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An Archeological Survey of the Interstate 77 Route in the South Carolina Piedmont

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AN ARCHEOLOGICAL SURVEY OF THE INTERSTATE 77 ROUTE IN THE SOUTH CAROLINA PIEDMONT

by

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MANAGEMENT SUMMARY

The projected Interstate 77 route between Columbia and Rock Hill, South Carolina is one of the last remaining Interstate routes to be built in South Carolina. In the fall and winter of 1975-76, John H. House and David L. Ballenger of the Institute of Archeology and Anthropology, University of South Carolina conducted a survey of the archeological resources in the portion of the I-77 corridor between Blythewood and Rock Hill. This portion of the route is located in Richland, Fairfield, Chester, and York Counties in the Piedmont portion of South Carolina. This research was funded by the South Carolina Highway Department in compliance with the National Environmental Policy Act of 1969 (NEPA) and Executive Order 11593.

An archeological survey of the Columbia to Rock Hill route was recommended by the Institute of Archeology and Anthropology in 1971. By June 1975 when the present survey was authorized, however, construction had already begun on portions of the route in Richland, Fairfield, and York Counties. Though the present survey took place after the authorization of the I-77 project, it is intended to fulfill the same planning needs usually served by environmental impact surveys.

The I-77 corridor is located in the Piedmont portion of South Carolina, entirely within a hilly upland area bounded by the Broad River on the west and the Catawba-Wateree River on the east. The region of the I-77 corridor is known to have been occupied by prehistoric Indians as early as 12,000 years ago. Settlement of the corridor area by persons of European and African descent began in the mid-eighteenth century and the region became a major cotton-producing area of the South in the early nineteenth century.

In planning the I-77 archeological survey, it was judged that the information requirements of the relevant legislation would be best fulfilled by a program of intensive sampling of the corridor rather than a superficial attempt to survey the whole corridor. Accordingly, three data gathering strategies were employed in the field: (1) intensive survey of 10-acre quadrats comprising a 20% stratified random sample of the corridor, (2) investigation of the margins of all of the streams crossed by the I-77 corridor, and (3) reconnaissance of selected additional portions of the corridor. To aid in assessing the significance of the archeological resources in the corridor, a number of problem domains in the prehistoric and historical archeology of the region were identified prior to the survey. The field methods subsequently used during the survey were designed to generate archeological data relevant to these problem domains.

The I-77 corridor was found to be, for the most part, heavily wooded and difficult to survey. In order to better evaluate the survey results, the relative visibility of the archeological record in each survey unit was ranked on the basis of observations made in the field and experiments in subsurface investigation as a survey technique were carried out.

A total of 59 loci were designated as archeological sites. Fifteen of these had early historic components; 51 had prehistoric aboriginal components. Of these, 41 prehistoric and all 15 historic components were within the direct impact zone of the project; the remainder were immediately outside the corridor.

Analysis of temporally diagnostic prehistoric artifacts recovered by the survey indicates that the prehistoric remains in the corridor are overwhelmingly attributable to occupation during the Archaic Period, ca. 8000-1000 B.C. A single late prehistoric or Mississippian component was, however, encountered. The prehistoric artifacts and debitage and environmental data pertinent to each prehistoric site were analyzed in terms of alternative hypothesized patterns of prehistoric utilization of the inter-riverine Piedmont. Most of the prehistoric sites are low density artifact scatters which possibly represent temporary camps for hunting white-tailed deer. A few possible Archaic habitation sites and loci for quarrying of quartz for stone tool manufacture were also distinguished. It was noted that prehistoric sites were not confined to a single type of environment within the corridor and, while sites were not significantly associated with streams in general, those sites that were located on streams, seemed to be located on larger, rather than smaller, streams. The I-77 data taken as a whole suggest that Archaic occupation in this portion of the Piedmont probably centered in river valleys but that some prolonged--perhaps seasonal--habitation occurred in larger upland creek valleys and that a wide range of resources was probably exploited in the inter-riverine zones. The I-77 data set is, however, limited and these hypotheses remain to be more conclusively tested in future research in the Piedmont.

The I-77 survey failed to locate any eighteenth century historic sites in the corridor but encountered numerous sites representing occupation during the early decades of the nineteenth century when labor-intensive cotton monoculture was prevalent in the region. The survey also encountered abundant evidence of both intentional and unintentional alteration of the landscape by nineteenth century agricultural practices: terraces, rock piles, hillside ditches, gullies, and replacement of the oak-hickory climax by pines.

