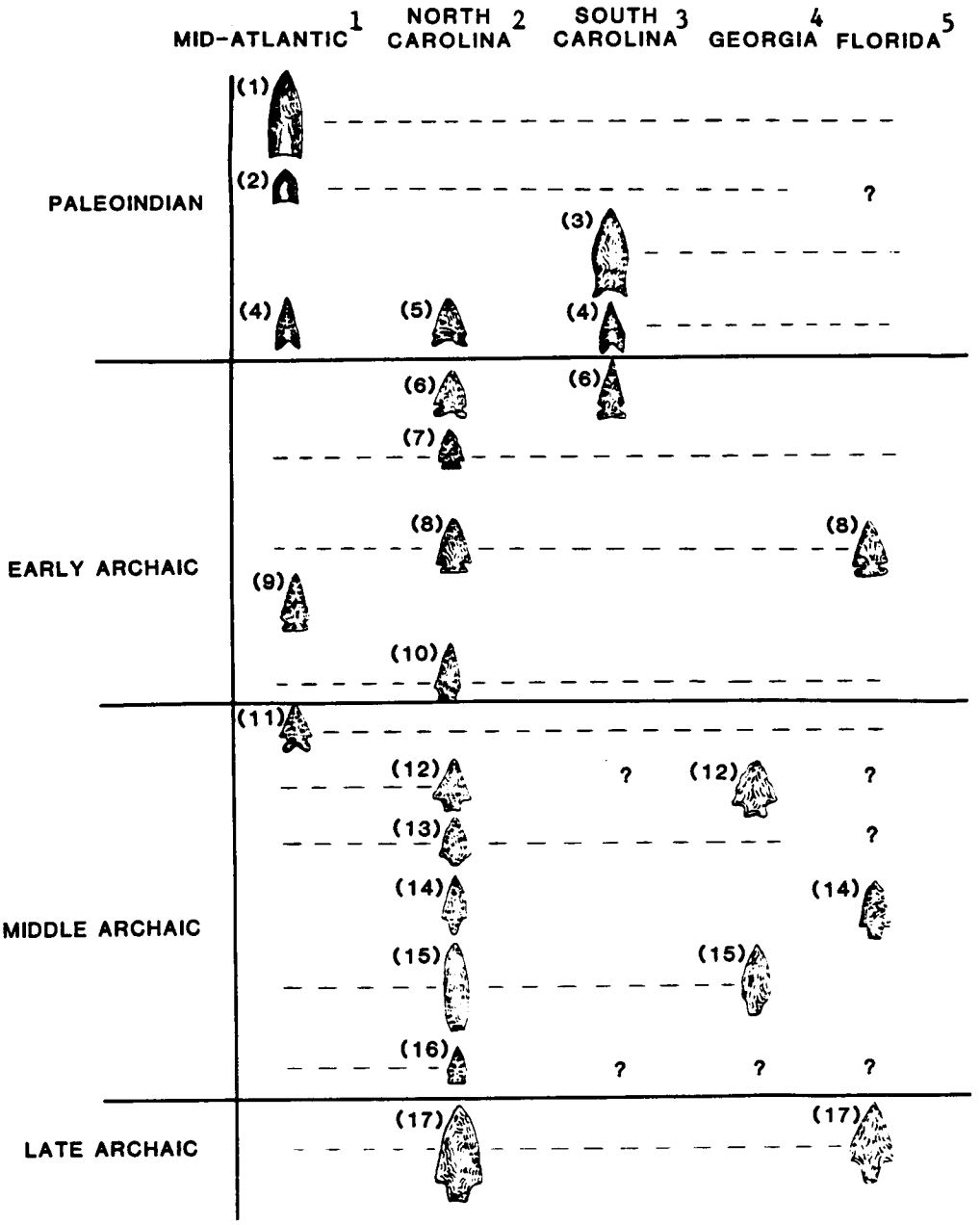
Table 4.2.1 Chronological Cultural Sequences for the South Atlantic Coastal Plain[7]

EASTERN UNITED STATES		COASTAL MIDDLE ATLANTIC[1]		NORTH CAROLINA[2]		SOUTH CAROLINA[3]	
PRE 11,500[BP]	PRE-PALEOINDIAN	?	?	?		?	
11,500		CLOVIS		CLOVIS	PALEOINDIAN	CLOVIS	
11,000	PALEOINDIAN	MID-PALEO	PALEOINDIAN			CLOVIS-LIKE	PALEOINDIAN
10,500		DALTON		HARDAWAY/DALTON		SUWANNEE/SIMPSON	
10,000		PALMER CN[8]		PALMER		DALTON	
		KIRK CN[8]				PALMER CN[8]	
9,500	EARLY ARCHAIC	KIRK SN[9]	EARLY ARCHAIC	KIRK		TAYLOR SN[9]	
		WARREN SN[9]				KIRK CN[8]	EARLY ARCHAIC
9,000		KIRK ST[10]				KIRK ST[10]	
						BIFURCATE TRADITION	
8,500		LECROY					
8,000		STANLY		STANLY		STANLY	
7,500		MORROW MT I		MORROW MT I		MORROW MT I	
7,000	MIDDLE ARCHAIC		MIDDLE ARCHAIC				MIDDLE ARCHAIC
6,500		MORROW MT II		MORROW MT II		MORROW MT II	
6,000		GUILFORD		GUILFORD		GUILFORD	
5,500		HALIFAX		HALIFAX		HALIFAX	
5,000				SAVANNAH RIVER		SAVANNAH RIVER	
4,500	LATE ARCHAIC	SAVANNAH RIVER	LATE ARCHAIC			STALLINGS IS/THOMS CR	LATE ARCHAIC
4,000						GARY/OTARRE	
3,500		HOLMES					
		MARCEY CREEK					
3,000	EARLY WOODLAND		EARLY WOODLAND			THOMS CREEK	
		ACCOKEEK					
2,500		POPES CREEK		BADIN	VINCENT	DEPTFORD	
2,000	MIDDLE WOODLAND	MOCKLEY	MIDDLE WOODLAND	YADKIN		CAPE FEAR ?	WOODLAND/
1,500							MISSISSIPPIAN
1,000	LATE WOODLAND/	RAPPAHANNOCK	LATE WOODLAND	UWHARRIE	CLEMENTS	WILMINGTON	
500	MISSISSIPPIAN	POTOMAC CREEK		PEEDEE		SAVANNAH	
				CARAWAY	GASTON	LAMAR/IRENE	

Table 4.2.1 Chronological Cultural Sequences for the South Atlantic Coastal Plain[7] (Continued)

EASTERN UNITED STATES		GEORGIA[4]	NORTHEAST FLORIDA[5]		SOUTH FLORIDA[6]		
PRE 11,500[BP]	PRE-PALEOINDIAN	?	?				
11,500		CLOVIS	CLOVIS	EARLY PALEOINDIAN			
11,000	PALEOINDIAN						
10,500		DALTON	SUWANNEE/SIMPSON	LATE PALEOINDIAN			
10,000		PALMER BIG SANDY I	GREENBRIAR/DALTON/BOLEN	EARLY DALTON			
9,500					?		
9,000		KIRK	TALLAHASSEE/DALTON/ SANTA FE	LATE DALTON			
8,500		MacCORKLE, ST.ALBANS, LECROY	KIRK ST	EARLY PRECERAMIC ARCHAIC			
8,000		KANAWHA					
7,500							
7,000				MIDDLE PRECERAMIC ARCHAIC			
6,500		MORROW MT					
6,000		GUILFORD					
5,500		STEMMED QUARTZ "OLD QUARTZ"	NEWNAN				
5,000		SAVANNAH RIVER PRECERAMIC	FLORIDA ARCHAIC STEMMED/MT TAYLOR	LATE PRECERAMIC ARCHAIC			
4,500							
4,000							
3,500		STALLINGS CERAMIC	ORANGE TICK ISLAND	TERMINAL ARCHAIC	ORANGE		
3,000		REFUGE, NORWOOD MOSSY OAK		TRANSITIONAL			
2,500		DEPTFORD I	ST. JOHNS IA		GLADES I	PERIOD I	MALABAR I
2,000		DEPTFORD II					
1,500		DEPTFORD III WILMINGTON	ST. JOHNS IIA		GLADES I LATE	PERIOD II	
1,000		ST. CATHERINES			GLADES II GLADES IIIA	PERIOD III	
500		SAVANNAH I MISSISSIPPIAN SAVANNAH II	ST. JOHNS IIB		GLADES IIIB		MALABAR II

1. Gardner, 1974, 1978
2. Coe, 1964
3. Goodyear, 1979; Anderson et al., 1979
4. DePratter, 1975; Schnell, 1975
5. Buller, 1975; Griffen & Miller, 1978
6. Griffen, Miller, Fryman, 1979
7. Diagnostic artifact types from these periods are generally ceramics
8. "CN" refers to Corner Notched
9. "SN" refers to Side Notched
10. "ST" refers to Stemmed



1 Gardner 1974, 1978

2 Coe 1964

3 Goodyear at al 1979; Anderson et al 1979

4 DePratter 1975; Schnell 1975

5 Bullen 1975; Griffin and Miller 1978; Griffin, Miller and Fryman 1979

Figure 4.2.2 South Atlantic Coastal Plain Projectile Point Sequence

POINT TYPE KEY

(Figure 4.2.2)

(1) CLOVIS

(2) MIDDLE PALEO (ALSO KNOWN AS QUAD OR SMALL FLUTED POINTS)

(3) SUWANNEE (ALSO KNOWN AS CUMBERLAND)

(4) DALTON

(5) HARDAWAY

(6) EARLY SIDE NOTCHED, i.e. HARDAWAY SIDE NOTCHED, KESSEL SIDE NOTCHED

(7) PALMER CORNER NOTCHED

(8) KIRK CORNER NOTCHED

(9) KIRK SIDE NOTCHED

(10) KIRK STEMMED

(11) BIFURCATE BASE TRADITION (i.e. LECROY)

(12) STANLY

(13) MORROW MOUNTAIN I

(14) MORROW MOUNTAIN II (ALSO KNOWN AS NEWNAN POINT)

(15) GUILFORD

(16) HALIFAX

(17) SAVANNAH RIVER

difficult to determine. The regionalization, which begins with the introduction of pottery, to some degree correlates with relative sedentism, and a reduction of wide-spread interaction, but again, this is only partly explanatory.

Pre-Paleoindian (? - 11,500 B.P.)

The purpose of dealing in some depth with the pre-Paleoindian period is the same as for any other period: if sites dating to this time are to be predicted it is necessary to understand their distribution and the nature of their adaptive systems. In the case of the pre-Paleoindian, the very existence of man in the Western hemisphere is open to question. At the present time, there is no site or set of data which can be unequivocally accepted after close examination (Haynes, 1977). Even one of the foremost proponents of the existence of such remains, Richard S. MacNeish, at the conclusion of an exhaustive review of sites dating from such early times admits they cannot be accepted without question (MacNeish, 1976). In a study similar to this investigation, Gagliano (1977) suggests that the Gulf Coast region was inhabited during the pre-Paleoindian period. It is the opinion here that both of these examples represent an uncritical acceptance of these purportedly early sites.

In a striking example of what critical reanalysis can result in, the Lewisville, Texas site which "has for many years been one of the pillars on which the whole (pre-Paleoindian period) rests" (Gagliano, 1977), had several radiocarbon dates in excess of 38,000 years. Recent reexamination of this now inundated site during lowering of the water behind the dam near which the site is located resulted in the discovery that the site dates at best to the Paleoindian period. The people who inhabited the site around 11,500 B.P. years ago were burning coal, in this case lignite, which resulted in the early dates (Dennis Stanford, Smithsonian Institution, personal communication, 1979).

In addition to the above example, there are other problems with the purported pre-Paleoindian sites. Some of these problems are summarized below:

The reality of the artifacts - The questions which arise center around human alteration of naturally occurring materials (artifacts) as opposed to materials which have been naturally altered (geofact). As an example, colluvially and alluvially transported lithic material can develop fracture patterns which suggest human modification (the Calico Hills site in California). Mechanical fracturing by frost at cryptocrystalline outcrops can produce similar alteration. Animals, through continuous trampling, can also modify cherts and flints (British Mountain in western Canada). Altered bones which are put forth as altered by human hands can also be modified by forces in nature. Spiral fractures are often assumed to indicate alteration by man, but experiments have shown that carnivore breakage and frost action (Gary Haynes, personal communication, 1979), and trampling by other animals, can produce similar results (C. Vance Haynes, personal communication, 1977).

The correlation of crudity and antiquity - An unfortunate assumption among archeologists is that if a lithic artifact is crude in form or if the artifact has characteristics that resemble attributes on tools which are known to date to the middle and lower Paleolithic in the Old World, then the artifact must be of considerable antiquity. Such identifications occur more often than not at quarries where the entire 2.5 million year history of tool manufacture can be replicated by considerably later populations as they transform a block of stone into a nearly finished or finished artifact. In other words, various manufacturing stages can replicate or resemble stages in the chronological evolution of tools. Crude tools, which are often only generalized functional tools of later peoples, found on top of geologically old horizons, are often put forth as being of great antiquity as a result of these two associations. This overlooks the ossibility of minimal modification because of tool function, activities present at restricted function sites, and the loss of more recent soil horizons through erosion.

The associations of radiocarbon dates with the artifacts they are purported to date - Several descriptions exist in the literature of situations where tests have been run on charcoal from either a soil horizon or from an artificial level which date these horizons or levels, but do not necessarily date the artifacts. In some cases the associations of artifacts and dated horizons have been connected over considerable distances (several miles), and because of pedological similarities the two are assumed to be contemporary. The association of artifacts with dated charcoal from artificial levels is most often done in caves or rock shelters where stratigraphic control is often difficult, if not impossible.

The accuracy or reliability of the radiocarbon dates - A number of sites with reported dates previous to 11,500 B.P. have been demonstrated or suggested to have possible contaminants. This particular problem occurs (or may have occurred) in sites such as Meadowcroft Rock Shelter in Pennsylvania where coal seams are nearby and ground water percolation through these seams could have carried the contaminants; in sites where there has been considerable fluctuation in the water table and earlier organic deposits lie beneath the artifact-bearing sediments; and in springs in which the water contains organic chemicals.

The modification of old materials by later populations - This can occur when fossilized bones and ivory are picked up several millenia later, and are culturally modified for tool use, and then discarded back in the original bone bed (as possibly occurred at Old Crow Flats in the Yukon).

The downward movement of artifacts through cultural and natural transforms in the deposits - from burial, storage, or garbage pit excavation artifacts are known to move through soil horizons as a result of anything from worm action, rodent activity, trampling, frost wedges. Often such modifications are detectable only with fine-grained analysis conducted by appropriate specialists, which normally does not fall within the archeologist's expertise.

Without attempting an exhaustive review of all the evidence, and focusing strictly on the Eastern United States, the crudity-antiquity problem was addressed at the Trenton, New Jersey gravel quarries by W.H. Holmes (1893) several decades ago. At that time, he demonstrated that "Paleolithic" hand axes coming from this locale did not represent great antiquity but rather different stages of the manufacturing process. A similar situation is probably also reflected in the materials from Ocala limestone-chert quarries near Gainesville, Florida, for which considerable age is claimed (Tallahassee Democrat, December 19, 1978).

In a similar vein, Dragoo (1973, 1976) has suggested that part of the Wells Creek Crater site artifact assemblage in Tennessee and the Lively Complex in Alabama are quite ancient because of their resemblance to European middle Paleolithic Mousterian and Levalloisian tools and cores. Both of these sites are quarry-related, and Wells Creek Crater has a major Paleoindian period component. Work by Gardner

and his associates at quarry-related sites and quarries in the Shenandoah Valley of Virginia, compliments Holmes' earlier statements, and indicates that nature-facts and crude artifacts appearing to be of some antiquity can be found at a location that was first utilized around 11,500 B.P. Site patterning at the "50" site (this site's name is derived from its numerical designation, 44WR50, a stratified Paleoindian-Early Archaic site in the Shenandoah Valley) shows at least two activity areas. One of these areas consists of finished but broken projectile points, and various fine cutting and scraping tools. The other area has only large chopping, crushing and butchering artifacts. These latter tools are morphologically crude, and also bear striking resemblances to European middle Paleolithic assemblages. The artifacts are located on a surface that is, in part at least, 25,000 years old. Yet, this is simply a functional area of a site that is no older than 11,500 B.P.

Another example of a potentially misleading situation also occurred at the "50" site. Approximately 30 small flakes were found in the bottom of a stratigraphic sequence that, at first glance, had to predate 11,500 B.P. These artifacts were sealed within a distinct soil horizon some 6 inches below the levels and horizon where Clovis points, dating from about 11,500 B.P., had previously been found. Based on previous pedological and geomorphological data, artifacts in this horizon should have dated to approximately 20,000 years ago. Subsequent fine-grained sedimentological and particle analysis indicated that the artifacts were in a trough, or small, shallow gulley, in the Clovis period paleotopography. This gulley and the artifacts were subsequently capped by sheetwash that resulted from early Holocene vegetational changes. Water table fluctuation through the millenia had all but homogenized the entire layer. Equally as important as these findings is the fact that considerable time, energy and money has been spent in the Shenandoah Valley looking for cultural artifacts which might pre-date Clovis. Nothing has been discovered to date. This is an area in excess of 777.01 hectares in which there are several stratified sequences beginning at the Clovis period.

Another eastern site which has been used as evidence for pre-11,500 B.P. habitation is the Dutchess Quarry Cave in New York. Carlson (1978) has recently cited this in support of his treatise on pre-Paleoindian migration into the New World. The site was originally reported as containing carbon which dated a fluted point and parts of a butchered caribou to 12,500 years ago. The excavator (Funk, 1977) has since noted that there is no clear-cut association with the point and the charcoal sample, and it is not even definite that the bone was butchered. This is an excellent example of a purportedly early date which finds its way into the literature and, even after corrections, is continuously cited.

The finds of human skeletal remains in association with extinct animal bones on the Atlantic coast of Florida near Vero Beach and Melbourne represent historically early claims for great antiquity of man in the New World (Rouse, 1951). Gagliano (1977) and Griffin and Miller (1978) provide excellent reviews of this controversy. Most archeologists consider the associations to be a result of considerably later intrusions. Recent, careful work in the vicinity has failed to find any early human skeletal remains, artifacts, or culturally altered bones (James Miller, Cultural Resources, Inc., personal communication, 1979).

The most important recent claim for man in the east prior to 11,500 years ago comes from the Meadowcroft Rock Shelter in Northwestern Pennsylvania (Adovasio et al., 1977). Radiocarbon dates from the site range from over 30,000 years ago to as recent as A.D. 1265. Cultural remains are claimed to date from only about 16,000 years ago, although possible artifacts are noted from about 20,000 B.P. The authors of the report have spent considerable time in defending the accuracy of the dates and the care taken to deal with possible coal contamination. The excavation techniques appear to be exceptionally meticulous and the presentation of the data and the use of the interdisciplinary approach is to be commended. There are, however, a number of problems. The problems which can be listed are:

Possible contamination through ground water percolation mixing materials from nearby coal deposits. Despite the assurances by the Smithsonian Radiocarbon Laboratory that this could not happen, Meyer Rubin of the U.S. Geological Survey Laboratory notes that such contamination is a strong possibility (personal communication, 1977). In the stratigraphic column it should be noted that a range of dates in Stratum IIa, in deposits not much thicker than 25 cm (possibly 50 cm) covers over 12,000 years (from 10,100-22,000 B.P.). There is also a considerable hiatus in the sequence between 9,165 B.P. and 13,290 B.P., which occurs in less than 7.62 cm with no evidence to suggest any paleosol development in this 4,000-year period. Above this is a similar hiatus between 5,350 and 8,060 B.P. Above and below this, the dates are consistent with respect to one another, and without major breaks.

Rock shelters are notorious for irregular topography and the possibility of mixture through cultural and natural transformations. At approximately 5,000 B.P. there was a massive roof fall in the shelter. This in itself would lend to considerable depression and disturbance of the pristine topography.

All the team members note only minor changes in the vegetation from before the Wisconsin maximum to the present. This, in spite of the fact that the shelter is only about 83 km from the ice front, and is located in the Appalachian Plateau. The vegetal cover throughout is noted as dominated by deciduous species. There is also little, if any, change from modern conditions in faunal, molluscan, and snail assemblages, all of which support the deciduous dominance and 20,000 or so years stability. Adovasio et al. (1977) note that this is "a protected cove." This stability and the presence of deciduous species throughout the late Pleistocene and Holocene so close to the glacial front does not fit with data from elsewhere in the Middle Atlantic and Southeast (Carbone, 1976).

There are no artifacts in the tool assemblages that typologically date any earlier than the Stanly phase, which is early Middle Archaic elsewhere. The tools in the putatively early levels which are said to be Paleoindian are no different from tools which cover the range from early Paleoindian to early Middle Archaic (Gardner, 1974). The biface which is said to resemble Paleoindian types could as easily be included within Early Archaic type descriptions (Palmer type).

In short, there is some doubt that the material is earlier than the Early Archaic, and probably reasonably late in this period. Adding some weight to this interpretation is the fact that nothing earlier than Dalton has even been found in any other cave or rock shelter in the east (Goodyear et al., 1979).

As noted previously, the purpose of addressing the problems of pre-9,500 B.P. habitation in the Eastern United States relates directly to determining the probability of occurrence of archeological sites of this period on the Outer Continental Shelf. Since the very existence of a cultural phase dating to this period is questionable, the probability of such sites occurring on the shelf prior to this time is low to nonexistent. Even if the sites which are said to be of this antiquity are present, the inherent problems on land, such as contamination, artifact recognition, and disturbance, are certain to be compounded on the shelf where drowning, tidal and wave action, and submarine currents would result in considerable multiplication of these problems.

Elsewhere (Gardner, 1974), modeling was briefly attempted, and a call was made for those working in this subject to establish settlement pattern models, predict pre-11,500 B.P. site locations, and search for these sites in a systematic manner. To date, this has not been attempted, and the purported finds are accidental. A settlement model for this period must consider a number of different factors. Almost all workers assume a very sparse population. The majority of sites claimed to date to this period are in the Western portion of North and South America. Of these, the majority are located in or near the Cordillera (the Andean and Rocky Mountains), near water and a variety of resources.

Several putatively early sites have been reported in association with proboscideans (as discussed in Section 4.1.3.1). Some have been reported in association with smaller mammals and seeds. The technologies which have been suggested include exclusive and/or mixed dependence on crude flake and core tools; bifacial tools; flake and blade tools; bone tools; and combinations of these.

This "evidence" suggests adaptation to many habitats with a variety of technological traditions and several exploitative orientations. Specialization toward big game hunting is a possibility, as is general foraging. Seasonal variation in resource orientation could also occur.

Considerable variation in adaptation could possibly be expected as people moved into different resource zones in North America after their initial entry. It is unlikely that human populations could have crossed Beringia without specialized equipment to cope with the climatic elements and the tundra-margin animal species. These, of course, could have been bone tools, but, based on northeast Asian remains, the tools would have been more likely derived from a lithic base of biface reduction. It is also possible that movement of general foragers was around the coastal areas of Beringia, where a less specialized technology could have more readily coped with on the now innundated Beringian littoral.

Based on this tenuous and conflicting evidence, it is almost impossible to predict where such sites might occur. The range of possible adaptive patterns from the generalized to the specialized provides no constant for prediction. Simply looking at landforms adjacent to where water and food resources might have occurred will not prove to be useful since the possibilities are virtually unlimited. To argue, in the case of this particular project, that very early populations would have been drawn to the pre-11,500 B.P. shorelines on the Continental Shelf is no more useful than the previous statement. To assume that there was any special abundance of food resources in the littoral and estuarine zones during the late Pleistocene is an assumption that cannot be totally justified. Assuming from a few oyster beds dating to the late Wisconsin that there were enough oysters and other food resources to provide viable alternatives (Edwards & Emery, 1977) to possible resources in any other physiographic province does not seem justified when the rapidity of the post-16,000 B.P. sea level rise is considered. As archeologists (Binford, 1968) and palynologists (Carbone, 1976) have pointed out the extension of modern environmental and cultural analogs into the past cannot be justified. This is not to deny that uniformitarianism works in both the cultural and environmental spheres, it is only to caution that specific conditions and processes can vary tremendously under altered settings. This also does not deny that easily procured food was available along the paleo-coastline. On the

contrary, available evidence indicates there was. All that is suggested here is that such resources were not as extensive as they became during and following the xerothermic and post-xerothermic (after 5,000 B.P.) eras.