Extrapolating from the survey data, it is estimated that roughly 200 prehistoric components and 50 early historic components will be destroyed by construction of the Blythewood to Rock Hill route. These direct impacts, however, will probably be exceeded by indirect impacts in the form of accelerated development of this now relatively uninhabited and inaccessible area of the South Carolina Piedmont. The analysis of the data generated by the I-77 survey strongly indicates that the prehistoric and historical archeological remains in the corridor can be considered to have a highly significant research potential if studied in terms of the Institute of Archeology and Anthropology's long-term goals in understanding prehistoric and early historic human lifeways in the Piedmont.

By virtue of their evident scientific research potential, certain of the archeological sites in the Interstate 77 corridor could be considered eligible for placement on the National Register of Historic Places. None of these sites, however, are recommended at this time for placement on the National Register. The significance of the sites is primarily scientific and best used in a program of intensive archeological investigation prior to the projected highway construction. A single minor structural change in the existing plans is recommended. The major cultural resource management recommendation resulting from the I-77 survey is a program of archeological research to mitigate the impact of the construction of Interstate 77 on the archeological resource base of the region. The recommended program is threefold: (1) extensive excavation at a number of prehistoric sites in the

corridor, (2) excavation and mapping at two early historic house places in the corridor, and (3) a multidisciplinary investigation of floodplain sediments along major creeks in the corridor to determine the feasibility of recovering paleo-environmental data for the Holocene. The combined budgets for this recommended program of research total $70,365. It is emphasized that construction of the remaining portions of I-77 is eminent and that it is urgent that this proposed research be authorized and funded at the earliest possible date.

INTRODUCTION

Background to the Interstate 77 Archeological Survey

The projected Interstate 77 route between Columbia and Rock Hill, South Carolina is one of the last remaining Interstate routes to be built in South Carolina. Between September 22, 1975 and January 14, 1976, the writers, John H. House and David L. Ballenger of the Institute of Archeology and Anthropology, University of South Carolina, Columbia, conducted a survey of the archeological resources in the 50-mile portion of the I-77 corridor between Blythewood and Rock Hill. This portion of the route is located in Richland, Fairfield, Chester, and York Counties in the Piedmont portion of South Carolina (Fig. 1). This archeological research was funded by the South Carolina Highway Department in compliance with the National Environmental Policy Act of 1969 (NEPA) and Executive Order 11593.

The need for an archeological survey of the I-77 corridor has been under consideration for some years. Under contract with the South Carolina Highway Department, Systems Design Concepts, Incorporated, a Washington D.C. consulting firm, undertook a broad-based engineering, economic, and environmental study of the proposed Interstate 77 route, submitting its report in 1972 (Systems Design Concepts, Inc. 1972). At the request of Systems Design Concepts, Inc., Thomas M. Ryan of the Institute of Archeology and Anthropology conducted a review of extant archeological site records for the corridor area and an evaluation of the need for an archeological survey in the corridor. Ryan (1971a) recommended an intensive survey in the right-of-way and, prior to construction, some excavation at sites in the corridor.

The present survey was provided for by an agreement made in June 1975, between the South Carolina Highway Department and the Institute. By the time of this agreement, however, the Columbia to Blythewood portion of the I-77 route was approaching completion and, by early fall 1975, construction was beginning on two additional segments of the route; from the Blythewood interchange to SC 34 and from the York-Chester County line north to Rock Hill. Portions of both segments were surveyed by us immediately prior to construction. In the early spring 1976, shortly after completion of the fieldwork, construction began on still another segment, in Chester County, from SC 9 north to the York County line. At the time of this writing, then, a total of 19 of the 50 miles of the Blythewood to Rock Hill route were already under construction without any mitigation-stage archeological research having taken place. The 31 miles remaining constitute only a remnant of the area recommended for archeological study by Ryan in 1971.