In short, while the predictive model applied in this study will include the possibility of pre-11,500 B.P. habitation on the Continental Shelf, the evidence to support the existence of such a population anywhere in the Western Hemisphere is not strong. It does not appear to be accidental that coastal adaptation elsewhere in the Western Hemisphere - the Peruvian coast, coastal Venezuela, Brazil, Mesoamerica, California and the Atlantic - does not appear until 6,000 years ago and later. In at least three of these areas - Peru, California and Brazil - there has been uplift and/or higher sea-level stands than present, yet nowhere is a strong or even minor littoral adaptation noted prior to this period.

Paleoindian (11,500 - 10,000 B.P.)

There is only one reported site in the Eastern United States exhibiting a clear-cut stratigraphic record for the entire Paleoindian sequence. This is the Thunderbird site, a part of the Flint Run Paleo-indian Complex in the northern Shenandoah Valley of Virginia (Gardner, 1974; 1976, 1977, 1979). The stratigraphic sequence, supplemented by associated stylistic changes, is represented in two widely separated areas of the site and has resulted in the definition of three phases. Analysis of attribute clusterings on the points representative of each phase (Gardner and Verrey, 1979) allows for the segregation of types in surface collections which can be extended to other areas of the Middle Atlantic. Nearby, Site "50" is also stratified, but contains only the Clovis phase below Early Archaic phases. Other sites along the eastern seaboard which show Paleoindian phase projectile points below Early Archaic include Shawnee-Minisink (McNett et al., 1977) in the lower Delaware River valley in Pennsylvania, and Hardaway (Coe, 1964) in the Piedmont of North Carolina.

The beginning dates of the early Paleoindian period diagnostic, the Clovis fluted point, has been thoroughly demonstrated to be 11,500 B.P. in the southwestern United States (Haynes, 1964). The earliest dates on fluted points for the East are 10,600 B.P. in Nova Scotia (Macdonald, 1968), and 10,590 B.P. from the Shawnee-Minisink site (McNett et al., 1977). Following Gardner (1974) and Gardner and Verrey (1979), the points from these sites stylistically fall into the mid-Paleo. Terminal Paleoindian,the Dalton style in Gardner's chronology, has been dated in Missouri at 10,200 B.P. and 10,500 B.P. (Dr. Albert Goodyear, Institute of Archeology and Anthropology, University of South Carolina, personal communication, 1979). The plus side of the deviation in dating could push mid-Paleo to 11,000 B.P. and Dalton to 10,500 B.P. That all three phases date before 10,000 B.P. is provided by a date of 9900 B.P. on Early Archaic at the Thunderbird site. Beneath this date is 45.7 cm of occupation containing three phases, Dalton, mid-Paleo and Clovis. Convention has normally put the eastern Paleoindian between 11,500 B.P. and 10,000 B.P. (Haynes, 1977; Gardner, 1974). Gardner makes the argument, which is supported by a number of others, that since the Eastern Clovis point is almost identical to the Western Clovis, the two phases must be contemporaneous, or nearly so. The radiocarbon dates, however, so far do not support this. Following tradition, however, we will assume an 11,500 B.P. starting date.

Clovis has been elevated to phase level throughout the Middle and South Atlantic coastal region. It is the known base culture of this area. A mid-Paleo phase following Clovis has not been generally recognized outside of the Middle Atlantic. There is a suggestion of a mid-Paleo phase in South Carolina with the designation "Clovis-like." From South Carolina to Florida, the Suwannee-Simpson points, which are restricted in distribution to these states, are generally put into a Late Paleoindian phase. It is possible that these are simply regional stylistic variations which should be put into a middle rather than a late phase. Goodyear and Michie (personal communication, 1979) note that Suwannee-Simpson points only occur in the southern portion of South Carolina and are replaced by "Clovis-like" points further north.

In the Middle Atlantic model, Dalton is placed in late Paleoindian. Coe (1964) puts the Hardaway-Dalton variant at the same level. Goodyear et al. (1979) and Michie (1979) consider the Dalton to be Early Archaic, as does Bullen (1975). At the Thunderbird, Dalton occurs below corner notched Early Archaic points. The same is true at the Hardaway site. Goodyear et al. (1979) place Dalton in the Early Archaic, noting that it dates between 10,500-10,200 B.P. They also feel that the Hardaway-Dalton, because of its apparent side notching, belongs in the Early Archaic. A study of Coe's (1964) illustrations indicates there are some points in the Hardaway-Dalton category which range from lanceolate to slightly side notched to side notched. We may be dealing with a slightly mixed assemblage. Hardaway is probably best interpreted as a localized variant of the Dalton continuum, and therefore late Paleoindian.

The strongest manifestation of the Dalton style is in the southeastern portion of the study area. Daltons become considerably less common toward the Middle Atlantic but, as noted, are present in the northern Shenandoah Valley. A survey of fluted points in Maryland (Brown, 1979) noted a few Daltons. Further north the Dalton variant is absent, being replaced by Plano styles with affinities to northern Midwest and northern Plains area. In the East, the division between Dalton and Plano-related variants represents the first clear-cut stylistic regionalization. Such categories as Quad, Cumberland, Suwannee, and mid-Paleo, represent variations that probably reflect differences in raw materials, and resharpening. These categories probably should not be interpreted as a decrease in interaction zones (Gardner and Verrey, 1979). During Clovis and mid-Paleo times, a pan-continental expression is mirrored in Clovis to Folsom in the West. During the Dalton phase there is a pan-regional expression that covers most, if not all, of the area south of the Ohio-Appalachian Mountain system and east of the Mississippi River. The changes reflected through the Clovis-mid-Paleo-Dalton phases may be interpreted as stylistic changes along a thematic continuum. The similarity in changes throughout the area must be seen as reflecting a relatively strong degree of interaction, although the nature of this interaction is unknown at the present time.

Throughout the entire East, the toolkit during the Paleoindian, where it has been defined, is essentially the same. Caution in dealing with the total toolkit of the Paleoindian period must be noted because Gardner (1976, 1977, 1979) has isolated at least six different types of functional sites with from two to three different activity areas within some of these sites. These sites and activity areas have distinct but overlapping toolkits. Different types of Paleoindian sites have only been recently recognized. Previously only "Paleoindian sites" or hunting camps were categorized. This has led at least some workers (Wilmsen, 1968) to claim that because of differences in edge angles of scrapers Eastern Paleoindians focused more on woodworking, and were therefore forest adapted. This is erroneous. Regardless of local activity, the overall toolkit is highly specialized in the direction of hunting and processing of the byproducts of the hunt.

The six different types of sites isolated since 1971 in the Shenandoah Valley include:

Quarries
Quarry reduction stations
Quarry-related base camps
Quarry-related base camp hunting/processing stations
Outlying hunting/processing camps
Isolated point finds

Two of these site types, quarries and quarry reduction stations, can be subsumed under the category Specialized Sites. The quarry-related base camp can be included under the general heading Base Camp, while the latter three can be incorporated into Transient Camps. The three categories which emerge are:

Specialized Sites
Base Camps
Transient Camps

Base camps can be generally considered to result from the interaction of fairly large social units (macro-bands) while transient camps can usually be interpreted as being the locus of small groups (micro-bands).

The characteristics of these types of sites are as follows: (The definitions below are broadened to include sites from all time periods).

Specialized sites: The artifacts contained within a site of this type will show a very limited range of activities which are not associated directly with the food quest. Sites of this type may have been used over a long period of time, but in general they will be small and the activity loci of a limited number of people for a limited duration. Examples of such sites are quarries, mounds, and cemeteries.

Transient Camps: The actifacts derived from sites of this type will be less limited in function, but will generally indicate a limited set of activities usually associated with subsistence pursuits. Examples of this type of site are hunting camps, gathering stations, shell heaps (as opposed to middens), any type of processing station such as a kill site, and individual chipping stations. Again, the presence of a small population for a limited time can be expected.

Base Camps: Sites of this type will show a wide range of activities including those associated with the food quest, and general maintenance, as well as artifacts which can be considered as non-functional (e.g., ceremonial-ornamental), and indicative of some degree of permanence. Sites which fall into this category include villages, shell middens, and multiple-activity procurement camps.

Gardner (1976, 1977) has presented evidence that all of the reported Paleoindian sites in the East can be placed in one or another of these categories. Continued work on the problem in the Shenandoah Valley, Chesapeake Bay, and Dismal Swamp areas has substantiated this position.

The basic Middle Atlantic Paleoindian settlement pattern model as derived by Gardner and his associates (Gardner 1974, 1976, 1977, 1979; Gardner and Wall, 1978; Rappleye and Gardner, 1979) suggests that the focal point of settlement during this period was a source of crypto-crystalline lithics, or raw material for the stone component of the toolkit. The importance of material of this type is interpreted as reflecting the hunting orientation of the toolkit; such tools include weapons for killing game (fluted and lanceolate points), tools for

processing felled animals (knives, scrapers, gravers, burins), bifaces or preforms for multiple use purposes including final stage reduction into finished points and tools for manufacturing tools (hammerstones, abraders). The distribution of game is also seen as important, hence stream junctions, high order stream valleys, high biomass areas such as broad grasslands, large swamps, and karst areas can also be used as predictive variables. Areas with southern exposure, and locations where windchill factors are reduced, are important in conjunction with the above-mentioned factors, especially in higher elevations and more northerly latitudes. Dragoo (1976) has suggested the relative importance of zones elevated above the surrounding terrain for game lookout or overview purposes. This seems to be of minimal importance except where elevated terrain relates to well drained late Pleistocene terraces adjacent to one or more of the variables noted above.

A number of factors present difficulties in the discovery of Paleoindian sites or Paleoindian point finds. Late Pleistocene terraces are often drowned, or eroded away, or silted in, especially along the major river valley flood plains. Species of game have changed, and specific predictions of where they might have occurred are tenuous at best. Southern exposures are almost ubiquitous; stream junctions are numerous; and major river valleys are quite long. Paleoindian site prediction using any of these factors together or in isolation has not worked. As an example, plotting Paleoindian point finds in conjunction with late Pleistocene megafaunal finds (Williams and Stoltman, 1965) has failed to demonstrate anything except that there appears to be some minor correlation with both types of discoveries. This, however, is by no means explanatory. It can be assumed that mastodons had a rather wide distribution during the late Pleistocene (indeed from at least 25,000 years ago). Paleoindians also had a rather wide distribution. Attempting to say that these finds co-vary is misleading, not the least because it has yet to be demonstrated conclusively (although there are some tenuous indications, Section 4.1.3.1, and Goodyear et al., 1979) that eastern Paleoindians ever killed a mastodon. The association of mastodon and fluted point finds with major river valleys may simply be a coincidence or a reflection of the fact that the primary focus of both were along these valleys. This could occur in the absence of interaction between man and mastodons.

The most useful factor to date for predicting Paleoindian site distribution has proven to be the distribution of specific types of cryptocrystalline material, namely cherts, jaspers, chalcedonies, and silicified slates. This has proven useful because an almost singular preference for cryptocrystalline lithic material during the Paleoindian period has been demonstrated. With intensive geologic studies, locations of the sources of this material can be discovered, primarily because the sources themselves are still present and unlike most factors in the late Pleistocene environment, the lithic source locations have remained constant.

Cryptocrystalline raw materials occur in two types of deposits, in situ and transported, herein termed as primary and secondary. Cherts and jaspers have a high association with limestones, although this is not exclusive. Nevertheless, for predictive purposes such an association has a high reliability. Other factors which are important include a nearby lithology with suitable silicates, changes in pH, and changes in lithology (Segovia, 1974) and (A.V. Segovia, Geology Department, University of Maryland, personal communication, 1978).

Cherts and jaspers are not the only cryptocrystalline materials used by Paleoindians. The Carolina Slate Belt contains thick deposits of metamorphosed silicified slate which has an excellent conchoidial fracture, and which was used extensively for toolmaking. It is possible that there is a source of devitrified obsidian in the South Carolina Piedmont, but this identification is tenuous at present (Goodyear and Michie, personal communication, 1979). The known primary sources of cherts, jaspers and silicified slates used by Paleoindians are presented on Figure 4.2.3.

Secondary sources of this type of material consist of pebbles, cobbles and boulders transported from the interior through the erosive activities of river systems (or, further north, through glacial transport and subsequent river activity). The currently active rivers which

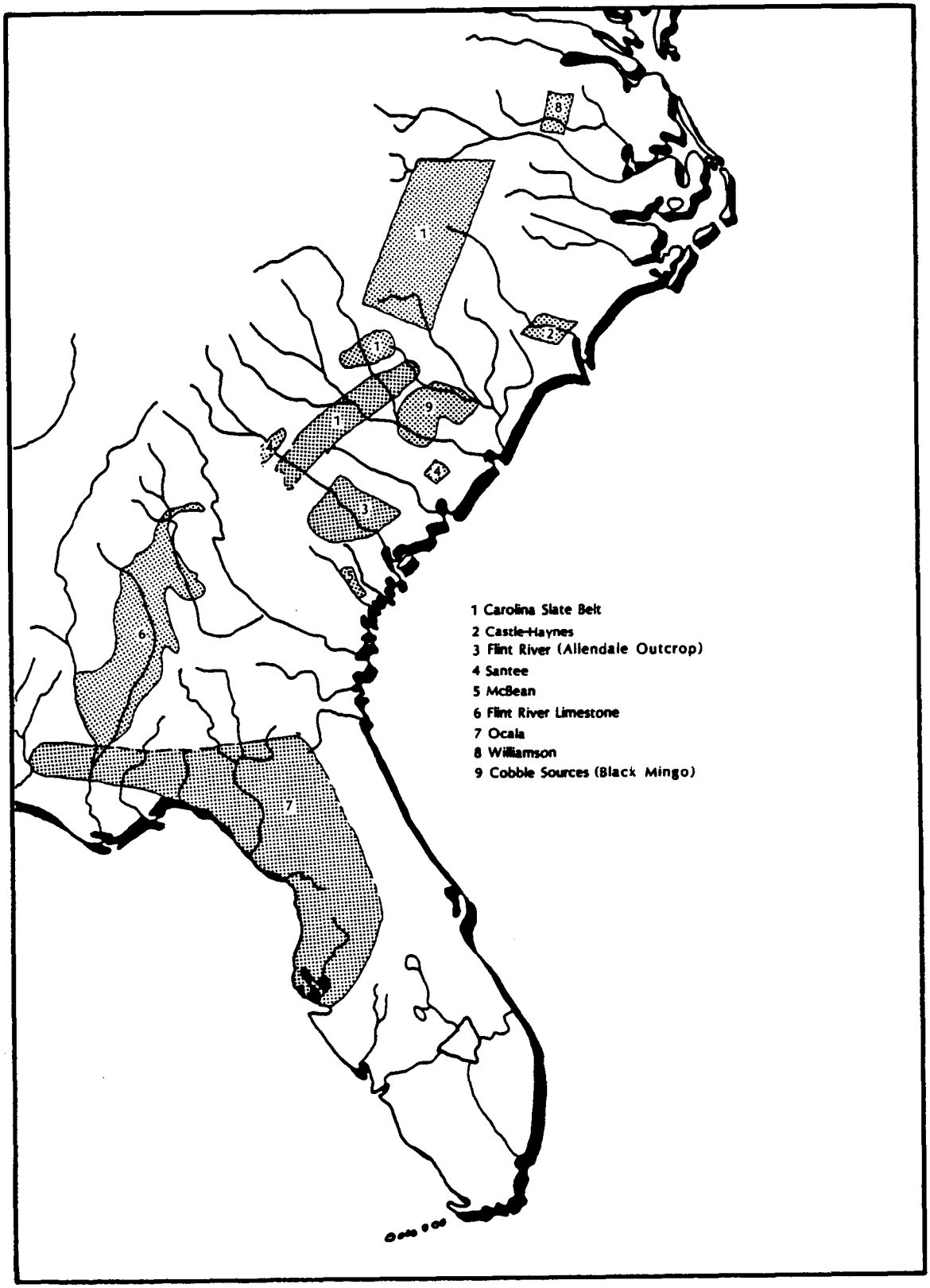


Figure 4.2.3 Known Primary Sources of Lithic Raw Materials

course through outcrops of cryptocrystalline rock frequently transport such material in their bedload. Depending on the age of the river, transportation of this material could have occurred at any time during the Pleistocene, Pliocene, or earlier. Extinct river systems could also have carried this material. It is necessary to consider these naturally transported lithic raw materials before resorting to long distance population movements or trade (Perkinson, 1971, 1973).

The complete range of sites isolated in the Flint Run complex has not been recognized throughout most of the study area. Paleoindian sites reported in North Carolina (Perkinson, 1971, 1973); South Carolina (Michie, 1979); Georgia (Waring, 1961; Stoltman, 1974); and Florida (J. Dunbar, Division of Archives, History and Research Management, Florida Dept. of State, Tallahassee, personal communication, 1978 and 1979) and (Waller and Dunbar, 1977; Neill, 1964a) are isolated point finds and possible kill sites. These finds illustrate an overwhelming association of Paleoindian period points and sources of cryptocrystalline raw materials. This is manifest in the point find densities in and near sources of raw material, and a reduction in numbers of such finds away from these sources.

It should be possible with in-depth studies to work with the concept of cultural catchment or human exploitative areas. Gardner (1979) has attempted to do this. His investigation has demonstrated the following line mile distances from known outcrops of preferred raw materials to point finds.

Northern Shenandoah Valley--20 line miles
Potomac Piedmont--40 line miles
Chesapeake Bay--30 line miles
Williamson Site--100 line miles
South Carolina--40 line miles
Georgia--40 line miles
Florida--20 line miles

Although these are, of course, rough distances, they do indicate that Paleoindian period populations were not free wanderers who would travel hundreds of miles for stone tools or game.

Several other relationships were observed between the lithic source and the projectile points. As the distance from the source increased, fewer points were found, fewer bifaces were found, the point size and flake sizes were smaller due to resharpening, and the number of points made from less desirable materials increased (these also appear to be in the early stage of use). This suggests that as distance from the quarries increases, the smaller and more transitory the site will be.

There are a number of variables which can intervene to alter these predictions or the overall appearance of the tool assemblage. Primary among these are the nature of the game being exploited, additional resource options, the nature of the topography, and factors of horizontal and vertical zonation. The distance between lithic sources and point finds appears to indicate that the catchment area is greater in the Piedmont because of the reduction in exploitable biomass in the Piedmont proper. The same distance data also indicate that the Coastal Plain and Great Valley provinces involve the most reduced catchment areas and probably the most productive environments. In North Carolina, South Carolina, Georgia, and the Potomac Piedmont, there seems to be a close association between point distribution and river systems and stream junctions. It can therefore be assumed that the areas surrounding river systems were the most productive. Because of this focus on the river systems there is a distinct linearity to the catchment or exploitive area. There is no direct correlation of the Shenandoah Valley, Chesapeake Bay and Florida models with river systems. A number of points are found in Florida, associated with certain rivers, but an equal number are found associated with sinkholes and "prairies" or extinct lakes.

It is necessary to point out that the evidential basis that is being used for the distribution of Paleoindian sites (and sites of all subsequent time periods) is the occurrence of the lithic component of the toolkit, that is stone tools, and in the case of Paleoindians this is stone spearpoints. It would be unjustified to deny that there were other elements in the toolkit, particularly items or parts of items

made of organic materials, which have not been preserved. Except by inference and induction and deduction archeology simply cannot deal with unpreserved remains.

This lacuna generally presents no problem but should be of concern to those scientists dealing in site prediction models in areas where suitable stone material is not likely to, or does not, occur. This brings up the concept of alternative or expedient toolkit strategies: the use of some material other than stone in the absence of or in areas of limited availability of lithics. Such material could include bone, wood, and shell. During later periods, the Later Archaic-Woodland, there are archeological sites, especially shell middens, which produce extensive cultural remains but contain little or no stone. This is not the case in known, documented Paleoindian sites where, with minor exceptions, bone or wood tools are rarely preserved. The occurrence of bone or wood tools, albeit rare, demonstrates that material other than stone was used. What it does not demonstrate is that Paleoindian (or Early and Middle Archaic) populations would settle in or use areas where stone did not occur. Cultural preferences and population pressures due to seasonal transhumance or attraction to coastal estuarine resources, have not been demonstrated to be operative during Paleoindian (or Early or Middle Archaic) times as they were for later populations. On the contrary, during Paleoindian times, hunting was the food quest emphasis; point finds are numerous but sites are not common and population could not have been dense; abundant estuary and coastal food resources are not common or pursued; and climatic evidence indicates that marked seasonality does not appear until about 9,000-7,000 B.P. and seasonal transhumance appears at about the same time.

There still remains the concept of an expedient technology. If, for whatever reasons, Paleoindians or later Early and Middle Archaic populations found themselves too far from suitable lithic raw materials would they alter their toolkit manufacturing strategies? This can be answered in part in the affirmative: there are a number of instances in the eastern United States where less than desirable quartz or quartzite was chosen but these tend to be at the end of Paleoindian site distribution and are uncommon, and the evidence is that the number of sites diminishes markedly.

This is still a lithic source and does not directly address the question of a complete substitution for purposes of expediency. The above data does indirectly suggest that early populations were loathe to get too far away from their preferred lithic sources. This is also indicated by parsimony and/or curation of preferred lithic sources at increasing distances from quarry sources. The reasons for this preference appear related to their hunting orientation, and, as Dr. Albert Goodyear (personal communication, 1978) has noted, the dependability and predictability of high quality cryptocrystalline material in the manufacture, resharpening and reshaping of points. This can be shown hypothetically in Figure 4.2.4A-D.

As can be noted in A, the number of fluted point finds and sites drops to zero at some distance from preferred lithic sources. At some time before finds and sites drops to zero, alternative lithic sources are sometimes employed. This occurs before the number of finds falls off to zero as shown in B but does not continue beyond if finds do drop to zero. Figure 4.2.4C shows that parsimony or curation of preferred lithic resources begins even earlier. This all suggests, along with the other data noted above, that expedient technological transfer to non-lithic materials is not likely to occur. Figure 4.2.4D illustrates the hypothetical situation in which non-lithic alternatives replace lithic alternatives at the presently understood end of Paleoindian (or Early or Middle Archaic site distribution. There is no evidence to support this transfer and, indeed, such a situation seems highly unlikely.

From the point of view of this project, it is important to note that, with the exception of South Carolina and the immediately contiguous parts of Georgia, Paleoindian points are rare from along the immediate coastline. The exceptions in South Carolina and the bordering parts of Georgia are seen as relating to the proximity of the Allendale chert quarries. In South Carolina, Georgia and North Carolina where Paleoindian points occur on the coast, their occurrence is generally at the mouths of rivers. Paleoindian points along the coast are conspicuously absent from Florida (Waller and Dunbar, 1977; Griffin and Miller, 1978).

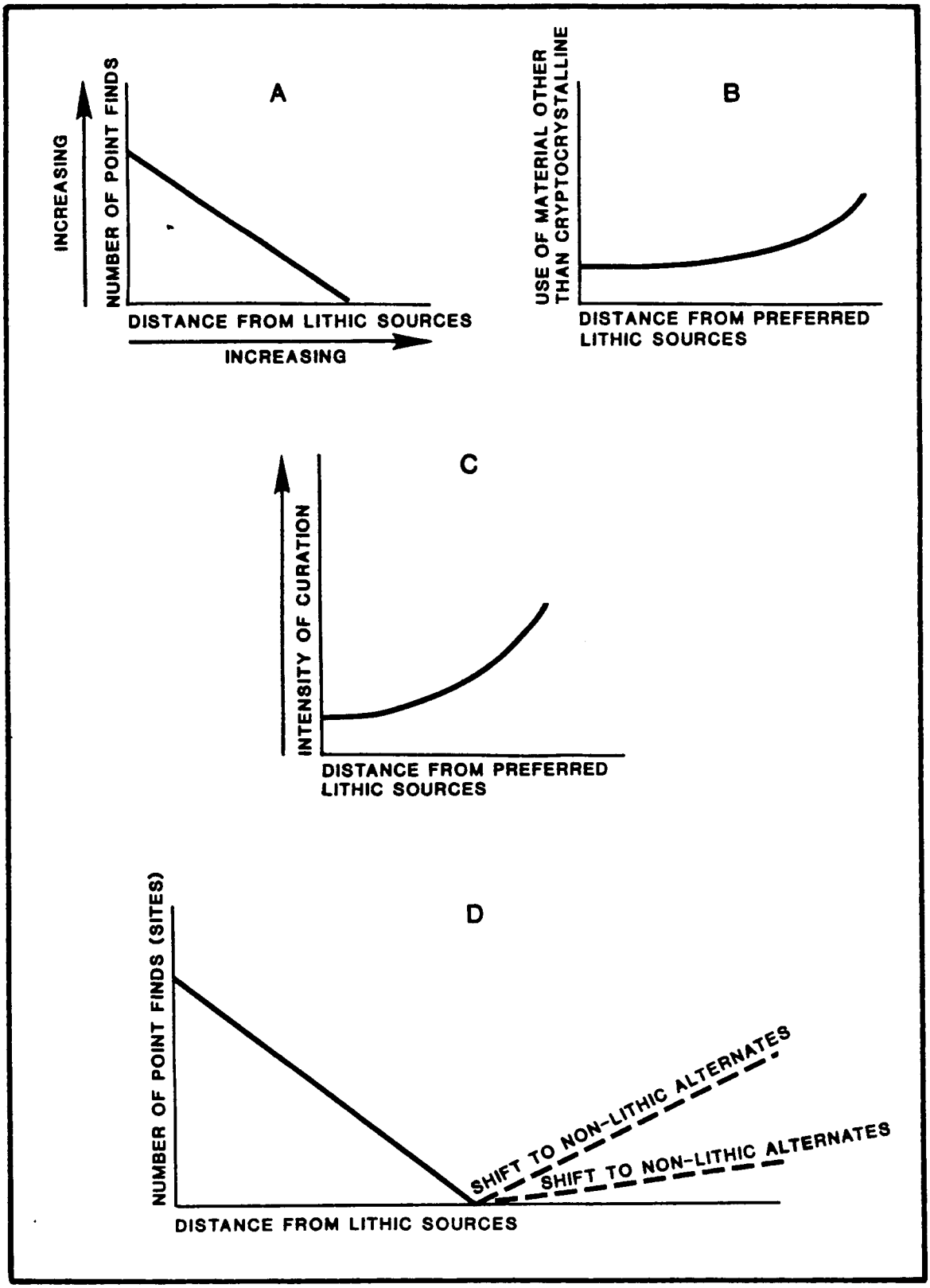


Figure 4.2.4 Trends Toward the Use of Non-Lithic Materials for Toolmaking

The following is a review of the Paleoindian period by state.

North Carolina - The main biblographic source of information for North Carolina is Perkinson (1971, 1973), who has plotted the finds of fluted points in the state. Coe (1964) provides an excellent discussion of the Late Paleoindian Hardaway assemblage from the Hardaway site in the North Carolina Piedmont. Loftfield (1970) documents two Paleoindian points at the mouth of the White Oak River.

Paleoindian points in North Carolina appear to fall into both the Clovis and mid-Paleo phases. Daltons, per se, are not discussed or illustrated, primarily because they are not fluted, and Perkinson's distribution studies are concerned with fluted points. Information on Daltons is therefore scanty, except for vague references to the Hardaway style. The distribution of fluted points concentrates in and on either side of the Carolina Slate Belt. Within the Coastal Plain these points concentrate on the Tar and Roanoke Rivers. To the north of the study area, they cluster in the general vicinity of the southern part of the Dismal Swamp where, according to Perkinson, the points generally appear to be made of material locally available as cobbles. Fluted points are nearly absent in the south central and southeastern Coastal Plain (Figure 4.2.5).

South Carolina - The main source for South Carolina is Michie (1979, and personal communication), and Goodyear et al., (1979, and personal communication). The distribution of Paleoindian points shows a close correlation with the Allendale chert outcrops with the greatest concentration of points occurring in the Fall Line/interior Coastal Plain areas. Both Michie and Goodyear point out the association of points with drainage systems, particularly the major rivers, some distance up these rivers and along their tributaries. Paleoindian points south of the Broad-Congaree River system tend to be made of Allendale chert. North of this they are manufactured from Carolina slate. Michie (1979) also suggests the possibility of chert outcrops along the Santee River in the regions of what are now Lake Marion and Lake Moultrie. Michie further notes that there are a number of outcrops in the Coastal Plain between the Savannah and Santee Rivers, and down to the Coast. Other resources used include quartz crystal from the Piedmont Region and silicified sandstone from various areas in the Coastal Plain (Figure 4.2.6).

Coastal zone finds of Paleoindian points concentrate between the Savannah and Santee Rivers, or where Michie notes the cherts and sandstones are distributed. These finds are

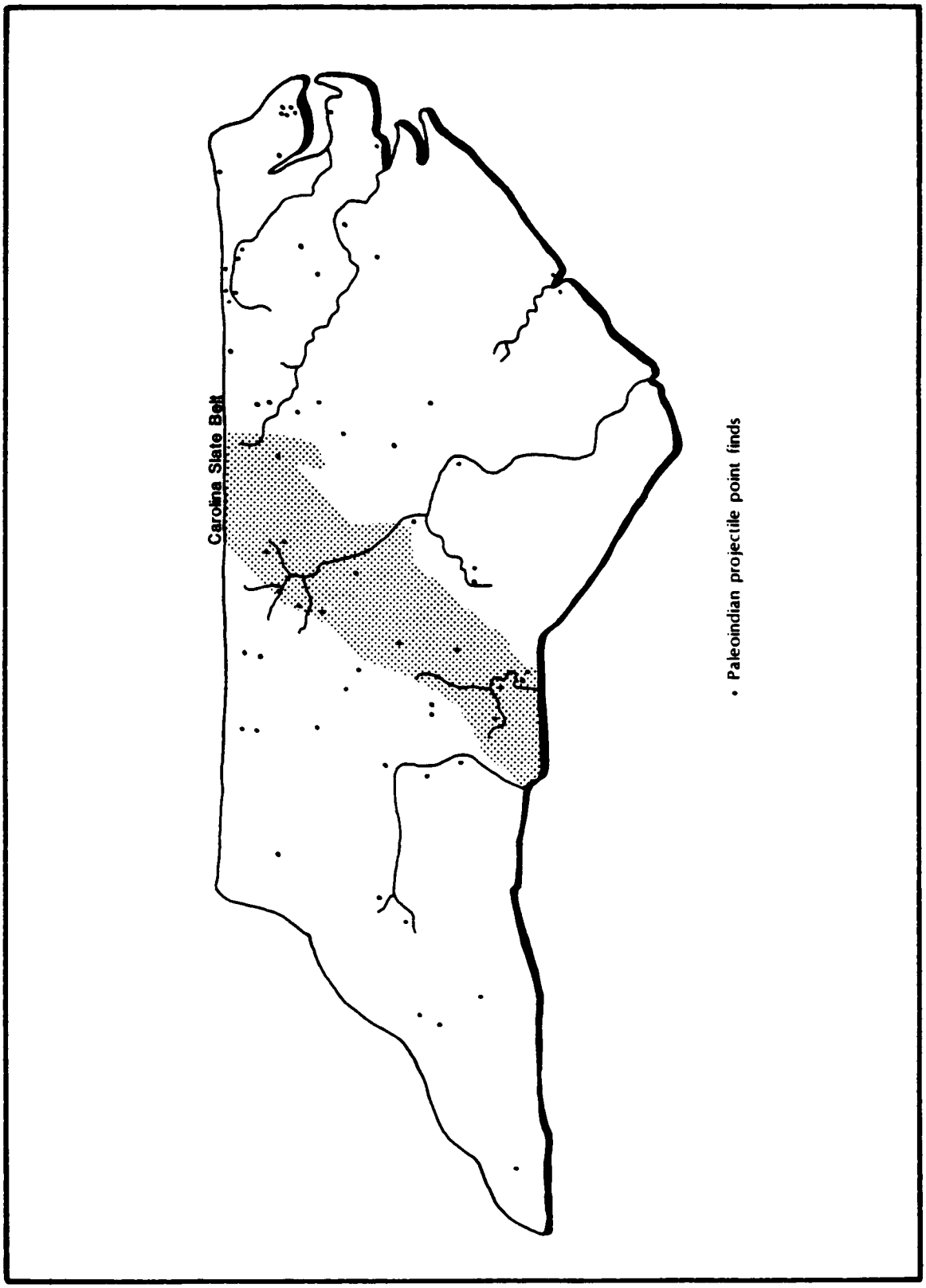


Figure 4.2.5 Paleoindian Projectile Point Finds in North Carolina (from Perkinson 1971, 1973)

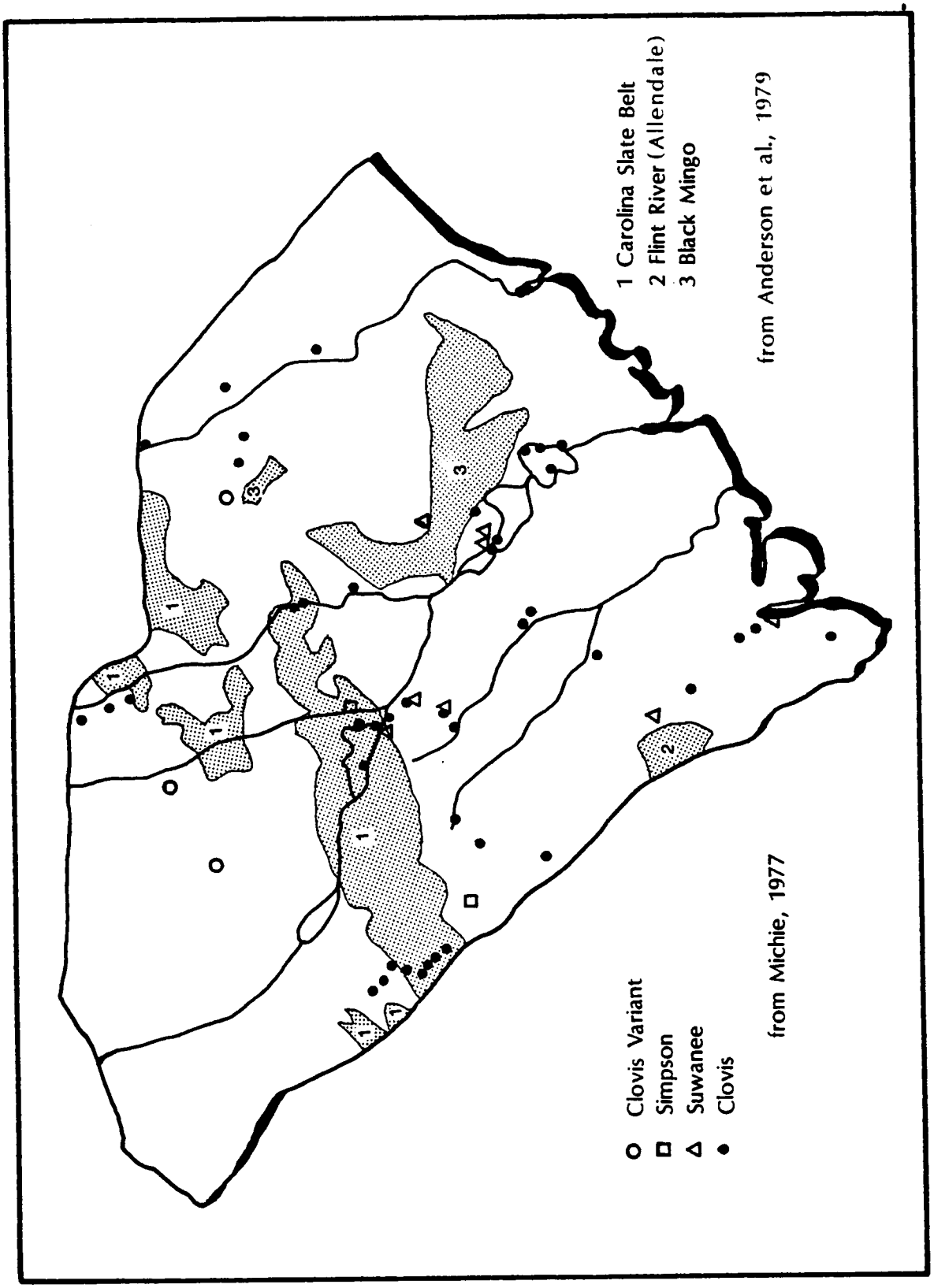


Figure 4.2.6 Paleoindian Fluted Projectile Point Finds and Lithic Sources in South Carolina

around Myrtle Island (Waring, 1961), Port Royal Sound (Michie, 1979), and the north end of the Cooper River estuary near Charleston. Moving north along the South Carolina Coast, fluted points diminish in number north and east of the Santee River, except along the Pee Dee. The absence of points along the current coastline is also evident in North Carolina. It is in this area that there is a shift toward Carolina slate as raw material, and a corresponding shift of intense Paleoindian land useage in the direction of the Piedmont. The cryptocrystalline sources noted for South Carolina between the Savannah and Santee Rivers apparently do not occur in the northeastern South Carolina or southeastern North Carolina Coastal Plain.

Georgia - Information on Paleoindian point distributions and the Paleoindian period in general in Georgia is difficult to obtain. No one has yet attempted a statewide fluted point distribution study. Extracting from Michie (1979), Waring (1961), Wauchope (1966), Stoltman (1974), and various other sources, the bulk of the Georgia fluted point finds are in the Piedmont and Gulf Coastal Plain portions of the state. Those that come from the Atlantic Coastal Plain are concentrated around the Savannah River mouth and Brier Creek, a tributary of the Savannah. The Brier Creek locality is in the heart of the Allendale Chert outcrop, and a considerable number of points have been reported from this area (P.R. Fish, University of Georgia, Athens, personal communication, 1979). The distribution of fluted points in the south central and southwestern portions of the state appears to be associated with the Flint River limestone cherts, of which the Allendale chert is a part. Chert deposits associated with this material follow the interior Coastal Plain/Fall Line zone. As this swings to the interior away from the Atlantic Coast, it is not likely that fluted points will be found in any numbers in the Atlantic Coastal Plain of Georgia, except around the Savannah River and in proximity to the Allendale outcrops.

Florida - Waller and Dunbar (1977) and Dunbar (J. Dunbar, Division of Archives, History and Records Management, Florida Department of State, Tallahassee, FL, personal communication, 1978) provide the information for Florida. Figure 4.2.7 shows that the distribution of points is coincident with the distribution of the Ocala limestone beds,and the Ocala chert, and in the north central portion of the state with the Flint River limestone. All workers in this area (Waller and Dunbar, 1977; Griffin and Miller, 1978; also Ben Waller, avocational archeologist, Ocala, FL; Jim Dunbar and Jim Miller, personal communications, 1978 and 1979) note

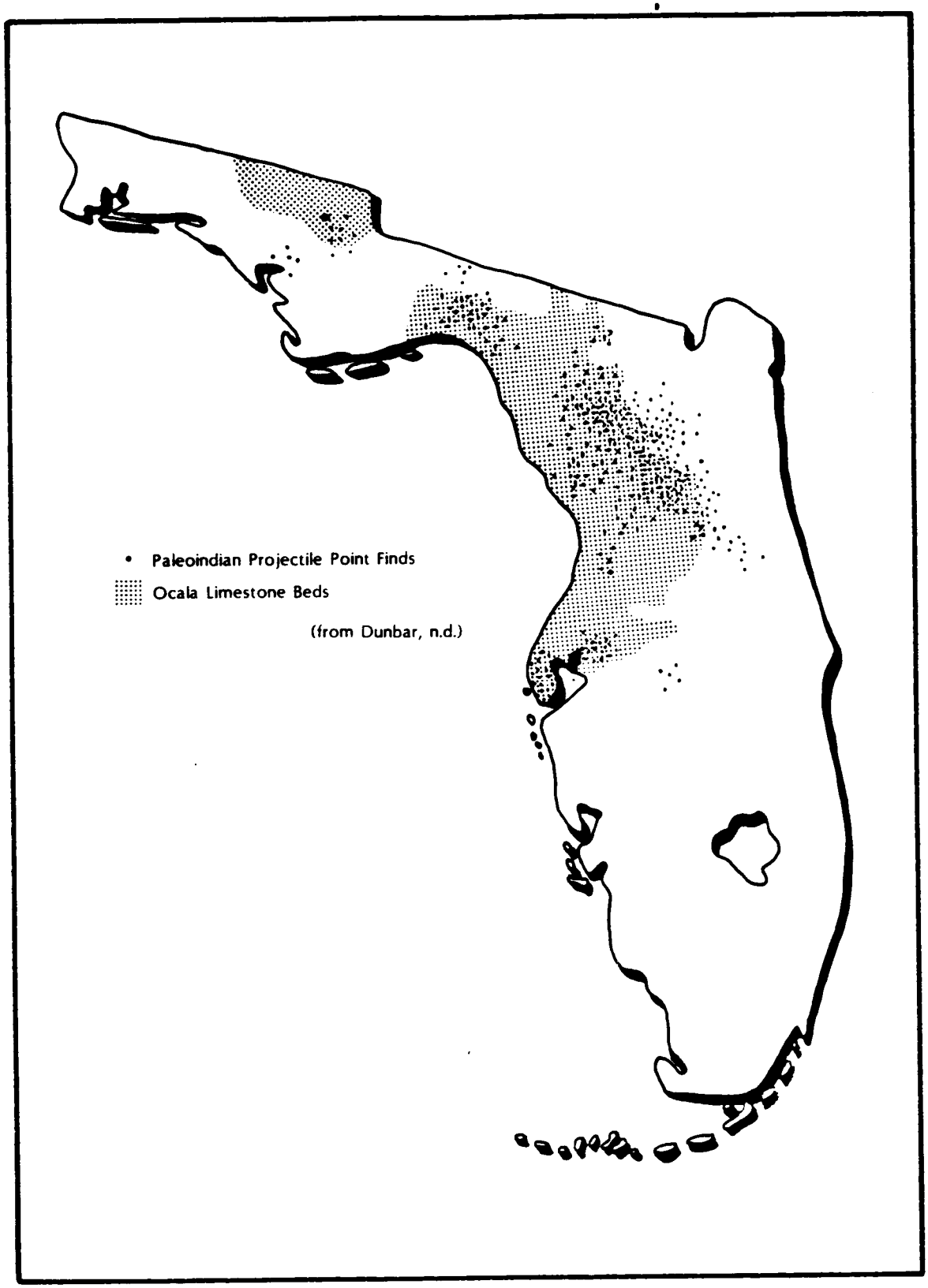


Figure 4.2.7 Paleoindian Projectile Point Finds in Florida

the total lack of Paleoindian points from any area outside of the distribution of these carbonates and associated cherts. Thus, there is a considerable distance between recorded Paleoindian point finds and the current Atlantic coastal zone. This is not the case on the Gulf Coast where the chert bearing beds continue into the now submerged Continental Shelf. This, in part, accounts for why shell dredging operations in the Gulf (Gagliano, 1977), bring up Paleoindian period points. Their association with shell middens has to be considered fortuitous and indicative of multicomponent occupation, the later component of which happened to exploit shellfish. (This is no different than finding fluted points associated with multicomponent sites in the terrestrial environment. For instance, finding flute points on a Woodland site would not lead the archeologist to assume Paleoindians were practicing agriculture).

In summary, Paleoindian points are found scattered throughout the project area (Figure 4.2.8). There is a close association of these points with the location of suitable types of cryptocrystalline raw material. The particular physiographic province makes no difference--where the lithic material is found, Paleoindian points will be found. Local resource variation, however, may be important. In the Shenandoah Valley, finds are scattered in the Great Valley where the broadest expanses of grassland and highest exploitable biomass would have occurred. In North and South Carolina, there is a tendency for fluted points to concentrate along major river tributaries. The major tributaries in this case would contain the most diverse environments and serve as habitats and avenues of game migration. Interior swamps such as the Dismal Swamp also seemed to have served as a minor game attraction, and therefore a minor human locus during the late Pleistocene and early Holocene. In Florida, the numerous animals and the raw material were concentrated in the limestone-karst regions which were well watered at the time, and contained extensive grassland and a mosaic of game-attracting habitats.

The Paleoindian period was more or less the same everywhere. Each region has its Clovis variants, and most have a mid-Paleo variant. Suwannee and Simpson points, which are probably mid to late Paleo variants, appear to cluster in Florida and the southeastern part of South Carolina. Hardaway points appear to be localized in the Central Piedmont of North Carolina. Where toolkits have been found, they suggest a strong orientation toward hunting. There is some suggestion

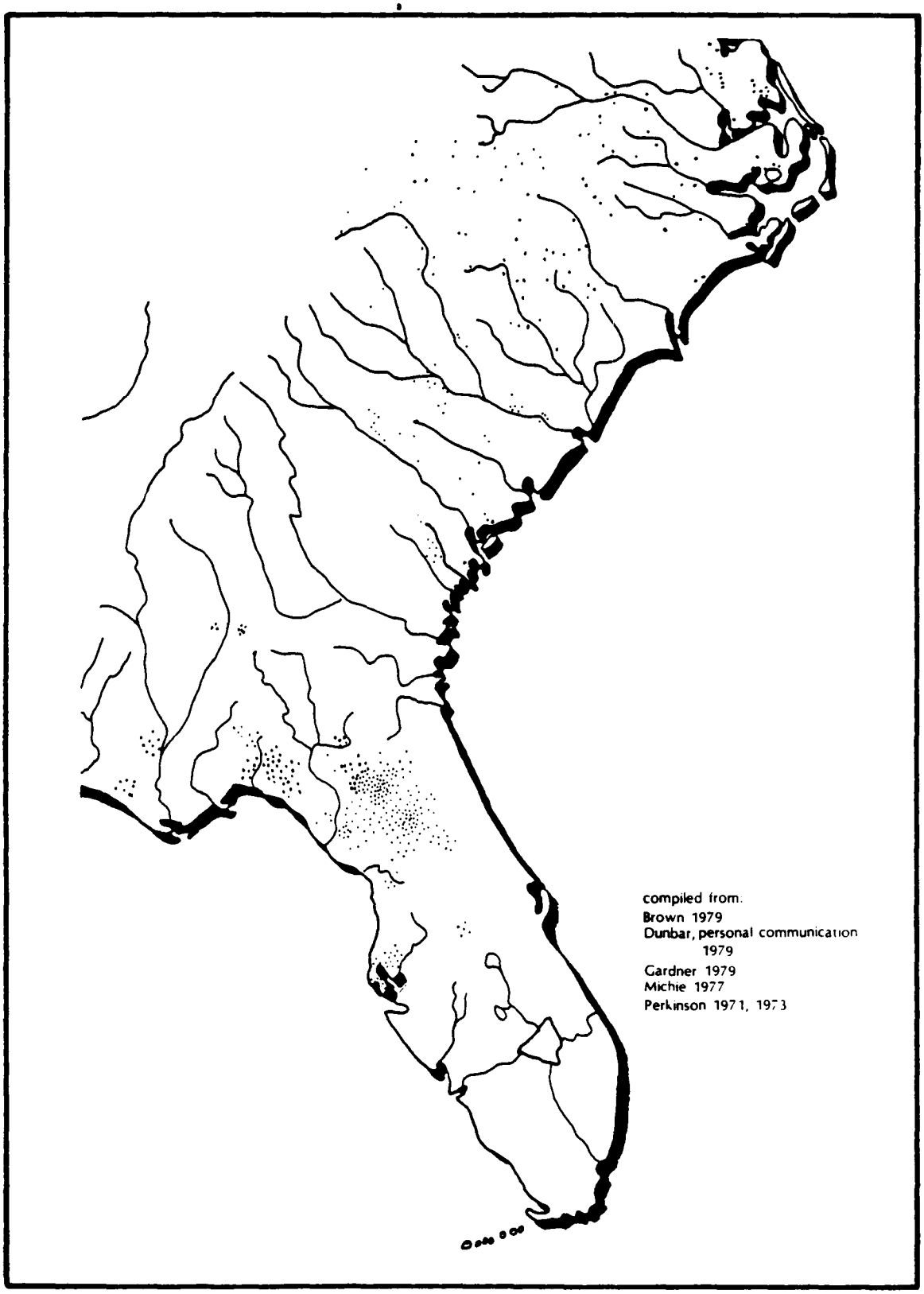


Figure 4.2.8 Distribution of Paleoindian Points in the South Atlantic and portions of the Middle Atlantic and Gulf Areas

of exploitation of Pleistocene megafauna, but the evidence for this can be disputed. Still, as Goodyear et al. (1979) and Gardner (1974) point out, it seems unlikely that hunters coming from a background in the Plains where megafauna was exploited would ignore megafauna in the east if man and the fauna were coeval. A problem in this regard is related to the dating of the Paleoindian period. Everyone assumes its beginnings to be about 11,500 B.P., yet the earliest dates on mid-Paleo in the east are about 10,500 B.P. This would suggest that Eastern Clovis does not predate 11,000 B.P. by much. Since the late Pleistocene climatic changes were well underway by this period, it can be assumed that megafaunal extinction was also well underway. Hunting would have thus diversified on smaller sized and smaller grouped animals, such as deer, which would have radiated into the space and niches abandoned by megafaunal extinction. This could in part account for the scattered distribution of fluted points and the small nature of the sites. Goodyear et al. (1979) citing McNett's work at the Shawanee-Minisink site in the Delaware Valley, notes that other food resources were probably also utilized. This is undoubtedly true but, based on toolkits, preferences for restricted types of raw material and site distributions which coincide with the distribution of material of this type, can only lead to the conclusion that Paleoindians were predominantly hunters.