The Interstate 77 Survey: A Sketch

The goals of the present survey are outlined in the proposal made by the Institute to the South Carolina Highway Department in June 1975. The purpose of the survey was to inventory and evaluate the significance of the archeological resources in the Interstate corridor in accordance with NEPA and relevant guidelines. Though this survey took place after the authorization of the Interstate 77 route, it was intended to serve the same basic planning needs usually served by archeological Environmental Impact Statements. Particularly, it was anticipated in the agreement that the survey

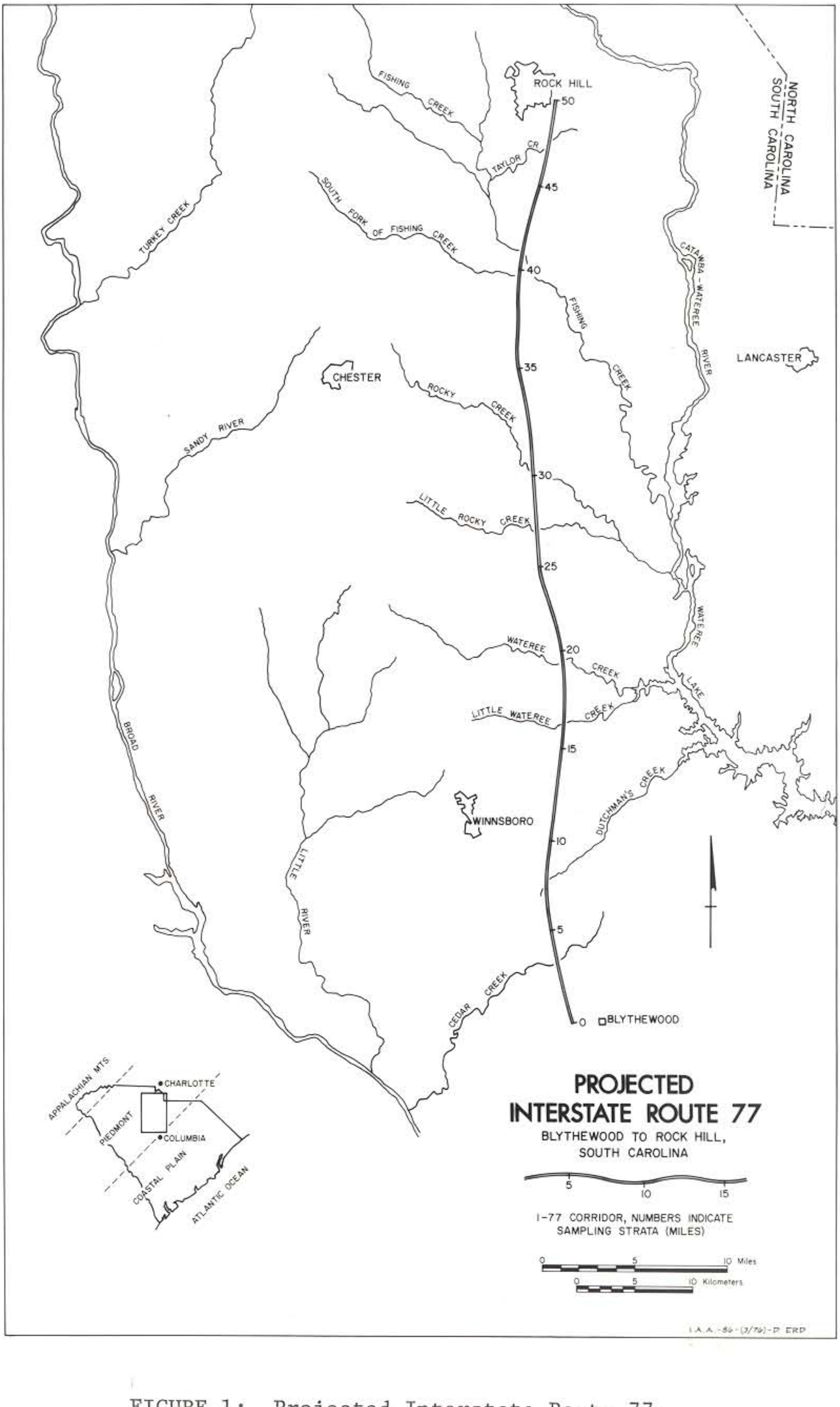

FIGURE 1: Projected Interstate Route 77.

would result in proposals for mitigation-stage research in the corridor to be funded by monies transferred by the Federal government to the State of South Carolina under the provisions of the Moss-Bennett Act of 1974.

The Interstate 77 survey is the first major research project undertaken by the Highway Archeology Program of the Institute in the Piedmont. It is also one of our first major attempts to operationalize the research strategies for contract archeology set forth in the General Research Design for Highway Archeology in South Carolina (Goodyear 1975a).