Early Archaic (10,000 - 8,500 B.P.)

As noted in the preceding discussion, a number of archeologists place Dalton in the Early Archaic, while others would see the introduction of notched points as the initial Early Archaic. The only site which shows the exact stratigraphic position of Dalton is the Thunderbird site where Dalton immediately follows mid-Paleo and occurs before notched points. Coe's work (1964) at the Hardaway site shows the Dalton-Hardaway variant occurring before Hardaway Side Notched. Our reasons for continuing to include Dalton within the Paleoindian period include:

(1) Dalton points are unnotched, lanceolate forms and presumably involve similar weaponry and hafting techniques as were employed during the earlier Paleoindian phases.

(2) Notched points indicate different hafting techniques and presumably different weaponry, for example, the spearthrower or atlatl, as opposed to the earlier hand thrown or thrusting spear (see Gardner, 1974 for a fuller development of this position).

(3) With the exception of the confusing stratigraphy at the Stanfield-Worley Bluff Shelter in Alabama, all radiocarbon-dated Daltons occur before 10,000 B.P., which places them in the late Pleistocene not the early Holocene. Dates on notched points fall after 10,000 B.P.

In the Shenandoah Valley, there appear to be slight shifts in settlement patterns between earlier Paleoindian phases and Dalton. In Florida, however, Dalton variants have a similar distribution as earlier Paleoindian forms. Goodyear et al. (1979) point out that in South Carolina a shift occurs which is manifest in a movement away from a strict concentration on the major rivers to the inter-river areas and the uplands between the rivers. There is no information on Dalton distribution in North Carolina or Georgia except that Dalton points are absent from the Atlantic Coastal Plain of Georgia (DePratter, 1975).

At least four sites in the east show stratigraphic sequences during the post-8,000 B.P. period: Thunderbird and "50" in the Shenandoah Valley; Hardaway in North Carolina; and St. Albans in West Virginia. Regionally there is some disagreement about which comes first, side or corner notching. The Thunderbird site and "50" both show the Palmer Corner Notched type as the initial notched point phase. At the Hardaway site, Hardaway Side Notched comes first (Coe, 1964). This is in turn succeeded by Palmer Corner Notched. The picture is unclear at the St. Albans site although the excavation data appears to indicate that Charleston Corner Notched (a variant of Palmer Corner Notched) underlies Kessel Side Notched (Broyles, 1971). The Stanfield-Worley Bluff Shelter has a confused stratigraphy, but Big Sandy Side Notched appears to follow Dalton (DeJarnette et al., 1962).

A comparison between the stratigraphies of the Thunderbird and "50" sites which are only a mile apart and operated in a symbiotic relationship as part of a total settlement system, further adds to the typologist's problems (Table 4.2.2).

Table 4.2.2 Site Stratigraphies

	Thunderbird	50	Hardaway
TERMINAL	KIRK ST	KIRK ST	KIRK ST
EARLY	WARREN SN	WARREN SN	
ARCHAIC	KIRK SN	KIRK CN	
	KIRK CN	KIRK CN	KIRK CN
		AMOS CN	
	PALMER CN	PALMER CN	PALMER CN
			HARDAWAY SN
	DALTON		HARDAWAY-DALTON
	MID-PALEO		
BASAL	CLOVIS	CLOVIS	STERILE
LEVEL			

CN=Corner Notched
SN=Side Notched
ST=Stemmed

Goodyear et al. (1979) following such workers as Tuck (1974), and Fitzhugh (1972), group all of these early Early Archaic styles together into a "side notched-corner notched" horizon. The horizon concept indicates interaction across the bulk of the southeast, and shows that while there is stylistic variation there is no regionalization comparable to the Dalton-Plano separation noted for the Late Paleoindian. The area encompassed by the side notched-corner notched horizon is almost identical to that of the Dalton period.

Most workers note an overall similarity in the toolkits between Paleoindian and the early part of the Early Archaic. This similarity is thoroughly documented at the Thunderbird site and Goodyear et al. (1979) note this similarity in South Carolina. This implies a continued hunting orientation, although by now the groups are no longer dealing with now extinct late Pleistocene species. The most striking difference between Holocene and late Pleistocene species is the lack of herd animals in the Holocene (excluding caribou which are far to the north). This implies the necessity for different hunting

techniques and different ranges of the fauna. Individual hunting techniques would have replaced group drives or other communal techniques as the most efficient methods. Gardner (1974) has suggested that the introduction of the spearthrower at this time, associated with notching for hafting, facilitated the continuation of a hunting based economy. Radiation of the deer population, which seems to be the main hunting focus (Goodyear et al., 1979), would have been insured as deer moved into the space abandoned by extinct late Pleistocene fauna. This occurred in response to the increased edge environments caused by rapidly changing vegetation. In terms of settlement shifts, Goodyear et al. (1979) note a movement away from exclusive focus on riverine areas to exploitation of the uplands and highlands between the river systems. This is also true to some degree in the Shenandoah Valley; however, there are a number of close parallels between early Early Archaic site distribution and that of the Paleoindian period in that area. These parallels are dictated in part by continued preference for jasper and other cryptocrystallines. This also seems to be true in Florida (Griffin and Miller, 1978) where Early Archaic components have a similar distribution as Paleoindian.

Neill (1964b) notes that in south Georgia and northern Florida Kirk types are found isolated in what are now pine flatwood areas, usually below eolian sands. He suggests that this indicates utilization of a more diversified biome found in these locations prior to the onset of essentially modern climatic conditions. He also notes the essential continuity of distribution of artifacts from Paleoindian through Early Archaic times in this area.

The later part of the Early Archaic, as we are here defining it, is characterized by a switch from notched to stemmed points. Throughout the entire area of study and most of the southeast, this shift is to Kirk Stemmed or related variants. It is during this period that significant settlement pattern shifts begin in both the Shenandoah Valley and Chesapeake Bay region. In the Shenandoah Valley, while there is still some overlap with earlier sites, particularly at quarry related sites, entirely new areas are inhabited. In the Chesapeake Bay

region, this shift is demonstrated at the Chance site (Messick 1967; Cresthull, 1971) where Kirk Stemmed points are found in association with interior swamps, especially riverine swamps. A similar pattern is seen in the Potomac Coastal Plain (Gardner, 1978) around Mattawoman and Zechiah Swamps, both of which are associated with streams (Gardner, 1978). A few Kirk Stemmed points are found on the edge of Dismal Swamp (Rappleye and Gardner, 1979). Kirk Stemmed points also show up adjacent to the riverine swamps of the interior Coastal Plain of North Carolina (Quinn and Gardner, 1979). Fitzhugh (1972) documents the northward spread of this part of the Kirk horizon. Kirk Stemmed points are still absent in the Atlantic Coastal Plains of Georgia and Florida, but are noted for South Carolina.

In summary then, while there are problems in typology and some disagreements as to the exact beginning of the Early Archaic, there is essential agreement that the period is a direct evolution out of the late Paleoindian. Notched points everywhere appear around 10,000 B.P., and the tradition continued until approximately 9000 B.P., when stemmed points evolved. Most aspects of the early archaic toolkit are the same as the Paleoindian period, and hunting continues. There appears to be some early diversification, at least in the interior part of the continent along the Tennessee River, where grinding stones have been found in association with Kirk Corner Notched points (Goodyear et al., 1979). This suggests the beginning of a shift away from a hunting emphasis to a more generalized foraging. It should be expected that the subsistence shifts will vary by region as to focus and time of occurrence. It is erroneous to think of early Holocene environments in terms of broad synchronous expanses of climax communities. It is equally misleading to assume that post-Pleistocene environmental readaptation occurred at the same rates and in the same forms throughout a region as diverse as Eastern North America. Even considering this, it must be kept in mind that the stylistic shifts appear to be roughly synchronic indicating, if nothing else, that pan-regional interaction continued.

The following is a state-by-state discussion of the Early Archaic period.

North Carolina - Coe's (1964) excavations in the North Carolina Piedmont provide the basis for Early Archaic chronology in the state as well as much of the Eastern United States. For the Coastal Plain there is minimal information. The impression gained is that there is little evidence of Early Archaic populations in the outer North Carolina Coastal Plain. A lack of information or research on this period or in the area must also be considered as a possibility. To the north in the Chesapeake Bay-Dismal Swamp area, Early Archaic is also scarce except near sources of cryptocrystalline material. The congruency of Paleoindian and Early Archaic in raw material preference and site distribution around these sources was first described for the Shenandoah Valley, and it appears to be fit elsewhere. For instance, in South Carolina there is considerable Early Archaic occupation near cryptocrystalline raw material. Coe's Piedmont sites are also near lithic sources. Recent work by Gardner and his associates in the interior portion of the North Carolina Coastal Plain (Quinn and Gardner, 1979) resulted in the discovery of a number of Early Archaic period (Palmer-Kirk) sites between Wilson and Greenville. It was also noted in this reconnaissance that there were considerable numbers of cobbles of various types of material in the area, and that one activity was biface reduction and point manufacturing from these cobbles. From this perspective it might be best to divide the Coastal Plain into inner and outer units with the latter being that portion closest to the current shoreline. Thus, it can be stated that Early Archaic activity is rather intense in the inner Coastal Plain, but decreases markedly toward the outer section. This follows the Paleoindian pattern for North Carolina.

South Carolina - Goodyear and his associates (Goodyear et al., 1979), Michie (1979), and Anderson et al., (1979) provide the basis for much of the Early Archaic interpretation. (A considerable amount of insight was also gained during conversations with Goodyear and Michie in March 1979). During the Early Archaic, there appears to be a slight shift in settlement pattern over the previous period. There is still a focus on cryptocrystalline materials. However the distribution is not strictly confined to the riverine areas, but occurs in the inter-riverine high-lands. There are considerable numbers of Early Archaic points and sites in the inner Coastal Plain, less so in the outer Coastal Plain. However, Michie (personal communication, March, 1979) indicated a site in Port Royal Sound containing large numbers of Early Archaic points which are being exposed by erosion on the beaches. The material used in tool manufacturing is chert, much of which is in river cobble form.

Georgia - The sources on Early Archaic in Georgia are limited. DePratter (1975) and Fish (1976) provide what information we have. Early Archaic is basically confined to the Piedmont and mountains with exceptions being noted in the interior portion of the Coastal Plain near the Flint River limestone. Along the Savannah River is the source of the Allendale Chert, and Fish notes a high density of what he defines as Early Archaic points. Gardner's own personal observations from southwest Georgia in the Gulf Coastal Plain show a similar association of Early Archaic points and Flint River limestone chert. All the other evidence suggests that Early Archaic is lacking from the Atlantic Coastal Plain of Georgia except along the Savannah River and probably in the interior portion near the Fall Line.

Florida - All workers in Florida note the absence of what we have defined as Early Archaic anywhere in the State except in the interior highlands. There it is found in association with either Ocala limestone or other chert-bearing carbonates. Early Archaic is also present in the Florida panhandle in association with Flint River and Ocala Limestones. Clausen's (1979) cultural material from Warm Mineral Springs which dates to the early part of the Early Archaic, represents the southernmost extremity of Early Archaic in Florida, and while the material is all bone or wood, it is again in association with this limestone belt. It can also be predicted that there are submerged Early Archaic-Paleoindian sites on the Continental Shelf of the Gulf Coast, but not on the Atlantic Coast.

Middle Archaic (8,500 - 5,500 B.P.)

Problems are again encountered in determining the early chronological boundaries of the Middle Archaic. As Figure 4.2.2 indicates, most archeologists would include the bifurcate base projectile point tradition in the terminal Early Archaic. This tradition includes the Lecroy type and its many variants. Gardner (1978) working from the Middle Atlantic, argues that the first substantial changes since Paleoindian are marked in that area by the appearance of bifurcate base projectile points. This is seen in the Shenandoah Valley where there is a major change in settlement patterns as sites that were continuously occupied in previous times are finally abandoned. Dependence on jasper also ends at this time. A number of stratified sites in the Shenandoah Valley also show important changes in depositional history. In the

Middle Atlantic Coastal Plain, the tremendous numbers of bifurcate base points, which are the first evidence of intensive use of the area, suggest a rapid population growth and major shifts in settlement. This density continues throughout the remaining phases of the Middle Archaic along the interior part of the Coastal Plain, but not along or near the current coastal zone.

Gardner (1978) has suggested that these changes are correlated with the onset of the Atlantic climatic episode and, in addition, are connected with emphasis on general foraging and shifts in settlements based on increasing seasonality of resources and deciduous domination. The latter would have resulted in a reduction of the edge environment and multiple mosaics as a series of climax forests developed which would have, in turn, reduced the deer population. Concomitant with this and connected with sea level rise is the creation of extensive bodies of water and swamps along drowned rivers and in the interior Coastal Plain depressions. This resulted in high biomass areas where game and other resources could be readily exploited by relatively large human populations. It is also felt that these swamps/lakes, which are in early seral stages, are somehow coincident with the expanded range of migratory waterfowl and the development of the Atlantic Flyway as an important migration route.

Further to the south, increased numbers of bifurcate base projectile points mark the beginning of considerable population growth in North Carolina's interior Coastal Plain (Quinn and Gardner, 1979) and Dismal Swamp (Rappleye and Gardner, 1979). As noted, it would be dangerous to assume that human adaptive responses in the Middle Atlantic are completely synchronous with events further south. Latitudinal differences alone could result in the earlier development of climax forests in the Southeast. The "Archaic" type of seasonal foraging pattern appears to have its roots as far back as 10,000 B.P. in the Tennessee Valley. In the Middle Atlantic Coastal Plain this is presaged somewhat by Kirk Stemmed points. The problems archeologists have in distinguishing between the boundaries of the Early and Middle Archaic may simply be a reflection of these differential responses.

The bifurcate point tradition represents a direct development from the indented stem Kirk Stemmed type. The use of the bifurcate point as a horizon marker for eastern North America has been thoroughly discussed by Chapman (1975). Fitzhugh (1972) notes the spread of this point type even further into the Northeast than the preceding Kirk styles. Goodyear et al. (1979) note that the bifurcate points are spread from Maine to Alabama. On the other hand, there appears to be a decrease in bifurcate points in the southeastern part of the South Atlantic. Michie (personal communication, 1979) notes a lack of bifurcate base variants in the South Carolina Coastal Plain. Work on the Edisto River in the central part of the South Carolina Coastal Plain (Anderson et al., 1979) also noted an absence of these type points. Bifurcate base points are not reported for the Atlantic Coastal Plain of Georgia or Florida. Something similar, however, does occur in the Florida ridge where it is called the Arredondo point (Bullen, 1975).

The Stanly point, which definitely is Middle Archaic, is the diagnostic for the Stanly phase. This type has an indented base, and appears to develop directly out of the bifurcate tradition. DePratter (1975), and Goodyear and his associates (Goodyear et al., 1979) note a reduction of the number of Stanly points in the Piedmont of Georgia and South Carolina as compared to earlier periods, suggesting less extensive use of this zone. Michie (personal communication, 1979) feels there is a general absence of this type in the South Carolina Coastal Plain. Stoltman (1974) agrees with this. Anderson and his associates (1979) report no Stanly points in the area of the Edisto River Coastal Plain. Stanly points are not reported from the Atlantic Coastal Plain of Georgia. Bullen (1975) describes no point in Florida which can be correlated with Stanly. Further to the north, in the Middle Atlantic Coastal Plain, Stanly points are also uncommon.

Bifurcate points begin around 8500 B.P. (9,000 B.P. if the earliest date is acceptable). Stanly points are dated between 7,800 B.P. and 7,000 B.P. The absence of these two types in the South Atlantic

Coastal Plain cannot be connected with any climatic episodes or environmental changes that would make the area less desirable than in preceding or subsequent periods. It is possible that the general absence of Lecroy-like and Stanly points in the South Atlantic Coastal Plain is simply a reflection of discovery bias.

The Morrow Mountain phase follows the Stanly phase. A contracting stem type, Morrow Mountain points are recognized throughout the South Atlantic. The Newnan point in Florida is a related variant. Morrow Mountain site distribution in the Middle Atlantic Coastal Plain is similar to that of Lecroy: large sites concentrated around interior swamps, smaller sites located near freshwater in numerous different zones. This pattern is seen in the Potomac River, Chesapeake Bay, Dismal Swamp and interior Coastal Plain of North Carolina. Thompson (personal communication, 1979) notes some small Morrow Mountain points on the lower Cape Fear River. Anderson and associates (1979) make the following comments concerning Morrow Mountain which fit with the Middle Atlantic Model:

> "...sites tended to cluster along swamp margins, particularly on terraces overlooking flood plains... artifact density dropped markedly with increasing distance from the edge areas. Few sites or even artifacts were observed on otherwise favorable locations away from the flood plain or swamp margins."

Morrow Mountain phase occupation appears to be lacking in much of the Atlantic Coastal Plain of Georgia. For the Piedmont, Fish (1976), however, provides evidence of Morrow Mountain habitation on the Georgia side of the Savannah River. The general consensus of opinion in Florida (Griffin and Miller, 1978; Milanich, n.d.; Thanz, 1977) is that population was restricted to the highlands of Florida until the Mt. Taylor period, or approximately 5,500 B.P. Bullen reports a date on Newnan points at Tick Island of approximately 5,400 B.P. Calvin Jones (personal communication, 1978) suggests a range of from 6,000-4,000 B.P. Clausen et al. (1979) suggest similar dates. This indicates possible movement out of the central Florida highlands during a time contemporaneous with Morrow Mountain, which dates from 6,500-6,000 B.P. (Goodyear et al., 1979). Notably, Newnan materials at this time are still associated with lakes and sinkholes.

Guilford points have the same distribution as noted above, although comparable forms are absent from Florida, where the Newnan type continues. Again, points representing this phase are absent from much of the Georgia Coastal Plain. Dates for Guilford fall around 6,000 B.P. Almost nothing is known about Halifax, the final Middle Archaic phase in the South Atlantic Coastal Plain. Halifax points which are dated at 5,500 B.P., are rather common in the Middle Atlantic Coastal Plain, the Shenandoah Valley and the North Carolina Piedmont. In the Georgia Piedmont the stemmed quartz points of the Old Quartz complex date from this period. Halifaxes are included in the South Carolina sequences, but apparently are restricted to the northwestern Piedmont. Nothing is mentioned about this type in the South Carolina Coastal Plain.

Notable technological changes during the Middle Archaic include the reduction in specialized hunting equipment so characteristic of the Paleoindian and Early Archaic periods, and the tendency to produce more generalized tools. Net weights appear at the Dismal Swamp by the Morrow Mountain period. Chipped stone axes appear in the Guilford complex. The technology has the expected overall appearance for seasonally oriented, general foraging procurement activities.

The following is a state-by-state summary of the Middle Archaic:

> North Carolina - Coe (1964) provides the major information base on North Carolina. His chronology is the standard by which other areas are compared. Interviews and literature searches show there is little information on the outer Coastal Plain. Quinn and Gardner (1979) show an increasing abundance of Middle Archaic points near interior riverine swamps near Greeneville in the interior Coastal Plain. Mark Wilde-Ramsing's (1978), and T. Thompson's (Thunderbird Research Corporation, personal communication, 1979) work along the Cape Fear shows some Morrow Mountain phase habitation. Infrequent finds of Morrow Mountain are reported for the White Oak River. During the Middle Archaic, we can expect numerous sites in the inner Coastal Plain in association with swamps. Such sites can also be expected along the outer Coastal Plain in association with river systems and areas like the Carolina Bays. Overall, however, the outer Coastal Plain does not appear to be supporting an extensive population.

South Carolina - Using Goodyear et al. (1979), and Anderson et al. (1979) in conjunction with our own literature search and interviews, there appears to be a population decrease in the Coastal Plain during the early phases of the Middle Archaic. During Morrow Mountain there is again considerable population which continued at least to Guilford. Halifax is not noted. The focus is on the interior swamps and associated river systems.

Georgia - Fish (1976) notes Middle Archaic occurring along the Savannah River. Elsewhere it is absent except for the inner Coastal Plain/Fall Line and mountain areas. Middle Archaic can be expected in the southwestern Georgia Gulf Coastal Plain, but probably not in the outer portion of the Atlantic Plain.

Florida - Archeologists in Florida (Thanz, 1977; Milanich, n.d.; Griffin and Miller, 1978) all note a shift from the interior of Florida to the St. Johns River portion of the outer Coastal Plain at approximately 5500 B.P. Bullen notes a date of 5500 B.P. on Newnan-like points at Tick Island Cemetery. In the southwestern Gulf area, Clausen (1978) cites a date of 6000 B.P. Calvin Jones, (personal communication, 1978) notes a cemetery on Lake Poinsett on the St. Johns which contains Newnan points. The occurrence of the Newnan Point indicates that Florida populations had moved into this area for the first time after having been restricted to the interior highlands. This shift has been linked with climatic changes which show a movement toward dominance of pine in the interior with changes in the St. Johns favoring the expansion of freshwater molluscs at 5,500 B.P.

Late Archaic (5,500 - 3,500 B.P.)

The Late Archaic everywhere along the Atlantic Coastal strip from the Northeast to Florida is dominated by stemmed broadspears in one form or another. Numerous archeologists have referred to this as the broadspear horizon (Turnbaugh, 1975, Kinsey, 1972; Witthoft, 1953). Goodyear et al. (1979) have summarized this succinctly: "The Late Archaic throughout the eastern seaboard has a remarkable artifactual... integrity." The dominant projectile point in the Middle and South Atlantic Coastal Plain is Savannah River and variants on this style such as Mt. Taylor in Florida.

Like the Middle Archaic, the Late Archaic is the beginning of a major settlement shift as people turn to intensive exploitation of estuarine and riverine resources (Turnbaugh, 1975; Gardner, 1976, 1977, 1978; Gardner and Wall, 1978; Custer, 1978; Goodyear et al., 1979). The resources exploited include brackish-water shellfish in the Chesapeake Bay, Lower Potomac; the coast and rivers of South Carolina; freshwater shellfish along the St. Johns River in Florida; and anadromous fish in the Fall Line and Eastern Piedmont regions of the Middle and South Atlantic rivers that flow to the coast. The best explanation for the sudden appearance of intense utilization of the brackish and estuarine and freshwater zones of the Atlantic Coastal zone and adjacent regions is the radiation of resources which could be successfully and extensively exploited (Gardner, 1978; Turnbaugh, 1975; Custer, 1978). This can be correlated in part with climatic shifts in the interior (Thanz, 1977; Custer, 1978) which somewhat reduced terrestrial options. It must also be related to the high productivity in the various littoral zones concurrent with sea level stabilization.