Very little previous archeological research has been carried out in the South Carolina Piedmont and no comparable archeological survey has ever been done in the region. Therefore, we were almost in terra incognita in terms of knowing the kinds of data and survey conditions we would encounter. The first few weeks of fieldwork, accordingly proceeded slowly and cautiously as experiments in survey technique were carried out. For these reasons--and the fearsome nature of much of the terrain surveyed--the fieldwork required much more time than was originally anticipated. In addition, considerable time was spent prior to the fieldwork and during the analysis and writing phase of the research reviewing background materials pertinent to the environment, history, and prehistory of the I-77 corridor area. The completion of this research then, has taken a long time and represents a major investment of the resources of the Highway Archeology Program of the Institute.

We feel that this time and effort have been justified. The Institute of Archeology and Anthropology's public trust of conserving the archeological heritage of South Carolina and meaningfully contributing to knowledge of the State's prehistoric and historic past required at this time the kind of carefully thought out, indepth study in the Piedmont that we have attempted here. In addition, we felt that this study would allow future archeological research in the Piedmont, including that conducted by the Highway Archeology Program of the Institute, to proceed much more efficiently and productively.

The cumulative aspect of the Highway Archeology Program's work in the Piedmont was realized almost immediately. As the fieldwork on I-77 was being completed, Albert C. Goodyear and Neal Ackerly of the Institute began the survey of the proposed Laurens-Anderson Connector Route in the western portion of the South Carolina Piedmont. Learning from our survey experience on I-77, Goodyear and Ackerly were able to design a more efficient and productive survey methodology for the Laurens-Anderson research methodology. The fieldwork on Laurens-Anderson is now complete and the ongoing analysis of the data is also building on the results of the I-77 survey, using the same artifact typology and operationalizing many of the same archeological variables. Another factor making these two surveys complementary is the fact that while the I-77 route runs north-south up the heart of a rather environmentally-uniform inter-riverine zone, the Laurens-Anderson route goes "across the grain," running east-west and cross-cutting the environmental diversity in the South Carolina Piedmont.

How to Use this Report

This report was written to fulfill diverse information needs. The South Carolina Highway Department will be especially interested in the estimated impacts of the I-77 project on the archeological resources of the region and in the scope and cost of recommended mitigation. The archeological community and others interested in prehistory and history in South Carolina will be more interested in the substantive research results of the project. And archeologists confronted with the need to plan and budget future archeological surveys in similar environments will be interested in the successes and shortcomings of the methods used by the I-77 survey.

In a larger sense, however, this report forms a whole. The background information and analyses of data serve to document the research potential and significance of the resources and justify the mitigation research proposal and budgets presented in the final chapter. The "Management Summary" at the very beginning of this report attempts a concise summary of the goals, results and recommendations of the I-77 survey for convenient reference.

A brief review of the organization of this report is in order:

Sections 2 and 3 give general background information on the environment of the region, previous archeological research in the Piedmont and a summary of our knowledge of its history and prehistory. These sections will be primarily of interest to archeologists.

Section 4, "Methods" will also be primarily of interest to the archeological community. Archeologists interested in critically evaluating the I-77 research results or planning archeological surveys in similar environments will be especially interested in Section 4. The I-77 survey methods are evaluated in Section 6 in light of our experience in the field.

Section 5 was written with the information needs of the South Carolina Highway Department and other planners in mind. This chapter provides a succinct summary of the results of the survey in terms of numbers and kinds of sites found and their relation to the project impact zone.

Sections 7 through 11 present the substantive research results of the I-77 survey. Most of the raw data upon which these discussions are based are presented in the Appendixes at the rear of the report.

Sections 12 and 13 are written to serve the needs of both the sponsor and any archeologists who may become involved in cultural resource management planning on this or similar projects in the future. These Sections, however, may also be of interest to the larger archeological community because of our discussion of problem domains and suggested strategies for future research in the region. Project impacts are estimated in Section 12 and assessments are made of the significance of the archeological resources in the project impact zones. In the final section, goals for cultural resource management and designs for mitigation stage research are recommended. The final portion of this section consists of proposed budgets for the recommended research.

ENVIRONMENTAL BACKGROUND

Environments and Archeological Research

A consideration of the environmental background of human adaptation is basic to modern anthropological and archeological research. No in-depth study of environments and environmental change relevant to human adaptation in the Piedmont has ever been carried out. To begin remedying this, we have assembled some basic environmental information for the region of the Interstate 77 corridor. The following discussion of environments is quite general and preliminary and contains some conspicuous gaps but, hopefully, it is the beginning of a cumulative process of assembling environmental information basic to formulating testable models of prehistoric and historic human adaptations to the South Carolina Piedmont.

Physiography

The portion of the I-77 route investigated lies entirely within the Piedmont physiographic province of North America. The boundary between the Piedmont province and the Coastal Plain to the south and east is the Fall Line, where metamorphic rocks of Paleozoic age dip under the Cretaceous and more recent formations of the Coastal Plain. The boundary between the Piedmont and the mountainous Blue Ridge province to the west is approximately where the metamorphic rocks of the Piedmont end against upthrust Pre-Cambrian formations. The Piedmont in South Carolina is an area of rolling hills with elevations ranging from about 500 feet at the Fall Line to about 1000 feet at the foot of the mountains to the west.

The most conspicous topographic features of the Piedmont are major rivers which have their headwaters in the Appalachian Mountains, cross-cut the Piedmont from northwest to southeast, and enter the Atlantic Coastal Plain at the Fall Line. The Blythewood to Rock Hill segment of the I-77 route lies within an inter-riverine portion of the Piedmont between the Broad River to the west and the Catawba-Wateree River to the east. The southernmost part of the route is about 10 miles from the Broad and about twenty miles from the Wateree; the northern end of the route at Rock Hill is, conversely, about seven miles from the Catawba (Wateree) and about thirty miles from the Broad. The outstanding topographic feature of the immediate area of the I-77 corridor is the divide between the Broad and Wateree systems. This divide roughly parallels the route (Systems Design Concepts, Inc. 1972: 64).

The topography in the corridor area is dominated by a well defined dendritic drainage pattern (Figs. 2A and 2B). Extensive gently rolling to almost flat areas are present in some parts of this region. In other parts, the landscape consists of a series of ridges separated by ravines as much as 200 feet deep. This inter-riverine zone is drained by a series of large creeks which have floodplains up to one-half mile wide. On the southern end of the corridor, Cedar Creek flows southwest toward the Broad River. Major streams draining the remainder of the corridor flow generally east to southeast toward the Catawba-Wateree River. The most important of these streams crossed by the projected I-77 route are, from south to north: Dutchman's Creek, Little Wateree Creek, Big Wateree Creek, Little Rocky Creek, Rocky Creek, South Fork of Fishing Creek, and Fishing Creek (Fig. 1).

FIGURE 2A: Small creek (rank 2 drainage) north of Unit 36-II.

FIGURE 2B: View of Big Wateree Creek from north bank (rank 4 drainage).

Geology and Petrology

The bedrock geology and geologic history of the Piedmont in South Carolina have been summarized by Overstreet and Bell (1965). Their map of upland South Carolina (Overstreet and Bell 1965, Plate 1) shows sedimentary rocks of Mesozoic and younger age and metamorphic and igneous rocks of Paleolozoic and, possibly, Pre-Cambrian age generally distributed in northeast tending belts. These belts are considered to represent major overthrust fault blocks. Six of these belts are underlain by crystalline rocks. From southeast to northwest, these are the Carolina slate belt, Charlotte belt, Kings Mountain belt, Inner Piedmont belt, Brevard belt, and Blue Ridge belt.

The metamorphic rocks of the Piedmont in South Carolina are inferred by Overstreet and Bell (1965: 9) to have originated as three sequences of sedimentary deposition separated by two erosional unconformities. All three sequences were originally composed of shale; greywacke; felsic and mafic tuffaceous shale; tuff and lava flows, containing thin and sparsely interbedded conglomerate; sandstone; and limestone. Each sequence was deposited in a subsiding basin, and the successive basins of deposition were superimposed in the South Carolina Piedmont.

Most of the rocks of the Piedmont are gneiss and schist with some quartzite and marble. The southernmost portion of the Blythewood to Rock Hill route lies in the Carolina slate belt and crosses extensive areas of argillite, amphibolite and Muscovite schist, granite, and granitoid gneiss. The northern portion of the route lies within the Charlotte belt and crosses extensive areas of mica gneiss. Also in the northern portion of the route are some granite occurrences and mafic dike swarms containing basalt, andesite, pyroxenite, gabbro and other igneous rocks. Veins of translucent white or clear quartz are found in rocks throughout the Piedmont. The veins range from a few inches to several feet in thickness. Since this quartz is much more resistant to weathering than surrounding rock, residual quartz chunks are common in the soil mantle in numerous localized areas. Pleistocene alluvial terraces occupy extensive areas along the Catawba and Broad Rivers and extend up many of the larger creek valleys.