In the area east of the Appalachian Plateau, there are at least three physiographic provinces in which broadspear horizons occur: Ridge and Valley, Piedmont, and Coastal Plain. There are also three different adaptive strategies. The Ridge and Valley continue the basic non-focused general foraging pattern. In the Piedmont and inner Coastal Plain, the focus is on anadromous fish. In the outer Coastal Plain the emphasis is on shellfish. Turnbaugh (1975) has noted that the north lagged the south in the shift to the broadspear horizon. This can also be linked with a south-to-north temporal gradient in the availability of estuarine resources: from approximately 6,500 B.P. in Brazil (Fairbridge, 1976) to 5,500-5,000 B.P. in Florida; to 5,000-4,500 B.P. in South Carolina to 4,500 B.P. in the Chesapeake Bay region. The only exceptions to this sliding time scale are from the Lower Hudson River where Brennan (1974) cites shell midden dates as early as 7,000 B.P. It is Brennan's argument that intensive utilization of shellfish resources began even earlier, but the early sites are now drowned. Review of the literature and investigations of the Middle Atlantic and South Atlantic Coastal Plain during this study provides no evidence to support this. The evidence by

Fairbridge (1976) from Brazil, and Griffin and Miller (1978) from Florida point to a higher than present sea-level stand before 6000 B.P., yet there are no sites associated with this higher stand. Admittedly, neither the results from this study nor Brennan's work provide actual proof of what lies beneath the appropriate portions of the inundated Continental Shelf. This data however, is not critical to the conclusions of this report in that early populations on the shelf are sparse since the existing terrestrial data, at least in the Middle and South Atlantic, show very little human activity in the current coastal zone prior to 5,500-5,000 B.P. Although Brennan's data cannot be ignored, the reliability of the age determination of his shells can be questioned.

Ceramics are an important addition to the technology of the Late Archaic period inhabitants of the southeastern part of the South Atlantic Coastal Plain. These appear in the Georgia-South Carolina area by 4,200 B.P., and perhaps as early as 4,500 B.P. Stallings Island fiber-tempered plain pottery, is generally accepted as the earliest form (Stoltman, 1974). Conflicting data, however, suggests that in some areas sand-tempered ware (e.g., Thoms Creek variety) is as early or perhaps slightly earlier (Anderson et al., 1979). Regardless of which comes first, the two wares are coeval in part. Anderson and his associates (1979) and Michie (1979) note that fiber-tempered pottery is most common in southeastern South Carolina and Georgia where it continues on into Florida, while sand-tempered pottery is more frequent in the central part of the South Carolina Coastal Plain. The distribution maps prepared by Anderson et al. (1979) show a marked decrease or absence of early pottery north of the Waccamaw River mouth. This absence continues into North Carolina, although traces of pottery similar to Thoms Creek are found in the Cape Fear and Cape Hatteras region (T. Thompson, Thunderbird Research Corp.; and David S. Phelps, East Carolina University, Greenville, NC, personal communication, 1979). Shell middens are not known along the North Carolina coast until later prehistoric periods, but are present in the Chesapeake Bay as early as 5000 B.P. Pottery, however, is absent until around 3000 B.P. (Gardner and McNett, 1971). Steatite bowls are not common in the outer Coastal Plain, but do frequently occur in association with

Savannah River and other broadspear manifestations in the Fall Line-Piedmont regions. A number of shell middens in South Carolina and Florida show pre-ceramic levels at the base of the middens. These are either associated with Savannah River or Mt. Taylor artifacts.

In South Carolina there are at least two clusterings in the ceramic distribution: along the current coastal zone and in the central part of the interior Coastal Plain (Anderson et al., 1979). Such differences could support the argument for differing social groupings, different exploitive zones inhabited during the seasonal rounds, or combinations of both. As we have noted, the interior Coastal Plain and the Piedmont, as well as the higher elevations to the west were utilized by populations with Savannah River artifact assemblages. It would thus seem more logical to argue that the widespread distribution of Savannah River populations across varying physiographic zones within any given area is representative of differing groups pursuing differing types of subsistence. This is certainly true in the Middle Atlantic in the dichotomy between such broadspear variants as Perkomen and Susquehanna as opposed to Savannah River, with the latter focused in the tidewater regions, and the former in the Piedmont riverine systems.

Analysis of the shell middens in Georgia and South Carolina shows a number of these to be base camps. Anderson et al. (1979) note some evidence for upland Savannah River activities in the South Carolina Coastal Plain, although such sites appear to be infrequent. Base camp activity is indicated in some of the shell middens in the Middle Atlantic, although there seems to have been more seasonal movement (Gardner, 1978). Brennan (1974) notes that even further north the shell middens or heaps cannot be interpreted as base camps. This may reflect latitudinal differences in resource zoning and greater seasonal variability. The coastal shell rings of Georgia and South Carolina have sometimes been interpreted as "ceremonial centers", while others have called them base camps. These shell rings are circular embankments of shell and mixed midden debris. The interiors of the rings are often, but not always, devoid of artifacts. James Michie (personal communication, 1979) has suggested that the settlement

complex involves actual middens as base camps on the interior of the estuarine zones, while the shell rings themselves are partly the result of specialized activities by larger numbers of people. In any event, it certainly seems that people, by this period, were living year-round in the current estuarine and immediately adjacent terrestrial zone resources.

The following is a state-by-state summary of the Late Archaic:

North Carolina - The Late Archaic is clearly identified by Coe (1964) in his investigations at the Fall Line, and is otherwise scattered through the state. Coe's excavations revealed the full artifact complex of ground-stone tools, steatite vessels, and the large bladed Savannah River point. A number of studies in the northern part of the outer Coastal Plain (Phelps, 1978) have revealed occasional Savannah River points, usually in locations suggesting small hunting camps along smaller tributaries of the sound or major rivers. Significantly, unsystematic survey by amateurs along the lower (estuarine) Cape Fear River failed to reveal any Late Archaic occupation (Thompson, 1979). Of similar interest, particularly by contrast to the southern part of the study area, is the fact that several surveys (Haag, 1958; Thompson, 1977; Phelps, 1978) of the coastal sound areas in North Carolina revealed that these areas were occupied intensively by shellfish gatherers during the Woodland period, but as yet, no evidence for Late Archaic period occupation of the immediate coastal area has been revealed. Farther south, Late Archaic midden occupation is indicated by the presence of fiber-tempered pottery (the Stallings and Orange series) in the middens, but this class of artifact has been identified in North Carolina coastal areas in only the most minute amounts (David S. Phelps, personal communication, 1979). Since only very limited excavation of North Carolina coastal shell middens has been carried out, it may be that occupation from the Late Archaic period will be revealed in the future. The inner Coastal Pain of North Carolina is not well known, but occasional finds of Savannah River points are recorded in the North Carolina state files in Raleigh. In general, it appears that Late Archaic populations were present in the North Carolina Coastal Plain, but essentially no evidence of a specifically coastal adaptation for these populations is presently available.

South Carolina - The literature on the Late Archaic in the South Carolina Coastal Plain is extensive. Stoltman (1974) and Anderson et al. (1979) provide the most recent reviews. Goodyear et al. (1979) review the situation in the Piedmont.

There appear to be some differences between the Coastal Plain and Piedmont groups. Ceramics, for instance, do not appear in the Piedmont until around 2800 B.P. The phase marker, Savannah River points, however, occurs in both areas as early as 5,000 B.P. In the Coastal Plain it is often found at the bottom of shell middens. Stoltman (1978) notes that elements of the Late Archaic part of the "Old Quartz" were found at the bottom of a shell midden at the Fall Line. Some workers suggest that these differences are a reflection of different social groups with distinct adaptations. Others point out that this may simply reflect materials left behind by groups seasonally visiting different zones in some sort of annual cycle. The use of ceramics in the Coastal Plain and steatite bowls in the Piedmont, the latter associated almost exclusively with river systems, indicates some degree of sedentism in both areas, and to some extent mutually exclusive cultural traditions. The occurrence of steatite bowls in later portions of the fiber-tempered sequence indicates subsequent interaction. The Piedmont adaptation may focus on the exploitation of anadromous fish similar to that of the Piedmont elsewhere (Gardner, 1978; Custer, 1978; Turnbaugh, 1975).

Within the Coastal Plain, ceramics appear between 4,500-4,000 B.P. Ceramic sites are clustered in two areas of the Coastal Plain, the embayed area along the current coastal strip, and the riverine portions of the central Coastal Plain. Shell midden sites are smaller and less common in this latter section, although they do occur, for instance, along the Savannah River as far inland as the Fall Line (Stoltman, 1978). There appear to be different, if somewhat overlapping, variations in the distributions of early fiber-tempered (Stallings Island) and sand-tempered (Thoms Creek) pottery. Where there is overlap, Thoms Creek sometimes occurs after Stallings Island, sometimes before, and sometimes at the same level. Burial and elaborate decoration of such items as bone pins suggest the rise of ceremonialism. This is also suggested by the shell rings which some have suggested are public centers. Others disagree with this latter interpretation. There do, however, seem to be some important distinctions, at least in South Carolina (Michie, 1979) between the artifact content of nearby middens as opposed to the shell rings.

Georgia - The most recent syntheses and work on the Georgia coast have been written by DePratter (1975, 1977), Marrinan (1975), Fryman, Griffin and Miller (1978), and Stoltman (1974). Apparently the most significant difference along the sea island section of Georgia, as compared to South Carolina and Florida, is the lack of a pre-ceramic shell midden occupation. Habitation apparently begins with the earliest fiber-tempered phase, St. Simons I, at 4,300 B.P. DePratter (1977) suggests this is related to fluctuations in sea level, and that earlier sites are either buried under recently

accumulated peat, or lie further out on the Continental Shelf, and are now submerged, noting that the sea islands are no older than about 3,700 B.P. He sees a higher sea level at 4,300 B.P. with a subsequent drop beginning at 3,100 B.P., and continuing until it begins to rise again around 2,600 B.P., reaching its present level by 2,400 B.P., which is 1.5-2 m above the 4,300 B.P. level. Fryman et al. (1978), and Stoltman (1978) note the possibility of a pre-ceramic level at the Bilbo site near Savannah. In connection with this it should be noted that wherever pre-ceramic levels occur below ceramic levels in shell middens (e.g., Florida and South Carolina) they are invariably associated with rivers, which are absent in this portion of Georgia. This may indicate that DePratter is right, and earlier middens are drowned or otherwise buried. It could also indicate that the current Georgia Coast was only inhabited later.

The Georgia Coast lacks the marked differences between early sand- and fiber-tempered ceramics characteristic of the South Carolina coast. This is in keeping with the interpretations emanating from South Carolina, where they see an increase in fiber-tempered usage through Georgia and into Florida. DePratter however, argues that not all the ceramic complexes along the Georgia coast are as similar as earlier workers would believe. This is probably true, and may be important for local considerations. However, there seems to be a greater homogeneity than exists in South Carolina. Early fiber-tempered pottery does not have the interior Coastal Plain distribution in Georgia that it does in South Carolina. This may reflect a lack of research, but more likely it reflects the lack of rivers and the general unproductivity of the Georgia Coastal Plain away from the littoral zone. The same problems with the distinction between shell rings and shell middens exist in Georgia. The rings could be anything from sacred or public areas to midden accumulation through specific arrangements of houses. A report by Simpkins (1975) if we interpret it correctly, appears to show scattered midden debris in association with the Sapelo Island shell ring, and a house associated with the non-ring part of the site. This tends to lend support to the idea of a ceremonial center, although as Marrinan points out, the evidence for such an interpretation is inconclusive.

Florida - As indicated previously, the Late Archaic in general is poorly understood in Florida. Goggin (1949) presented a definition based on the shell middens (freshwater) on the St. Johns River, dividing this period into pre-ceramic and ceramic phases. From the point of view of this discussion, it is difficult to identify specifically Late Archaic occupation of the interior uplands, but large bladed points, similar to those of the Savannah River, are occasionally found. It should be noted that no real attempt has been made to separate these from the Newnan type, categorized here as

"Middle Archaic." It is clear that pre-ceramic occupations are found on the St. Johns River, underlying the first ceramic manifestations represented by the fiber-tempered Orange ceramic series. The St. Johns middens also represent the first extensive occupation in Florida that is not concentrated in the central ridge. At some point after this rather extensive change in adaptation (4,000 B.P.) fiber-tempered ceramics appear, at first plain, and then with incised decorations. These ceramics, particularly the later styles, are occasionally found in the immediate coastal area, but Griffin and Miller (1978), reviewing previous work by Rouse (1951) and others, conclude that fiber-tempered pottery in coastal settings is too sparse to indicate any extensive coastal adaptation during this period. This appears to contrast somewhat with the Late Archaic coastal occupations identified by Marrinan (1976) and others on the Georgia Coast. The Late Archaic in Florida apparently represents the first extension of human occupations east from the central uplands, and the first focus on the freshwater riverine environment of the St. Johns. Toward the end of the fiber-tempered period some tentative movement to the coastal estuaries begins, and this appears to represent the earliest occupation of those environments. The first evidence for occupation of South Florida is found during the fiber-tempered period (Griffin, Miller and Fryman, 1979). Orange period habitation is dated at 2,400 B.P. on Marco Island on the Gulf Coast, and at ca. 3,100 B.P. at the Peace Camp Midden site in the Loxahatchee Refuge in Broward County. Intensive occupation does not begin until around 2,500 B.P. According to James Miller (Cultural Resources, Inc., personal communication, 1979) there is a north-to-south gradient in the South Florida area, with the earliest habitation being to the north with the fiber-tempered pottery, and the latest being associated with Glades series. Human habitation in the Keys dates from quite late in the prehistoric period, and is beyond the temporal scope of this paper.

4.2.2. Paleoenvironment

4.2.2.1 Introduction

Understanding the paleoenvironment from the cultural ecological perspective is a key factor in applying the Continental Shelf settlement pattern predictive model. This section discusses the environmental changes that occurred during the succession of Pleistocene/Holocene climate episodes and the impact of these changes on the distribution of early archeological sites. Also discussed is the influence

that specific river systems and sea level rise had on settlement patterns. A more thorough discussion of the paleoenvironments of the project area appears in Sections 4.1.2, 4.1.3, and 4.1.4.

As noted in previous sections, and as stated by Carbone (1978), the reconstruction of past environments is fraught with problems, and various workers produce different interpretations. The results of the reconstructions are the generation of large-scale structures or very localized settings. These structures generally provide the interpretive framework in which ecologically oriented archeologists operate. The concepts of zonal shifts and broad climax communities are the usual ones employed. Recent work (Gardner, 1974; Carbone, 1976) has shown that such constructs have limited utility, and that a study of floral community mosaics would be more useful. As has been noted (Flannery 1968), humans do not adapt to total environments but to selected areas within the total setting. Archeological sites do not simply occur everywhere across the landscape, they occur in restricted locations which can be predicted with high degrees of reliability once the nature of the environment is understood. To understand the environment and the possible man-land relationship which might have developed requires a knowledge of the biotic and abiotic resources which would have been available at any given period of time. These have been addressed in the previous discussions of lithic raw material sources, river systems, shelf geomorphology, paleoshorelines, palynology, and paleontology (Volume I, Sections 4.1.1 - 4.1.5) and will be briefly rediscussed here.

From the archeological perspective the most useful system of classification and periodization of the paleoenvironmental records comes from the work of Wendland and Bryson (1974). Wendland and Bryson studied a set of geologic-botanic data consisting of all the C^{14} dates which marked discontinuities in pollen profiles, glacial records, sea level heights, and peat beds. These dates were then collectively analyzed for common discontinuities using statistical methods. The result was a set of significant dates of environmental change which

could be correlated with the Blytt-Sernander nomenclature for environmental episodes. Table 4.2.3 summarizes these dates and the corresponding environmental episodes.

The characteristics of each episode are summarized below. The emphasis is on the potential interactions between man and the environment. Where these interactions are germane, localized variations are discussed, and each period is interrelated with the culture history previously outlined. Table 4.2.1 presents this in summary form.

4.2.2.2 Climatic Episodes

Late Glacial

The overall pattern at the early and middle parts of this episode is one of domination by extensive open areas within the various forested zones. In essence, this means broad grassland or non-arboreal belts which would have attracted grazing species. Interspersed within this were various vegetal mosaics caused by climatic and edaphic factors. These mosaics would have resulted in extensive floral community boundaries between deciduous, coniferous forests, and grasslands. Flood plain flora would have added another element to the variation. The boundary environments would have attracted such fauna as deer, whereas the arboreal settings would have attracted browsing species such as mastodons.

River valleys would have been much deeper and presumably broader during this period. The rivers themselves could have alternated between braided and swift flowing streams depending on temperature fluctuations and variations in precipitation and evaporation rates. The fauna which were present would have included essentially modern species as well as now extinct species such as mammoth, and mastodon, and some species of horse, bison, and camel. Many of the now extinct species were large animals. From the human perspective, it is important to realize that this species diversity and biomass in terms of individual animal and herd sizes ended with the Pleistocene and

Table 4.2.3 Significant Dates of Environmental Change
(All Dates in Years B.P. Modified from
Wendland and Bryson 1974, and Carbone, 1976)

Episode	Major Discontinuity	Minor Discontinuity	Archeological Periods	
sub-Atlantic	2760		Early Woodland	
		3570	Stallings Island	Late Archaic
		4240	Savannah River	
sub-Boreal	5060			
		6050	Halifax	
		6910	Morrow Mt. II	
		7740	Morrow Mt. I	Middle Archaic
Atlantic	8490		Stanly	
			Bifurcate Base	
Boreal	9300		Kirk ST Warren SN Kirk SN	Early Archaic
pre-Boreal	10,030		Kirk CN Palmer CN	
			Dalton	
			Mid-Paleo	Paleoindian
Late Glacial	?		Clovis	
			Pre-Paleo?	

never occurred in the South Atlantic region again (excluding perhaps the late prehistoric appearance of bison, which apparently never did occur in any great numbers). The dominant element in the environment at this time would have been the animal populations. Hunting is therefore indicated by the environment as the most likely method of securing food. This is further supported by Paleoindian toolkits. That gathering, perhaps even fishing, took place is indicated by work on the Upper Delaware River (McNett et al., 1977), but very few archeologists would deny that hunting was the major focus during this time period.

Most workers assume a generally uniform distribution of the vegetation zones. As previously discussed in Section 4.1.2, three large communities were evident in the South Atlantic during the Late Glacial: 1) scrub vegetation in Southern Florida; 2) xeric oak-hickory woodlands in southern Georgia; and 3) pine-spruce forests in North Carolina. There is no reason to doubt that the forests extended outward to the full-glacial coastline. It is difficult, however, to envision that soils on the Continental Shelf did not exert some edaphic control over the type of vegetation that grew there. Even now, there are differences in vegetation regimes between the inner and outer Coastal Plain. Extending this, it would seem logical to suggest the possibilities of community types in addition to those controlled by latitude. The controls would be based on various edaphic factors, and would in part follow an east-west gradient from late Pleistocene shorelines across the Coastal Zone of the Outer Continental Shelf; to the outer and inner portions of the Continental Shelf; and across various divisions of the Piedmont. How different these communities were, and their exact composition is beyond reconstruction based on current data. It is probable that all the communities dealt with, and the possible associations of animals and plants have, as Carbone (1976) has noted, no modern analogs. This seems to be underscored by the consistent discovery in bone deposits of a variety of Rancholabrean fauna consisting of species and genera assumed to be adapted to widely diverse habitats.

Pleistocene faunal finds are relatively abundant on the Coastal Plain. They are less prevalent in the interior part of the Eastern United States. This could suggest differential distributions of the fauna or, more likely, differential preservation. When preservation conditions exist, such as at Saltville, Virginia (Ray et al., 1967) the same range of fauna is present in all physiographic provinces. The published dates suggest a time differential with the earliest dates coming from the Coastal Plain. The rare dates from the Piedmont and Ridge and Valley provinces are considerably later. There is, of course, overlap and some late Late Pleistocene dates are known from areas on the Coastal Plain. This difference in dates is probably also an artifact of preservation.

It is likely that there was a rather uniform distribution of megafauna throughout the various provinces east and south of the Appalachians, at least in terms of species and genera. The differences in vertical zonation east and west may not have been enough to cause much variation since overall the region had a strong grassland or non-arboreal element. The total available space occupied by non-arboreal species would seem to be greater in the less vertically zoned Coastal Plain than in the more compact and varied Piedmont and Ridge and Valley. This would perhaps suggest that the number of herd animals in the Coastal Plain was greater than elsewhere, at least prior to 12,000 B.P.

Paleoindian artifacts, however, are strikingly less abundant in the Coastal Plain, especially the outer Coastal Plain. The direction of human population movement is definitely from west to east. In other words, the baseline Paleoindian culture, Clovis, originates in the west. The radiocarbon dates are, without argument, earlier for the southwestern Plains: 11,500 B.P. for Clovis and 11,000 B.P. for Folsom as opposed to our Middle Paleo dates for Folsom in the east of 10,500 B.P. Couple these dates with the increased concentration of Paleoindian points as one moves away from the Coastal Plain toward the interior and there would seem to be no argument about the direction of Paleoindian population movement. The initial population would also be

of relatively low density. There would have been little pressure to move out onto the Coastal Plain. By the time the Paleoindians arrived, the former extent of the Coastal Plain had been considerably reduced, and the types of sites which can be expected are most likely to be highly transitory, as indicated by the isolated and scattered fluted point finds reported. This is unlike the clusterings typical of certain areas in the interior. The Coastal Plain also lacks predictable and dependable lithic material sources except in certain locations along the interior portion.

One final point concerns the game the Paleoindians were hunting. Throughout this discussion we have focused on extinct forms. The association of Pleistocene megafauna and fluted points in the west would suggest that the presence of fluted points in the east indicates hunting of similar game. To date, however, there has been no definite associations of mastodons, mammoths, horses, camels, or bison, with fluted points. There have been tantalizing hints but no proof (Section 4.1.3; B.I. Waller, Avocational Archeologist, Ocala, FL, personal communication, 1978). It seems logical that if these animals were present in large numbers, early man did hunt them. But the lack of evidence could be explained by considering that the fauna in question were either extinct or largely extinct by the time man arrived. Increasingly, the paleoenvironmentalists are reconstructing settings that indicate a relatively early loss of, or marked reduction in, non-arboreal elements, with much of this taking place before the Paleoindian period. This does not obviate hunting, but only suggests the possibility that the focus was on more solitary forms, who seem to have been forest or edge adapted, such as deer and elk, and perhaps even mastodons. In connection with this, it is difficult not to interpret the wide distribution of isolated fluted points and the small, transitory nature of Paleoindian period hunting sites in the Southeast as indicative of micro-band group exploitation of non-herding animals. Larger hunting sites which seem to be fairly common to the north, such as Shoop, Holcombe Beach, and Debert, are lacking in the Middle Atlantic and Southeast. Such sites seem to be present in the north, because of caribou, the only herd animal in the east to definitely survive into the Holocene. Associations of caribou and man have been found at Holcombe Beach (Fitting, DeVischer and E.J. Wahla, 1965).

Pre-Boreal/Boreal

The pre-Boreal/Boreal period falls into the Holocene. Holocene beginnings have been traditionally dated at 10,000 B.P., and archeologists have assumed that this is the period of greatest environmental transition following the end of the Pleistocene. This has been reinforced to some degree by the assumption of marked differences between the Paleoindian and Archaic, a change which also occurs at this date. The early Holocene is also the period when glacial ice has moved north of the Canadian-United States border. As Ogden (1977) notes, however, the glaciers had been receding rapidly since about 18,000 years ago, and were well to the north by 12,000 B.P.

This retreat mirrors important climatic and overall environmental changes that were felt throughout the East well before the 10,000 B.P. date, which tends to be pivotal in archeological interpretation. In the Blytt-Sernander nomenclature, the use of the term pre-Boreal/Boreal suggests an overall dominance of boreal elements. Viewed from the northern perspective, this is generally the case. This is not true in the Middle and South Atlantic. Whitehead (1972) suggests a successional sequence for the Chesapeake Bay and North Carolina, which consists of pine-spruce (full-glacial), beech-hemlock-birch (late glacial), and oak-hickory (early postglacial). House and Ballenger (1976) note that before 10,000 B.P. in southeastern North Carolina the pine-spruce assemblage was replaced with oak, hickory, birch, hemlock, beech and elm. This is also noted in Section 4.1.2. The Delcourts (Delcourt and Delcourt, in press) state "early Holocene forests of the Southern Atlantic and Gulf Coastal Plains were xeric, dominated by species of oak, hickory and southern pine." In southern Georgia and northern central Florida, there is a scrub oak and sand pine association, and pine-oak dominance in southern Florida by 13,000 B.P. Throughout the Middle and South Atlantic there was a decrease in non-arboreal elements, and a rise in arboreal elements indicating the closing of the open forest areas and a reduction in grassland types of habitats. This corresponds closely with the extinction of the late Pleistocene grazing fauna but cannot be excepted as

the only causally related factor. In Florida, a parkland-like setting appears to have continued for a longer period of time. This may indicate a relatively longer survival of late Pleistocene fauna than elsewhere. This does not necessarily raise Florida to a biotic refuge position, but is suggested only to note that the open habitat disappeared earlier in the more northern parts of the South Atlantic. During this episode shoreline encroachment was in its most rapid period, again indicating the tenuousness of the continental shelf for human adaptation.