The petrology of the Piedmont area is significant to understanding past human adaptations in a number of ways. First, some of the available lithic rocks of the region served as raw materials for chipped and ground stone tools during prehistoric times. The raw materials used prehistorically in the I-77 corridor area are discussed in Chapter 10. Rocks occurring near the surface form the parent material of the soils of the Piedmont and the soils, are thus a factor determining the naturally-occurring biotic resources of the region. The fertility, pH, and texture of the soils also determine the feasibility of agriculture in various locations, given varying cultigens and agricultural technologies.

Climate

This brief review of the climate in the survey area is based on Kronberg (1959). Temperatures in north central South Carolina are characterized by mean daytime highs of approximately 90^{o} F in the summer and 56^{o} F in the winter. The mean annual precipitation is about 46 inches. The frost-freee growing season for the Piedmont is variable, lying between the average of 199 days for

the mountains and the 257 day average for the southern part of the Coastal Plain. Some areas of the Piedmont have unusually long growing seasons because of drainage of cold, dense air down slopes into valleys.

Summers are warm and humid and highs greater than 100° F frequently occur. One to four cold waves take place every winter with night temperatures of 20° F or lower. Temperatures of 0° F or below, however, are extremely uncommon.

Summer rains occur most frequently in the form of local thunder storms. Autumn, on the other hand is usually rather dry. Winter and spring rains are increased by the upslope of the land where lifting of moist air currents from the southeast increases condensation and precipitation. Snowfall in the Piedmont averages about three inches annually. Dry periods affecting plant growth occur almost every year but significant droughts occur infrequently.

Flood-producing rains occur primarily from early spring through late fall. Flash floods causing loss of human life and significant damage have occurred frequently during this century. Serious floods occur on the average of every eight to ten years. It should be borne in mind, however, that severe floods were probably much less frequent in prehistoric times when Piedmont watersheds were protected by dense forest cover.

Soils

Soil is an extremely important environmental variable in the study of human adaptation. The writers were not, however, successful in assembling any very useful information on soils in the Piedmont at this time. Sources of useful information on soils do presumably exist in the literature of agriculture for the region and, hopefully, this serious gap in the present discussion of Piedmont environment will soon be remedied in a future archeological report.

Vegetation

The entire South Carolina Piedmont is included by Braun (1950) and Küchler (1964) in the Oak-Pine forest region. The following description of this region is based, unless otherwise noted, on Braun (1950), and Oosting (1942). Oosting's article is chiefly based on data from the Duke University forest study tract in North Carolina.

The Oak-Pine forest region is considered by Braun (1950) to be transitional between the Oak-Hickory region and the Southern Evergreen forest region. The region was apparently dominated by oaks and hickories in pre-contact times with pines persisting from an earlier successional stage only on poorer soils and in drier sites. The present abundance of pines in Piedmont forests is attributed to the fact that virtually all of the region has been cleared at one time or another, and irrespective of soils, pines are usually the first invaders of abandoned fields. The present vegetational cover of the upland Piedmont--a patchwork of fields, stands of pine, mixed stands, deciduous woods, and old fields in various stages of succession (Figs. 3A, 3B, and 4A)--reflects repeated clearing agricultural use, and abandonment of various tracts beginning in Colonial times.

FIGURE 3A: Abandoned pasture beginning to grow up in broomsedge, briars, blackberry, young sweetgum and young cedar (Unit 37-I).

FIGURE 3B: Pines in old field with some recent timber harvesting (Unit 37-I).

FIGURE 4A: Predominantly pine woods with some cedars, early hardwood development (young sweetgum, oak, elm), and undergrowth of pines and blackberry (Unit 37-I).

FIGURE 4B: Mixed bottomland hardwood community on the north side of Big Wateree Creek.

Another vegetational difference between the Oak-Pine and Oak-Hickory forest regions to the west is the presence in the former of sweet gum and sourwood as almost constant associates of the dominant oaks and hickories (Braun 1950).