The culture history indicates that some changes took place during the culture period corresponding to the pre-Boreal climatic episode. However, there seems to be more continuity during this period than there is change. Gardner (1974, 1976, 1977) feels that the cultural continuity exists in part because hunting continues. The real change is one of focus from one type of faunal resource to another, that is, from the late Pleistocene megafauna and herd animals to smaller more solitary forms. This latter process may have begun earlier than originally thought. This can probably best be viewed as a shifting emphasis relating in part to a human population movement into the east from more open environments in the west and subsequent changes in emphasis on the animals which were hunted. This would have begun in the Paleoindian period, and culminated in the Early Archaic. This represents somewhat of a change in previous interpretations, in that rather than seeing a simplistic relationship between Paleoindian and big game, and Early Archaic and small game. It is suggested here that this is a gradual change along a continuum.

As noted previously, early Early Archaic sites in the Middle and South Atlantic tend to have a similar distribution to that of the Paleoindians. This relates to the continued use of cryptocrystalline lithic material and the continued emphasis on hunting throughout the pre-Boreal/Boreal. In the Middle Atlantic and inner Coastal Plains of North Carolina, a shift in site choice and presumably adaptive strategies began with the Kirk Stemmed horizon or the late Early Archaic, and becomes accelerated during the bifurcate base point horizon, or during

the early part of the Middle Archaic (or terminal Early Archaic in other classifications). This shift is manifest most strongly during this time in the Chesapeake Bay area, and interior Coastal Plains of the southern Mid-Atlantic and North Carolina. The data is not sufficient to suggest this for South Carolina and Georgia. In Florida, the central highlands remain the loci of the sites. These cultural patterns which consist both of continuity and change depending on the locality probably reflect differential rates of change during the pre-Boreal/Boreal.

Atlantic:

The beginning of the Atlantic episode can be correlated with an amelioration of the conditions of the Boreal episode. The major climatic event associated with this is the northward retreat of a deep cold trough in the air mass over the midwest. The initial climatic pattern is a swing to warm and moist conditions (Carbone, 1976). During the middle portion of the Atlantic there is a shift which climaxes in the mid-postglacial xerothermic at about 5,000 B.P. In the Dismal Swamp, Whitehead (1972) describes the continued extension of freshwater marsh inland, with a hardwood forest similar to that in southeastern Virginia and northeastern North Carolina. House and Ballenger (1976) note that overall the oak-hickory forests attain their maximum during this interval. During the period from 7,500-5,000 B.P., they state that the Coastal Plain of Georgia and northern and central Florida was a mosaic of oak savanna and small prairies. Importantly, by 7,000 B.P., marked seasonality in summer and winter temperatures were established.

The Atlantic episode corresponds well with the beginning of the Middle Archaic between 9,000-8,500 B.P. The date of 8,500 B.P. in the Shenandoah Valley is the end of the Paleoindian-Early Archaic continuum manifested in the Flint Run complex (Gardner 1974, 1978). As noted, this is marked by shifts in settlement, changes in natural soil stratigraphy, flood plain sedimentation rates, and river terrace formation. Changes in settlement pattern become extremely pronounced in the Potomac River

Coastal Plain and the Chesapeake Bay. This is the period when base camp activities focus on interfluvial and fluvial swamps. A similar pattern is manifest in the Dismal Swamp, northeastern North Carolina and the inner Coastal Plain of Central North Carolina. Anderson et al. (1979) note similar adaptations in the South Carolina inner Coastal Plain. Middle Archaic period sites also become more common on the Cape Fear River in the southeastern Coastal Plain of North Carolina. The period can generally be characterized as the final abandonment of the earlier hunting orientation and the development of a broad based general foraging subsistence economy which is geared to seasonal availability of resources.

Sub-Boreal

The sub-Boreal environmental episode is correlated with the 5,000 B.P. time period and the mid-postglacial xerothermic or hypsithermal interval. The warming and drying conditions which began midway in the Atlantic continued well into the sub-Boreal and reached a climax around 4,200 B.P. At the Dismal Swamp, Whitehead (1972) characterizes the period between 6,000-3,500 B.P. as one in which hardwood forests were gradually replaced by cypress-gum forests. Cypress also reaches its northward extent in Maryland at this time. The Delcourts (Delcourt and Delcourt, in press) note the presence of southeast Coastal Plain species such as bald cypress and tupelo gum in the Rockyhock Bay pollen spectra at about 5,000 B.P. Thanz (1977) notes a change in the vegetative composition of the central ridge of Florida which made outer Coastal Plain areas like the St. Johns River more attractive. Watts (1971) indicates long-leaf pine forest began to replace oaks in Florida.

From the archeological perspective, these changes correspond to the Late Archaic. As noted in the culture history section, the focus of Middle Atlantic and Southeastern Coastal Plain settlements shifts to the littoral zone and shell mounds and middens began to expand rapidly. In the eastern Piedmont the populations concentrate on anadromous fish runs. The rate of sea level rise decreases during this time. Also at this time or perhaps slightly earlier, the stability of

the estuarine zones, the reduction of shoreline progradation, and barrier island growth establish conditions under which clams, oysters and other fauna of the estuarine setting, including anadromous fish, flourish. Emery (1966) notes that oysters were present even earlier. What is suggested here is that at this time (5,000 B.P.) and probably for the first time, estuarine conditions have become stable enough for oysters and other shellfish to become a viable alternative to inland or terrestrial food sources. That this is connected with changes in the interior which reduce the viability of food procurement in certain interior zones, especially much of the Piedmont, can be documented for a number of areas (Custer, 1978; Thanz, 1978).

Sub-Atlantic

This era is characterized by a shift to modern climatic and environmental conditions. The dry conditions of the xerothermic maximum were replaced by increased precipitation. The Delcourts (Delcourt and Delcourt, in press) note "southern pines became abundant (after 5,000 B.P.) due to increased dominance of the tropical maritime airmass from the Gulf of Mexico, providing abundant precipitation throughout the year." The forest of the historic period for the entire project area is dominated by the southeastern evergreen. For Florida and Georgia, Watts (1971) states that the sclerophyllous oak woodland and small patches of prairie characteristic of these areas, between 8,000-5,000 B.P. underwent a transition during the late Holocene. "From 5,000 B.P. to the present, the vegetation changed progressively, first to eliminate the upland herb communities and substitute long-leaf pine forest for oak, then to permit the development of "hammocks" of mesic broad-leaved trees. While this was occurring, rising water tables resulted in the establishment of vast cypress swamps and extensive shrub-bogs." In the Dismal Swamp, the closing of much of the swamp occurred as terrestrial vegetation continued to invade.

The dominance of pine forests throughout this area would have tended to reduce the biomass, and to reduce the fertility of the soil. In much of the Southeast, however, natural fires acted as a deterrent

to the development of climax forests and created constant edges. The flood plain hydrophytic sere would have consisted principally of deciduous species, and mixed deciduous elements would have been present in the Coastal Zone. In general, the interfluvial areas would have been of lower productivity, thus a lower level of exploitation should be expected in these zones. Agriculture appeared sometime during this period which corresponds with the Woodland, but it does not, by and large, make an important contribution to the diet until after 1,200 B.P. Shell middens seem, in general, to decrease in size, and by 1,200 B.P. appear only sporadically in the Chesapeake Bay region. However, it is during this time along the North Carolina coast that extensive shell middens first developed. In Florida, the Atlantic Coastal strip was first intensively inhabited area. Later in this period human populations moved into southern Florida. Burial mounds and other evidence of sedentism and social stratification became increasingly common.

4.2.2.3 River Systems

In this section, river systems will be addressed in terms of their importance from the cultural ecological perspective. The characteristics of rivers that would have attracted early man, and those factors which add the element of high artifact and site preservation potential include:

1. Fluvial systems as secondary sources of transported raw material for the manufacture of stone tools.
2. Rivers as special environmental settings and resource zones.
3. Rivers as sources of fresh water.
4. Rivers as loci of site burial through alluviation, and therefore areas where sites are apt to be protected.

Southeastern United States rivers can be divided into two groups: those originating in the Piedmont and those which begin in the Coastal Plain (Table 4.2.4). Piedmont-originating rivers generally have greater discharge rates as compared to Coastal Plain-originating rivers and can transport larger size rocks. Some of the Piedmont rivers frequently flow through cryptocrystalline rock outcrops and could carry

Table 4.2.4 Known Major River Systems of the U.S. East Coast South of Cape Hatteras

Piedmont Origin	Extreme Historical Discharge	Coastal Plain Origin	Extreme Historical Discharge*
Tar (N.C.)	1050 m^3/sec	Neuse (N.C.)	1704 m^3/sec
Cape Fear (N.C.)	2796 m^3/sec	N.E. Cape Fear (N.C.)	
Pee Dee (N.C.-S.C.)	8074 m^3/sec	South Cape Fear (N.C.)	
Santee (S.C.)	3728 m^3/sec	White Oak (N.C.)	
Savannah (S.C.-GA)	7650 m^3/sec	Little River (N.C.)	
Altamaha (GA)	8500 m^3/sec	Waccamaw (N.C.-S.C.)	
		Little Pee Dee (S.C.)	782 m^3/sec
		Salkehatchie River (S.C.)	66 m^3/sec
		Broad River (S.C.)	
		Black (S.C.)	354 m^3/sec
		Edisto (S.C.)	694 m^3/sec
		Congaree (S.C)	
		Ogeechee (Ga.,)	850 m^3/sec
		Canoochie (Ga.)	
		Satilla (Ga.)	3120 m^3/sec
		St. Marys (Ga.-Fla)	796 m^3/sec
		St. Johns (Fla.)	

*Separate Discharge Rates are unavailable

chert, jasper, rhyolite, silicified slate, silicified sandstone, quartz and quartzite. Coastal Plain-originating rivers, however, have a lesser potential for flowing through lithic source areas, except where sources such as the Allendale chert or other chert bearing limestone deposits occur in the Coastal Plain. It should also be noted that any river, Coastal Plain or Piedmont, can cut through earlier deposits of boulders, cobbles, and gravels, which can in turn be transported in that river's bedload.

Full understanding of the resource potential of rivers requires a detailed study of each system. Micro-environmental zonation studies from the river to bluff edge in the Shenandoah Valley have shown that there is considerable floral and faunal diversity within this zone alone, and that this area, in turn, differs considerably from the adjacent uplands and interfluvial areas (Gardner and Boyer 1978; Gardner 1978). Gardner (1978) has stated that in the Middle Atlantic a reduction in site numbers and size can be expected away from river systems. Goodyear et al. (1979) and Anderson et al. (1979) have commented on this phenomenon for South Carolina.

Rivers and streams of varying orders serve as the loci for archeological sites. Because resources not necessarily found in interfluvial areas are found in abundance here. Rivers are more stable in terms of resource availability than any other environmental zone. Throughout the varied climatic episodes since the late Pleistocene, river valleys have tended to support a mixed hydrophytic forest which would have differed markedly from the environmental settings in the inter-riverine areas (Carbone, 1976; Gardner and Boyer, 1978). The boundary between the flood plain forests and adjacent settings would have been a zone of maximum habitat overlap and attractive as a human habitation zone. Flooding of rivers tend to disrupt the normal patterns of floral succession and place riverine settings within early seral stage communities which are especially attractive to game animals. Such areas are much easier to exploit by human populations using a lithic based technology.

In summary, rivers must be considered as important focal points for human settings for multiple reasons. In considering possible locations of prehistoric sites on the Outer Continental Shelf, it becomes important to be able to plot these settings. Based on research by other members of this team, the following river systems can be plotted on the submerged Continental Shelf and can be considered, other things being equal, important potential site loci:

Pee Dee
Savannah Complex
Altamaha Complex

4.2.2.4 Sea Level

The determination of sea levels during the late Pleistocene and Holocene is of considerable importance for determining the areas on the Outer Continental Shelf that would have been available for human occupation. The intent here is not to repeat what has already been presented but to consider sea level and shorelines from the cultural ecological perspective.

As has been discussed in preceding pages, coastal environments in general provide a range of potential food resources which, under proper conditions are capable of supporting rather dense, sedentary human populations. It is generally not the ocean-facing beaches which are important but the protected coves, river mouths and deltaic areas, and estuarine zones. These latter areas, at least at the present time and apparently for the past 6,000-5,000 years, are the locales which are rich in resources. Along the coast of Southeastern North America, it is also not the open seas which are important extractive zones during prehistoric times, but the littoral, or that zone which is immediately accessible within the limitations of prehistoric Indian technology.

Archeologists, in general, have held that the coastal estuarine zones are areas of rich natural productivity that can be harvested with even the most primitive technology and with minimal specialization. In recent years, some archeologists have begun to

question not so much the productivity of the littoral, but the potential of this zone for supporting permanent populations. Brennan (1974) for instance, citing food remains and nutritive analyses of shell midden contents, has suggested that such sites were only transient camps and the available resources could not have supported people for any period of time. Gardner (1978) has suggested that the shell middens which appear on the Chesapeake Bay and tidewater rivers such as the Potomac are the loci for base camps after 5,000 B.P. It is perhaps possible that both positions are correct. Certain shell middens could well be base camps. Analyses of the full range of food and artifactual debris found in middens should be useful in determining whether or not multiple activities were taking place and what resources were exploited during the period of time the middens were inhabited. Such analyses are rare. When they have been undertaken, the results are equivocal: some middens indicate relatively permanent long term encampments, others appear to be highly specialized, short term transitory locations. This is a reflection of at least three factors: the composition of the estuarine setting itself, latitude, and the immediately adjacent or nearby terrestial resources. Detailed reconstruction of local settings as well as midden contents is required before adequate predictions can be generated.

Even without such analyses, it is obvious that there is a strong potential for variation in resources along the present and late prehistoric coast lines of the South Atlantic. Accordingly, there is the potential that at any given interval during the late Pleistocene and Holocene there will be similar variation. This means that the Atlantic littoral zone cannot be simply viewed in toto as a desirable place to settle. Numerous variables must be analyzed and/or inferred to determine if a particular shoreline might have presented optimal conditions for human exploitation.

While it is noted that there are difficulties in establishing paleo-shorelines on the Continental Shelf, these shorelines are the core of the model in which predictions must be generated. Assuming constant rates, it is possible with this data, to approximate the rate of vertical sea level rise per year and the annual horizontal encroachment rate.

Estimates made from present shelf declevities off of Charleston, South Carolina, for instance, suggest a vertical rise rate of 58.4 centimetres per century during the period between 12,000-10,000 B.P. Horizontal encroachment rates for various periods in three transects along the South Carolina-Georgia coast are presented in Table 4.2.5.

Table 4.2.5 Rates of Shoreline Transgression

	Savannah Area	Charleston Area	NC/SC State Line
16,000-14,000	9.8 m/year	5.8 m/year	2.3 m/year
14,000-12,000	8.2	4.8	7.9
12,000-10,000	12.7	10.6	17.1
10,000- 8,000	22.8	14.2	22.9
8,000- 6,000	1.3	2.4	3.0
6,000-present	1.4	1.6	.2

While these figures project a smooth shoreline retreat and do not account for intermediate stillstands they do at least indicate very rapid rates of encroachment, particulary between the period 14,000-8,000 B.P. Viewed from the perspective of shoreline, estuarine and Coastal Plain riverine ecology, these rates suggest that conditions may not have been stable enough for the diffusion of the resources which humans with a littoral focus require. Rapid changes in salinity, sedimentation, and depth alone could retard the development of stable faunal and floral communities which could be exploited by man. This does not mean that resources were not available. All it indicates is that the coastal littoral zone may not have provided a stable and predictable resource alternative to the terrestrial environment.

According to the sea-level curve provided in this report, (Section 4.1.1.5), lowering of sea level began around 25,000 B.P. reaching a maximum low at approximately 16,000 B.P. This would have provided a period of up to 10,000 years for terrestrial vegetation to become established on the Outer Continental Shelf. Rivers, streams,

flood plains, and inter-riverine areas would have been suitable for human subsistence pursuits. But this is the period (pre-Paleoindian), when there is no evidence that man was anywhere in the area. Since the rate of sea level lowering during this period is even more rapid than the subsequent rise, littoral resources would not have been abundant as a result of the instability of the littoral zone. The principal focus of any pre-Paleoindian populations on the Outer Continental Shelf during this period up to 16,000 B.P. would likely have been on terrestrial and riverine resources. These same resources would have been present on both the outer and inner parts of the current Coastal Plain and the Piedmont. It follows that if artifacts were being manufactured, used, and discarded or lost, during this interval, then they should be discoverable in the current terrestrial setting. As noted previously they have not been. There is no reason then to expect evidence of human activity on the shelf.

The rapid encroachment of the sea during the post-16,000 B.P. era would have affected the terrestrial and riverine biota on the Outer Continental Shelf. Since, however, the communities had some period of relative stability the main effects on the fixed biota (rooted plants) would have been drowning, or perhaps other coastal geologic processes, while the mobile biota could have simply migrated inland. The principal impact on the distribution of terrestrial fauna would have been a reduction of space and a crowding toward the interior. Such crowding would have set up competition which would have resulted in gross population losses. This coupled with the corresponding climatic changes and the trend toward extinction, would have reduced the available biomass. Similar changes were going on in the interior and until evidence to the contrary is developed it can only be assumed that the animals and plants in all zones were undergoing fairly similar rates of change, with perhaps more rapid change taking place on the Outer Continental Shelf.

4.2.2.5 Distribution of Lithic Raw Materials

Although bone, wood, fibers, shells, some metals, and a variety of other raw materials were used by the prehistoric inhabitants

of the Eastern United States, the basis of the technology was stone. Exceptions to this can be noted in extreme south Florida where the general absence of stone forced the extensive use of substitutes such as shell, but this is a late phenomena. Elsewhere, throughout the entire prehistoric spectrum, stone played the integral role. There are periods when certain types of lithic raw material are preferred almost to the exclusion of others. This is most clearly indicated during the Paleoindian and Early Archaic periods of the late Pleistocene and early Holocene. Preferences for cryptocrystalline material during this time for all practical purposes served as a limiting factor on where early populations located their sites. This is not true of subsequent periods when the types of lithic material sought and/or utilized broadened. Even in the later periods, however, access to lithic materials must be considered an important variable, although populations in the St. Johns River area and Atlantic Coastal strip of Florida seem to have done extensive substitution by 5,000-5,500 B.P. Bone and wooden tools are noted in southwestern Florida as early as 10,000 B.P. (Clausen et al., 1979). Given the necessity for doing so, stone can be substituted for by other materials. This, however, tends to be the exception rather than the rule, even in situations where preservation of other organic material is rather high.

Mechanisms for coping with the limitations of raw material can include trade or visiting quarries and transporting material elsewhere. P.R. Fish (University of Georgia, Athens, personal communications, 1979) notes the transportation of tabular blocks of Allendale chert in various areas of Georgia in the Savannah River region. Michie (1979) and Dr. Albert C. Goodyear (Institute of Archeology and Anthropology, University of South Carolina, personal communication, 1979) note that movement of Allendale chert in at least small core or biface form occurred during the Paleoindian period. This would probably also hold true to some degree in North Carolina, and other noted sources of chert in South Carolina, Georgia and Florida, although information is lacking. Determination of how far material would be moved or transported at any given time period is difficult and would require extensive analysis of several other variables which influenced site choice. For instance,

population pressures in and around areas of desired lithics could force people to move into areas where lithics were less desirable or not so easily obtained. Concentrations of game or other food resources in zones where lithics were unavailable could force people to carry lithics greater distances or choose alternate materials. Trade was also a mechanism by which certain materials were transported far from their source. Trade in the east seems to focus on nonessential items, such as copper and steatite. Traded items only appear at recognizable levels during the Late Archaic, and seem more closely associated with ceremonial rather than subsistance activity.

In general the two types of lithic material sources are primary outcrops and secondary or reworked deposits. Both types of occurences can provide raw material suitable for the manufacture of stone tools, however secondary deposits can be of slightly more limited value because size can be small and thereby limit the size of the tool that can be produced. This is important when lithic reduction strategies demand initial stages of a certain size. Nevertheless, elsewhere both types of sources have proven to be important foci for settlement choice at all time periods (Gardner and Boyer, 1978; Gardner, 1978).

Little exact information concerning the occurrence of reworked deposits is available; however, river systems are the primary transporters of these materials. Analysis of primary lithic sources within their drainage nets can yield some information as to the potential for workable lithic materials as part of their bedload. The analysis of present river systems however, provides only a fragmentary picture of the distributions of secondary deposits of lithic raw materials. Work in the Chesapeake Bay (Gardner, 1979) has indicated that Pliocene/Pleistocene Susquehanna River deposited large cobble beds as part of the bedload and migrating point bar deposits within braided stream patterns. There is also the possibility that the river systems within the study area (Tertiary in age) could have produced cobble beds of material suitable for the manufacture of stone tools. Unfortunately, there is little information concerning these kinds of lithic sources within the outer Coastal Plain of the South Atlantic.

The primary sources which were utilized as raw materials by prehistoric populations are noted below and mapped on Figure 4.2.3 (also see Section 4.1.1.4).

Carolina Slate Belt - silicified slate and metarhyolites from east central and eastern Piedmont.

Caste-Haynes Formation - chert bearing limestones and dolomites of Tertiary age in southern North Carolina.

Allendale Chert - cherts bedded as part of the Tertiary age Flint River formation found between the Savannah and Santee Rivers.

Santee River - cherts have been observed in this area, but their origin is not certain.

McBean Formation - a white chert formation located near Savannah, Georgia.

Suwanee Limestone - Tertiary limestone with cryptocrystalline minerals from the central Georgia Coastal Plain.

Ocala Chert - Tertiary age cherts in nodular form within the limestone formations of Northwest Florida.

Williamson Chert - Chert outcrop from the central Virginia Piedmont.

Flint River Formation - Tertiary chert bearing limestone located in the inner Atlantic and Gulf Coastal Plains of Georgia.

Sources which could have been used include:

Coosawhatchie Clay - Tertiary formation with chert and other material on the outer Coastal Plain in Jasper and Beaufort Counties, South Carolina (see Section 4.1.1.4).

Eocene Cherts - Thin beds found throughout Georgia Coastal Plain (see Section 4.1.1.4).

When these primary outcrops are evaluated in terms of the local river system the transportation pattern seems to be such that some areas are especially rich in raw materials, while others are impoverished. The most impoverished areas outside of the river systems appear to be the outer Coastal Plain of North Carolina; Georgia, south of the mouth of the Savannah; the Atlantic Coast of Florida; and South Florida. The outer Coastal Plain in South Carolina, on the other hand, seems to be one of the richest in terms of lithic resources. Those areas which are lithically impoverished are also those areas which do not seem to be extensively settled until the Late and post-Late Archaic periods.

4.2.3 Predictive Model

4.2.3.1 Chronological Units

In the previous sections, the cultural and environmental history and the interaction of man and the environment was discussed. In this section, the groundwork for the development of a habitation model will be addressed. Based on chronology, adaptive patterns, and environmental variables, it is reasonable to group the culture history of the South Atlantic into the following divisions for modeling purposes:

Era	Date
Pre-Paleoindian	before 11,500 B.P.
Paleoindian - Early Archaic (early)	11,500 - 9,000 B.P.
Early Archaic (late) - Middle Archaic	9,000 - 5,000 B.P.
Late Archaic - Early Woodland	5,000 - 2,000 B.P.
Woodland	2,000 B.P. - historic

Pre-Paleoindian Period

As noted, human occupation of the Eastern United States at this time is questionable. If people were in southeastern North America, they could have been present from at least as early as 20,000 years ago or during the Wisconsin maximum. Since there is no data with which to predict the location of sites in the current terrestrial environment, it is difficult to predict locations on the submerged terrestrial environment. If, however, such populations possessed a relatively unsophisticated and unspecialized technology, then sites would be located in areas of highest productivity, where the most generalized type of foraging activity would be successful and where the greatest number of food resources were available. This situation would occur along the larger riverine systems. If it can be assumed that the estuary setting was also a zone of relatively high biomass, then river mouths near the shorelines, at the appropriate time periods, would be the most likely locations. If these populations possessed a rather more specialized toolkit with a slight focus towards hunting, similar sorts of settings

would be appropriate, although in this case exploitive activities could have penetrated further into the interfluvial areas.

Predicated on the presence of people in the South Atlantic area before 11,500 B.P., the location of sites dating to this period on the submerged Continental Shelf could be anywhere along the major river systems between the 16,000 and 11,500 B.P. shorelines. Given an (assumed) extremely low population density, only transient camps could be expected. Since there are no artifacts diagnostic of this period, it is doubtful if there would be any way to identify these sites, except by the location of *in situ* artifacts east of an incontestable 11,500 B.P. shoreline. The position adopted here is that there is an extremely low probability of such sites occurring.

Paleoindian-Early Archaic (early)

Sites dating to the 11,500 - 9,000 B.P. time period are clustered around primary or secondary deposits of cryptocrystalline lithic material. Outward from the loci of such deposits, the numbers and size of the sites decrease markedly. Base camps and associated types of sites will be found near such deposits. Transient camps in North Carolina, South Carolina, and Georgia appear to be concentrated along major river systems and their junctions with tributary streams. In Florida, the association is with rivers, sinkholes and, perhaps, extinct lake edges. In areas where this riverine association can be demonstrated, there is minimal exploitation of the interfluvial zones. With the exception of that portion of the Coastal Plain near the Allendale and other chert outcrops in the vicinity of the Savannah River and bordering parts of Georgia and South Carolina, Paleoindian and Early Archaic period points are rare in the outer Coastal Plain or current coastal zone portions of the project area. Where such finds are reported, as in South Carolina and North Carolina, they are invariably no more than one or a few isolated points.

It would therefore appear that Paleoindian and Early Archaic period sites (except, perhaps, for the isolated fluted point), are not

likely to occur on the submerged Continental Shelf except in South Carolina, south of the mouth of the Waccamaw and into Georgia for a few miles south of the Savannah River. The types of sites could be expected to fall into the transient camp category, but could include periodically revisited sites, kill and butchering stations and stray point finds. The probability of finding sites of this time period, particularly along the Savannah River and adjacent systems, seems rather good. Sites located beyond a range of perhaps 10 miles away from the valleys associated with these river systems and their tributaries are less likely to occur. It would seem probable that some of these sites, especially those associated with drowned stream valleys, could be preserved. Sites of this time period can be expected along these river systems anywhere from the 11,500 B.P. shoreline to the current shoreline. Outside of this region, such sites are not likely to occur. The existence of habitation sites east of the St. Johns River mouth in sinkholes, noted on various maps (USGS Jacksonville, 1:250,000 sheet NHM-5, 1957), is possible. Paleoindian and Early Archaic sites may also be located in other areas along drowned river systems. It should be stressed, however, that these sites are likely to be only stray fluted points, and therefore are of limited information potential.

Early Archaic (late) - Middle Archaic

Sites associated with the period between 9,000 and 5,000 B.P. can occur in a number of zones. Within the Coastal Plain, there is a tendency for base camps to be associated with fluvial and/or upland swamps. These are best interpreted as either seasonal encampments of the macro-band portion of a broad-based, transient exploitative pattern, or micro-band groups traveling some distance into interfluvial areas. Sites of this period are rare in the outer North Carolina Coastal Plain, although they temporarily become more common during the Morrow Mountain phase (6,500 B.P.) on major drainage ways such as the Cape Fear River. In Florida, sites dating to this time are absent on the Atlantic Coast until around 6,000 to 5,500 B.P. when they appear on the St. Johns River. In South Carolina, sites are reported for the inner Coastal Plain and appear in limited numbers on the outer Coastal Plain during

the entire period. In Georgia, they appear to be completely absent from the Coastal Plain except near the Fall Line and along the lower Savannah River.

It is possible that sites of this time period may lie on the submerged Continental Shelf. If so, these sites would be located along the rivers west of the 9,000 B.P. shoreline and would extend inland to the present coast. Base camps are likely to be located and perhaps preserved along the flood plains of the major river systems. Transient camps would be located in the areas between the rivers. The most probable locations for such sites would be along the southeastern South Carolina and northeastern Georgia coasts, or the same areas as sites of the previous period, and on the Cape Fear River system.

It is also possible that at approximately 7,000 to 6,000 B.P, sea level rise slowed enough for the development of stable estuarine areas and the radiation of associated resources. If so, then shell heaps and/or middens can be expected along portions of the North Carolina, South Carolina and Georgia coasts inside shorelines dating from this 7,000 - 6,000 B.P. period.

Late Archaic - Early Woodland

The 5,000 B.P. time period is when human populations in the South Atlantic began to exploit the Coastal Zone with some intensity. It is possible that this type of exploitative pattern began as early as 6,000 B.P. but there is no terrestrial evidence to support this. This type of adaptation at this time is most strongly manifest along the current coastline in South Carolina, south of the mouth of the Waccamaw and in the Sea Island section of Georgia. It is not until the end of this period that sites are reported for most of the North Carolina and the central Florida coasts. The present south Florida coast shows no habitation until after this period.

Coastal sites of this period might occur in any estuarine setting. The larger sites tend to be associated with the most productive estuaries and adjacent terrestrial zones. That is, in areas where

multiple options are available. Sites in these settings tend to be shell midden base camps. Shell heaps, or more transient sites can be expected in smaller and/or less productive estuaries.

It is highly probable that there are quite a number of sites of the 5,000 B.P. and later period which lie underwater on the inner portion of the inundated Continental Shelf. These sites are most likely to occur off the shore of South Carolina and Georgia, although it would be odd if there were not inundated, littoral-associated sites of this period in the sounds of North Carolina's Outer Banks as this can be assumed to be a coast-wide adaptive phenomenon. All sites dating to the Late Archaic/Early Woodland time periods will be inside or west of the 6,000 - 5,000 B.P. shoreline.

4.2.3.2 Data Evaluation

Known archeological sites along the present coastline were plotted on various scale U.S.G.S. maps. A selected number of these are plotted on Plate 1 (Volume V). Originally it was intended that all sites would be plotted on these maps. However, this soon proved to result in overcrowding since there are a tremendous number of late sites. Selection and reduction of the number of late sites plotted was therefore based on a representation that would provide a general picture of the time periods. All early sites, Paleoindian through Middle Archaic, are plotted where these sites are unequivocably accepted by all or a majority of, the archeologists interviewed.

The data throughout the entire project area and the comparative areas, the Shenandoah Valley and Middle Atlantic, vary in focus and thoroughness. Much of the research on these areas has been unsystematic, focused on specific projects or concentrated in cultural historical as opposed to ecological concerns. There are gaps in both interest and research on specific time periods within specific geographic areas. The best research has developed recently in conjunction with the merging of problem-oriented archeology and cultural resource management investigations. Overall, South Carolina is the most extensively studied area.

The study of the Atlantic Coast of Florida is nearly as thorough. Work in the Georgia Coastal Plain is limited, except in the Sea Island area where some excellent work has been done on the Late Archaic and later horizons. The most poorly covered portion of the project area is the North Carolina Coastal Plain. Within these limitations, the time periods which have received the greatest amount of attention are the Paleoindian, Late Archaic, and post-Late Archaic. Most all the work on the Paleoindian period has focused on fluted point distribution studies and not on site or toolkit examinations. Late Archaic interests have been largely focused on ceramic analysis, degree of interrelatedness between various areas, and trait listing. Recently research interests have focused on dietary concerns, overall adaptation, and climatic changes and cultural responses to these changes. With the exception of South Carolina, there has been little attempt at synthetic statements and almost no interest in process or cultural adaptation. In almost every instance, South Carolina provided the most reliable data. However, in the South Atlantic as well as the Shenandoah Valley and the middle Atlantic, there are many gaps and a considerable amount of work remains to be accomplished.

The overall data base developed in this study may be evaluated as being of only fair quality. In general, however, it is doubted that the picture developed for Florida, Georgia, and South Carolina will be substantially changed by future research. In North Carolina it may be expected that the understanding of Middle and Late Archaic occupations of the coast and Coastal Plain will be somewhat expanded -- very likely in a manner consistent with findings elsewhere in the South Atlantic coastal area. In spite of limitations, the data base may be regarded as adequate for the development of useful predictive models. Archeological data from the submerged Continental Shelf will be the only test of the applicability of the models to that area.

4.2.3.3 Reliability of the Predictive Model

Determining the reliability of the model for predicting the location of archeological data on the Continental Shelf is difficult

for two basic reasons. First, the model depends totally on terrestrially gathered archeological data, and second, data coverage for all areas is not equal. These problems, at present, cannot be overcome. However, there is at least one factor which adds strength to the model: the model has evolved from the predictive models developed for the Paleo-indian through Woodland periods in the Middle Atlantic by Gardner (1974, 1976, 1977, 1978, 1979). Independent formulation of similar models was presented by a number of professionals in the cultural history discussion (Section 4.2.1) and in some cases were actual tests of Gardner's statements. Research associated with this investigation can also be considered as a partial test. Since the inundated portions of the Continental Shelf are but extensions of the Coastal Plain there seems to be no logical reason why an extension of the current Coastal Plain site prediction model is not valid. Figures 4.2.9 - 4.2.14 show what appears to be a clear-cut west-to-east movement through time from the interior portions of the continent to the current shoreline. This transition supports the major tenets of the model. The major difficulties will be encountered in locating sites because of the problems inherent in reconstructing environmental specifics such as the locations of rivers, streams, springs, sinkholes, fluvial and upland swamps, and estuarine settings in an environment which lies under water, mud, and sand.

It cannot be denied that there were probably people on the inundated portions of the Continental Shelf of southeastern North America. It has been noted at what periods this might occur, the types of sites which might be expected, and, in general, where these sites would occur. It could be argued that since the advent of man in the South Atlantic area, he has always lived just in front of an advancing shoreline, exploiting what littoral and estuarine resources were available. There is no way to refute this argument short of overcoming the technical difficulties and conducting field surveys. All of the existing terrestrial evidence supports the settlement model described herein. The model therefore appears to be reliable. Reliability does not equate with irrefutability and a predictive model is, at best, a probability statement.

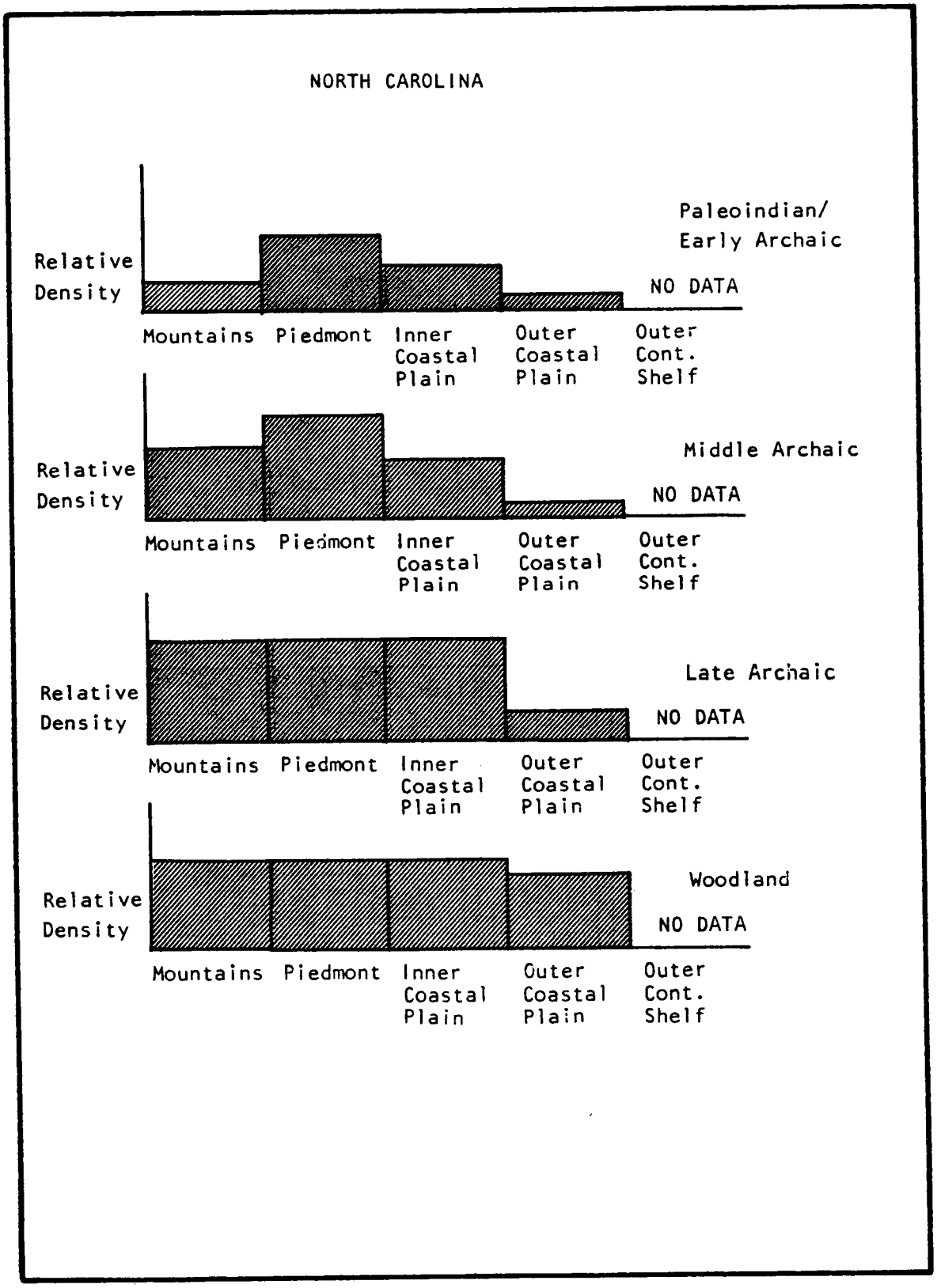


Figure 4.2.9 Relative Prehistoric Site Densities by Time Period and Physiographic Zone: South Atlantic

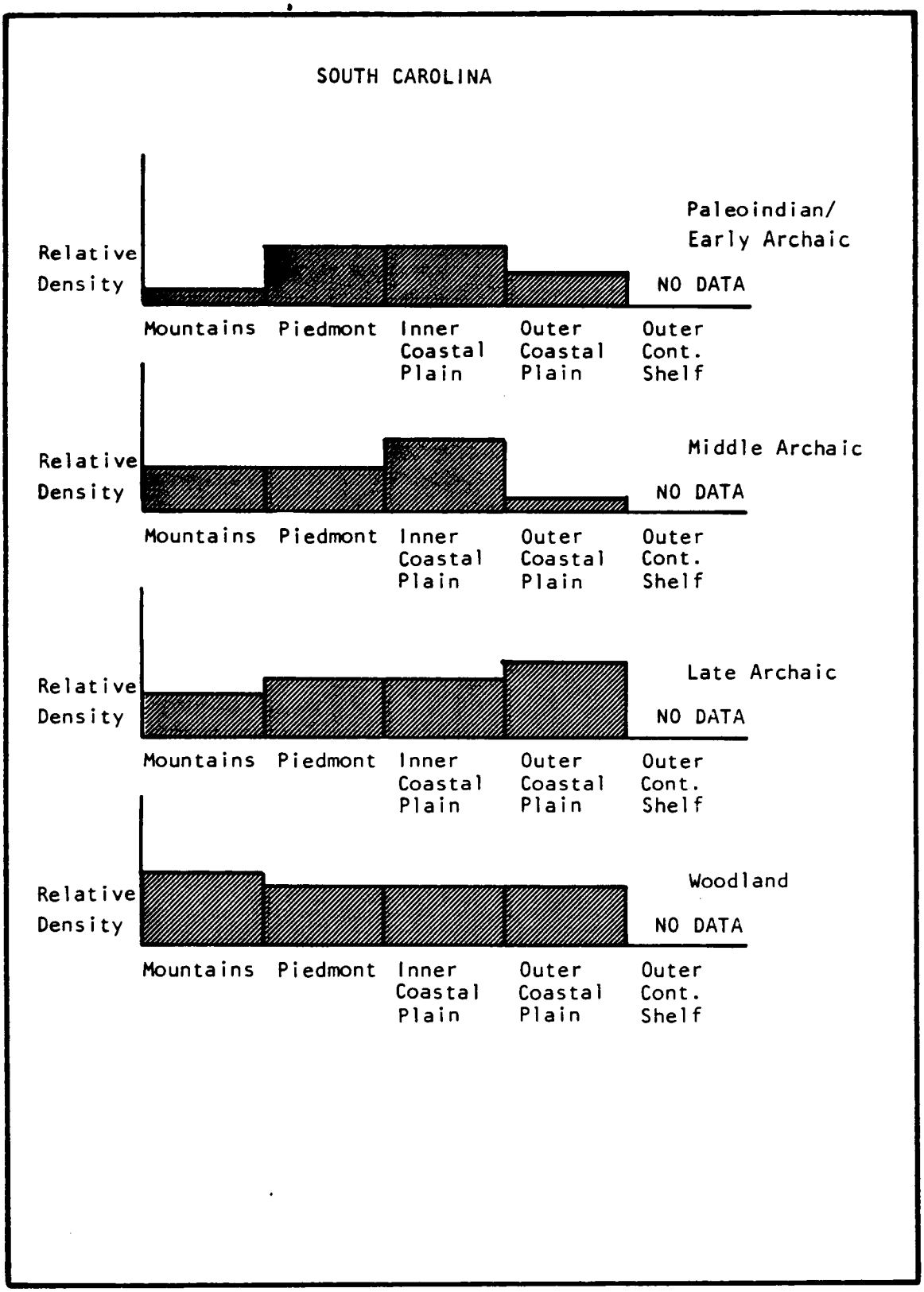
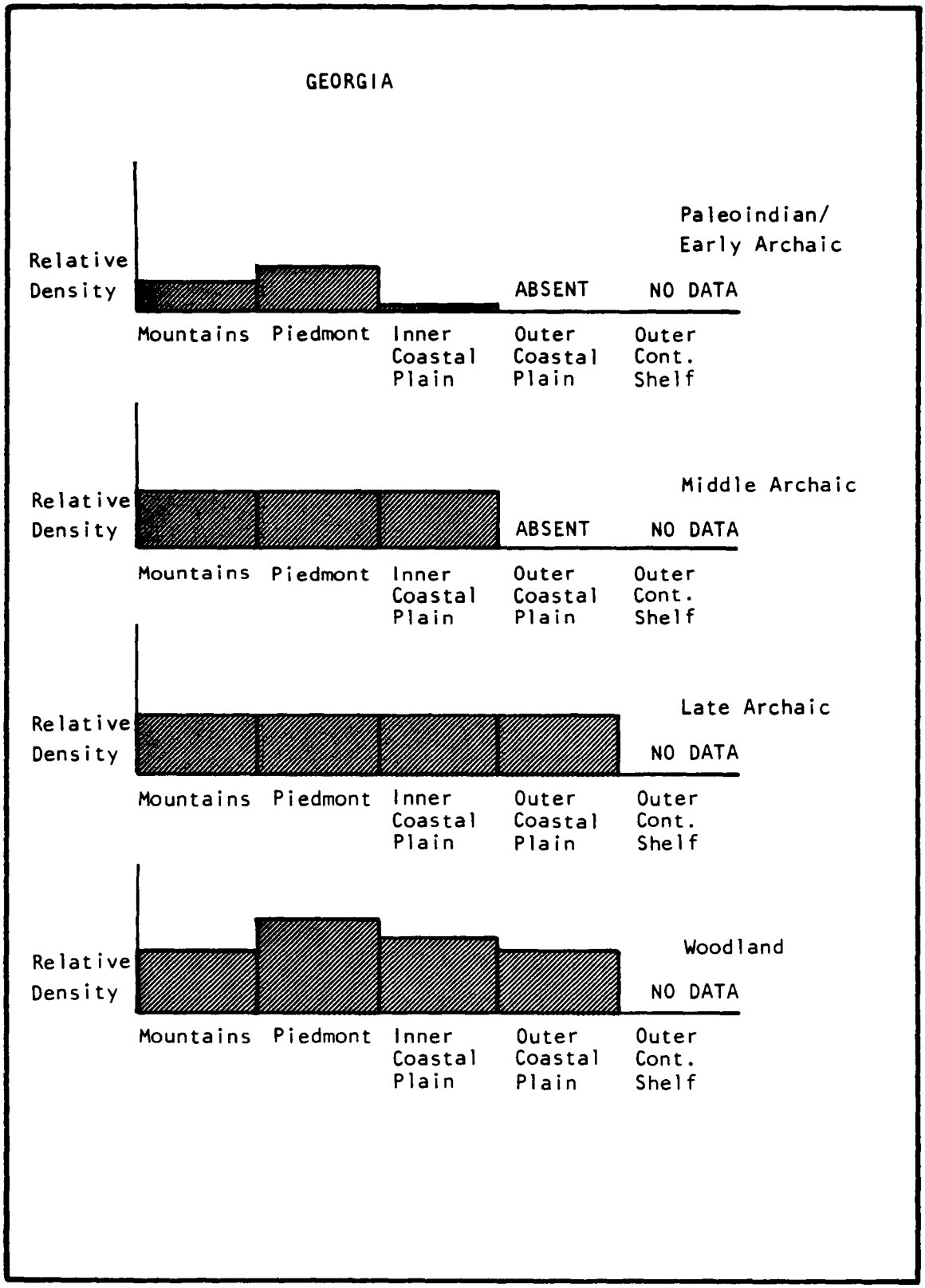


Figure 4.2.9 Cont'd



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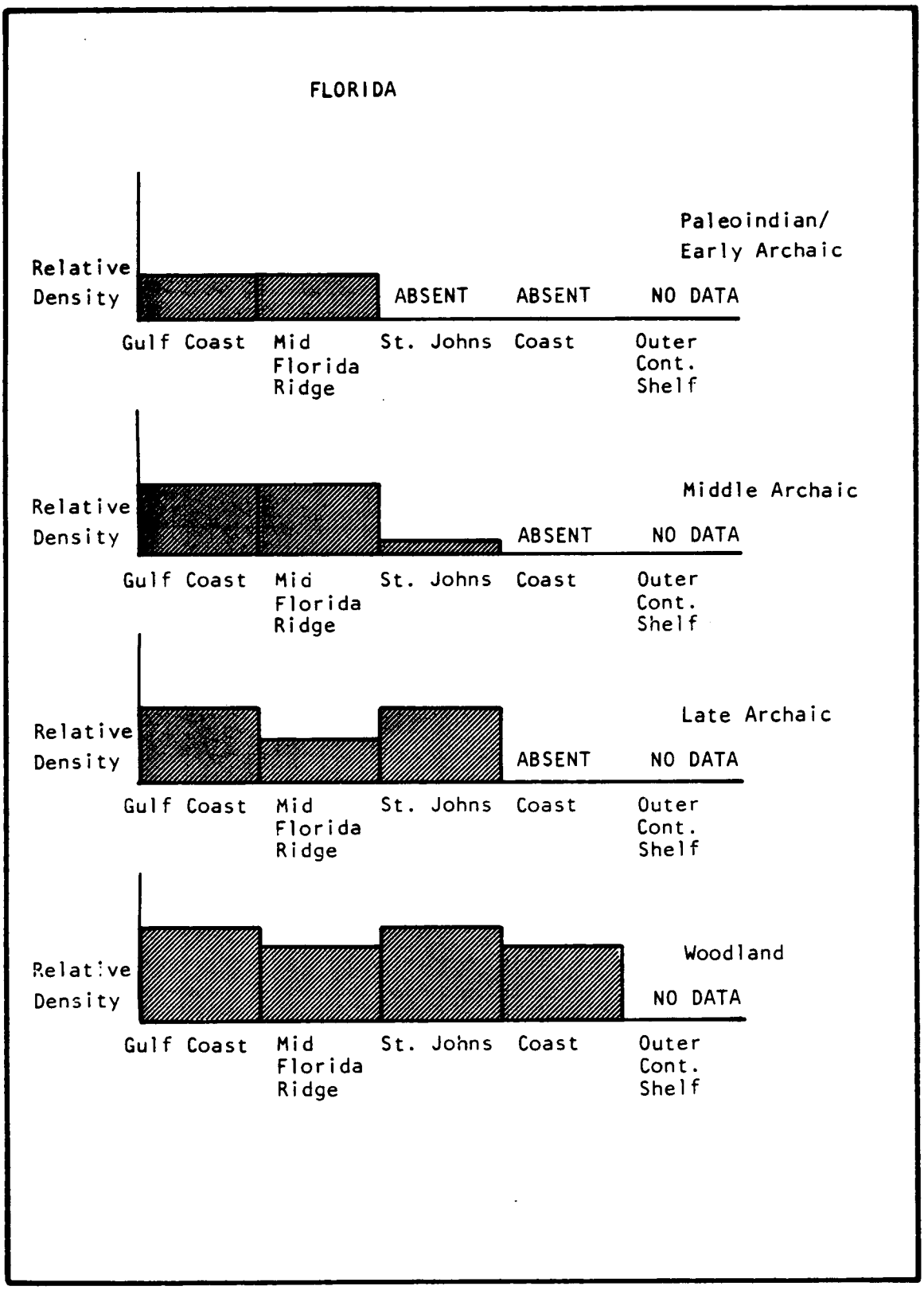

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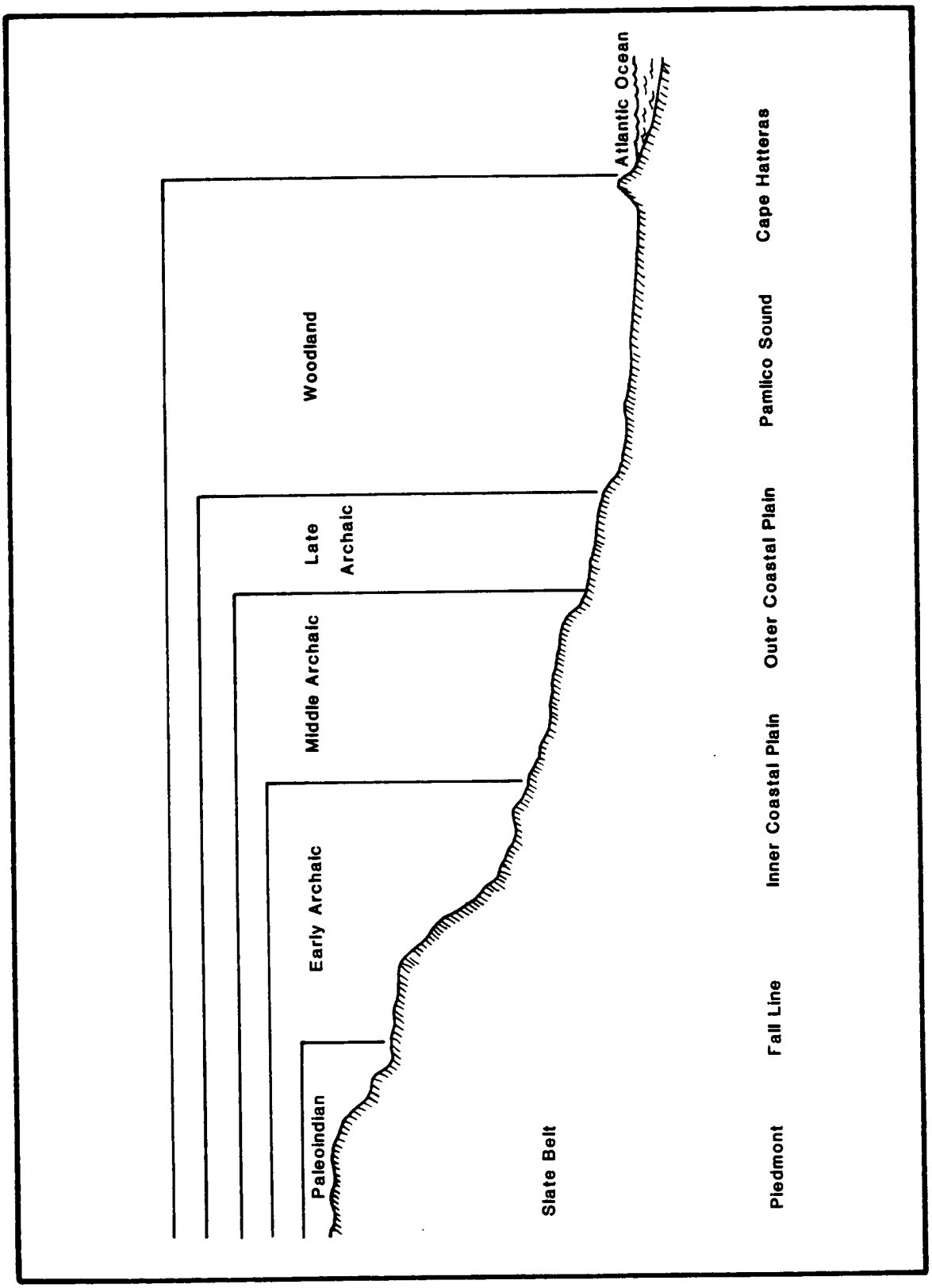

Figure 4.2.10 Schematic Cross Section - Northern North Carolina Piedmont to Atlantic Ocean Showing Approximate Limits of Site Distribution by Periods

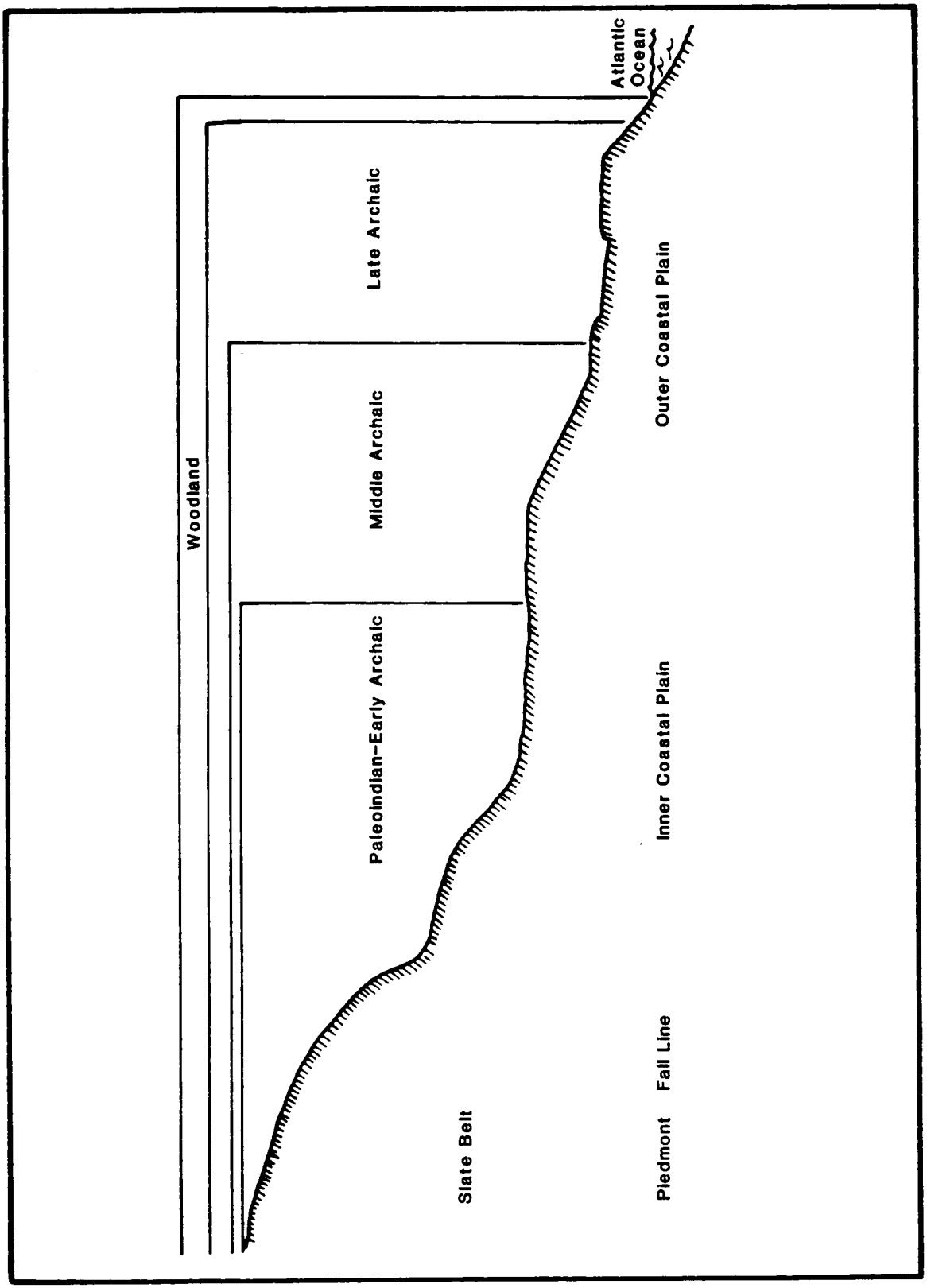

Figure 4.2.11 Schematic Cross Section - Carolina Beach to Charlotte, North Carolina Showing Approximate Limits of Site Distribution by Periods

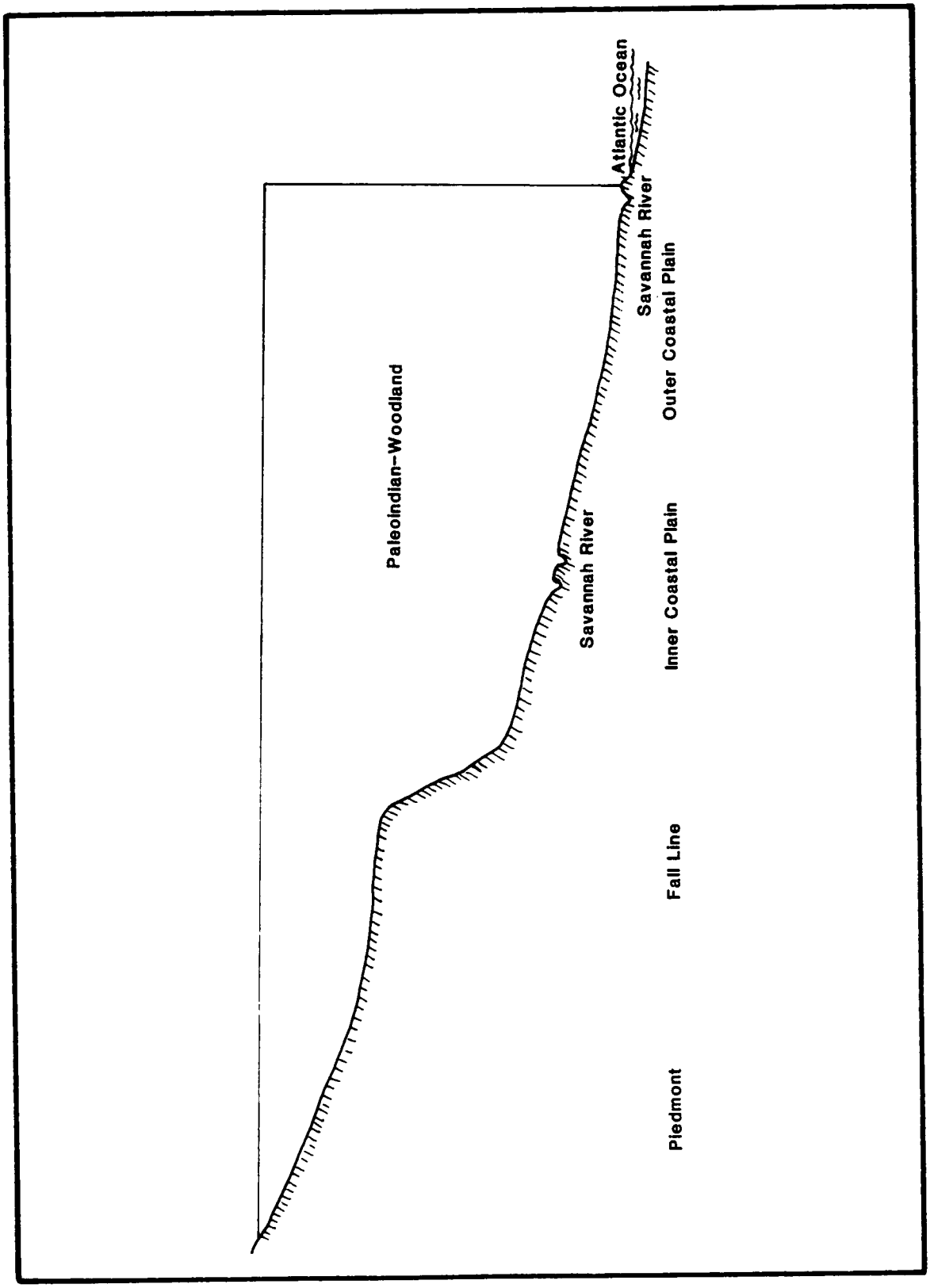

Figure 4.2.12 Schematic Cross Section - Tybee Island (Mouth of Savannah River) through Augusta to Anderson, South Carolina Showing Approximate Limits of Site Distribution by Periods

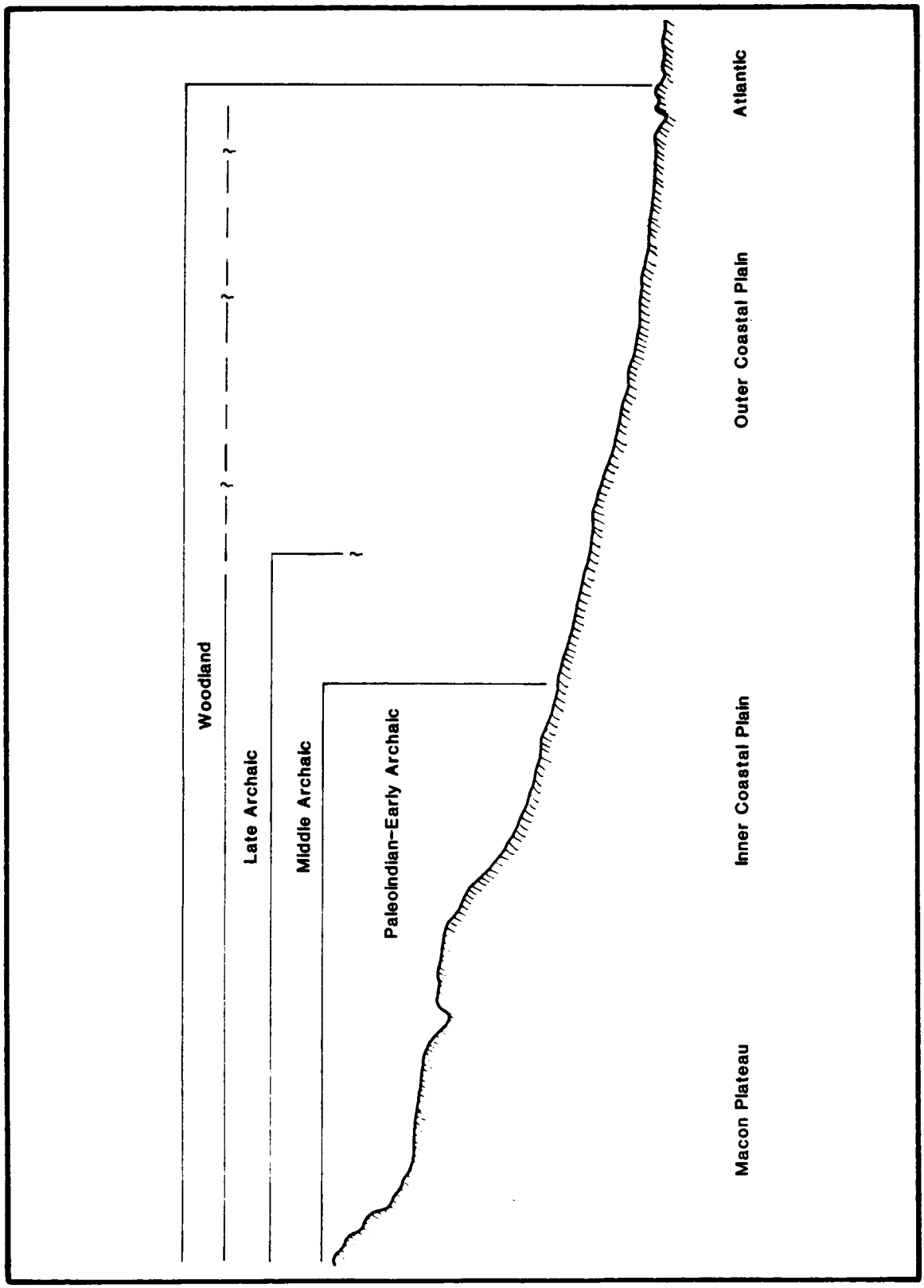

Figure 4.2.13 Schematic Cross Section - Brunswick to Macon, Georgia Showing Approximate Limits of Site Distribution by Periods

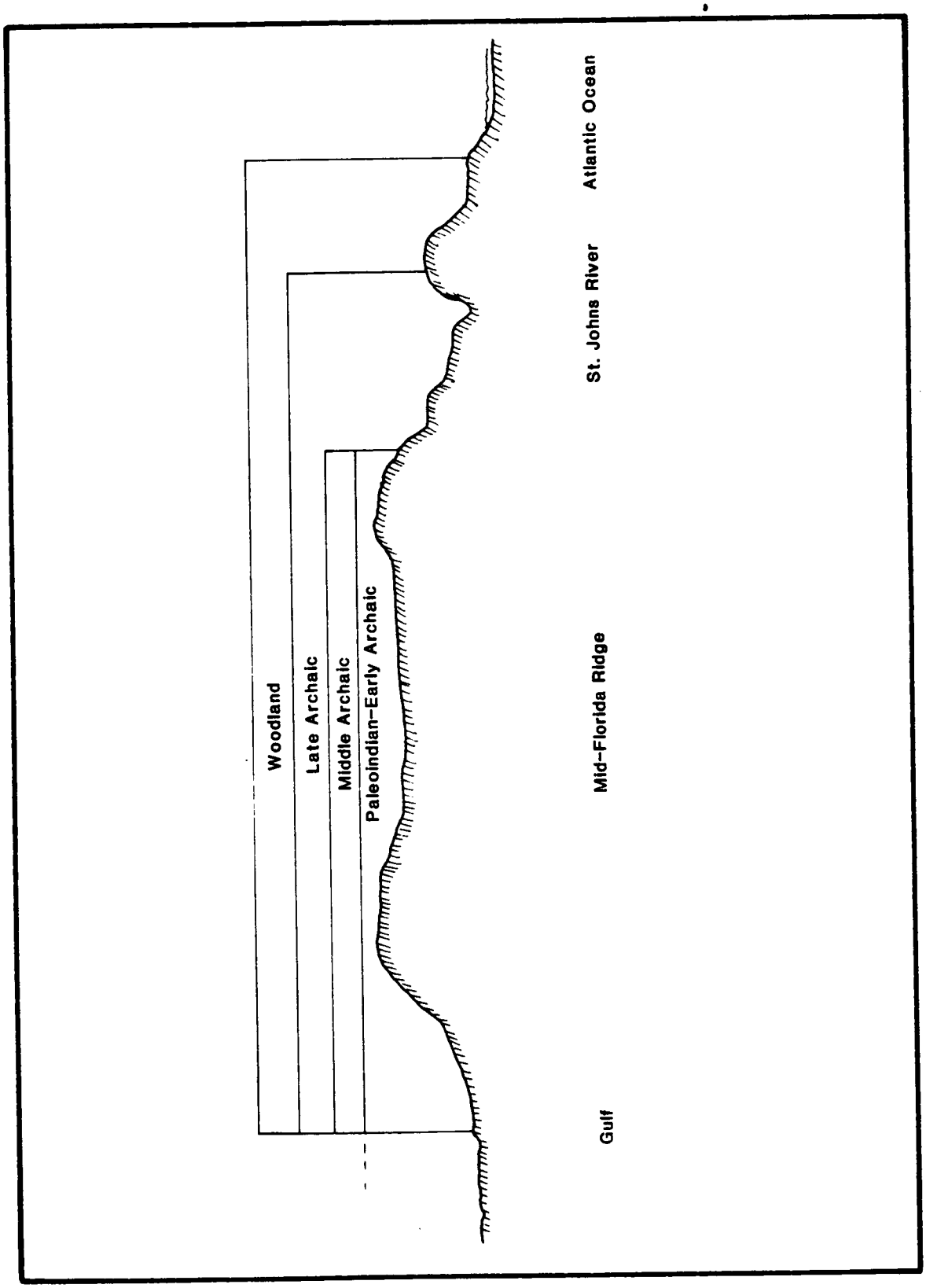

Figure 4.2.14 Schematic Cross Section - Central Florida Gulf of Mexico to Atlantic Ocean Showing Approximate Limits of Site Distribution by Periods

4.2.4 Sensitivity Zones

Three sensitivity zones, or areas on the submerged Continental Shelf which are most likely to contain submerged prehistoric archeological sites have been defined and placed on the project maps (Plate 1). These zones are derived from the previously discussed (Section 4.2.3) predictive model. The three zones range from the most sensitive (most likely to contain archeological sites) to the least sensitive (areas where archeological sites are least likely to be present). Zone 1 has the highest probability of site occurrence, Zone 2 the next highest, and Zone 3 the least.

In general, Zone 1 includes the area from the 8,000 B.P. shoreline to the present shoreline, except for the region between Charleston, South Carolina and the Altamaha River where it extends out to the 12,000 B.P. shoreline. The latter portion takes into account the higher probability of Paleoindian and Early Archaic period sites occurring on the submerged river systems in that portion of South Carolina and Georgia because of nearness to the Allendale chert outcrops. There is a fairly high probability that these systems transported suitable lithic materials from the Allendale chert outcrops. The area west of the 8,000 B.P. shoreline covers what would have been essentially at least one-half of the total range of land available for habitation during the Paleoindian period, and at least a portion of that available for use during the Early Archaic and early parts of the Middle Archaic. The 8,000 B.P. shoreline takes into account the increased presence of prehistoric populations on the Coastal Plain and operates on the assumption that by this period, at least part of their seasonal rounds could have extended out to that portion of the available landmass which is now submerged. This shoreline includes within it the possible occurrence of 6,000 - 5,000 B.P. littoral adaptations as well as sites from all time periods which might be submerged in the nearshore environment. Zone 1 is also the zone in which the potential impact of man's activities on archeological sites is highest and the zone which should be subjected to the greatest amount of cultural resource management control.

The outer limit of Zone 2 is the 12,000 B.P. shoreline. The inner limit is the 8,000 B.P. shoreline. With the exception of the portion of the study area between Charleston and the Altamaha River mouth, which lies in Zone 1, this zone is considered to be of medium to low probability of containing prehistoric archeological sites. For reasons stated in the predictive model, it is possible, but not highly probable, that Paleoindian through terminal Early Archaic sites may occur in Zone 2. These sites, if they are present, are likely to be small, transitory and more often than not represented by single or relatively small numbers of artifacts. As such, they would be extremely difficult to recognize, much less manage.

Zone 3 extends from the 12,000 B.P. to the 16,000 B.P. shorelines. The probability of archeological sites occurring in this zone is considered extremely low. The only possible sites which could occur are pre-Paleoindian. If these sites occur, they are as likely to occur in Zones 1 and 2 as they are in Zone 3.

All zones terminate around the south central portion of Florida because there is no data to suggest people ever inhabited this area until very late in the prehistoric period. All zones take into account bottom disturbances (scoured bottoms) which could be discerned from available maps. Although this project was limited to the period before 2,000 B.P., it should be noted that the current shoreline and the immediate near-shore environment contains abundant post-2,000 B.P. archeological sites which will be subjected to impact from any activity directly or indirectly connected with oil exploration and transportation. These sites should be considered in any future management plans.

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*All of these people have spent considerable time examining the material culture remains of the aboriginal inhabitants of coastal Virginia and North Carolina.

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