Several types of upland deciduous forest, all apparently representing edaphic variants of the oak-hickory climax, have been distinguished within the Piedmont region. Stands dominated by white oaks with a high percentage of hickories are present in more mesic locations. A white oak-black oak-red oak type is widespread on the better soils with other oaks and hickories represented as well as a scattering of other species. On somewhat drier sites with poorer soils, post oak predominates over white oak. In the Piedmont forest in pre-European times, occasional pines, chiefly loblolly and shortleaf, probably matured in scattered sunny spots left open by the fall of large hardwoods. Persimmon, dogwood, sourwood, red maple, and cedar are common in the understory of these climax communities (Oosting 1942: 90; Braun 1950).

Oosting (1942: 111) distinguishes a pre-climax post oak-black jack oak type on some upland sites. This type is usually associated with Iredell and Orange soils which have an impermeable clay horizon a few inches below the surface and, below this, are permanently dry. This forest type is characterized by an open scrubby appearance and abundant grasses, herbs, and mats of moss and lichens on the ground.

Oosting (1942: 106) also distinguishes a postclimax community on stream bottoms. River birch, black willow, cottonwood, sycamore, and sweet gum are the most frequent streamside trees. A mixed bottomland hardwood community develops where flats are old and wide enough (Fig. 4B). Sweet gum, willow oak, white and winged elm, red maple, tulip tree, ash, (southward) water oak, and sugarberry are common in this bottomland forest. Where slopes of northerly exposure rise more or less abruptly from the bottomlands, a more mesophytic upland forest community characterized by white oak, tulip tree, red maple, walnut, and black cherry as common associates is seen.

The writers observed and recorded the vegetation encountered in the sampling units surveyed in the I-77 corridor. We are admittedly not trained in identification of ecological phenomena, nor can we claim to have reliably identified all tree species. Nor were quantified observations made. Nonetheless, a few remarks based on our observations may be appropriate here. With one possible exception, no upland areas surveyed seemed to represent virgin forest; obvious oldfield communities dominated by pines or mixed pines and hardwoods were almost universal on upland flats. Considerable variation in the vegetation of north and south facing ravine slopes was observed. South facing slopes were usually dominated by pines, post oak, and occasionally black jack, while white oak predominated on north facing slopes. Hickories seem to be strongly associated with white oaks. Beeches and white oaks were the most common trees observed on the floors of upland ravines. Water oak was observed to be a major constituent of bottomland forests in addition to the postclimax community dominants identified in Oosting's (1942: 106) study area in North Carolina.

Fauna

Shelford (1963: 57) includes the South Carolina Piedmont in the Oak-Hickory zone of the Southern Temperate Deciduous Forest Biome. The animal dominants of this biome are white-tailed deer, turkey, squirrel, grey fox, racoon, opossum, skunk, black bear, bobcat and wolf. Shelford's population density estimates for various species, based largely on Missouri Ozarks data, are: one wolf per 10 mi.^{2}; 22 grey squirrels, 6-9 racoons, 2 skunks, and 3 opposums per mi.^{2} Turkey may have had their greatest density in oak-hickory forest due to abundant acorn mast; estimates of turkey densities in deciduous forests of Missouri prior to historic settlement are about 5 individuals per mi.^{2} (Shelford 1963: 59). Smith (1975: 39) cites data from the Missouri Ozarks and from the Savannah River area in South Carolina indicating that the deer population in the Southern Deciduous Forest Biome probably ranged between 20 and 50 individuals per mi.^{2} under normal conditions of predation. Now extirpated species recorded in the South Carolina Piedmont include bison, wapiti, mountain lion (panther) and, possibly jaguar--a possible identification of the "tyger" of early historic accounts (Laurie 1975).

Within the Deciduous Forest Biome, Shelford (1963: 86-119) distinguishes a set of terrestial biotic communities associated with major river floodplains. The animal dominants of floodplain forest are basically those of surrounding climax forests but many of the species are present in greater densities in the floodplain forests. Swamp rabbits are especially common during some successional stages in floodplain communities. Early historic accounts record deer, wapiti and, in some areas, bison coming to rivers to drink.

The writers have not undertaken any review of the literature on fishes, birds, and invertebrates which may have been significant to past human adaptations in the Piedmont. Ethnohistoric (see especially Canouts 1971: 113-117) and archeological data suggest that fish were an important resource available in Piedmont rivers. This region is close to the Atlantic flyway and migratory waterfowl were probably an important potential food resource. The availability of mussels in Piedmont rivers needs to be investigated. Insects, too, can be directly important to human adaptation. Trimble (1972) suggests that mosquitos (and hence malaria, introduced from the Old World in early historic times) became a serious problem in the Piedmont only after the original drainage pattern was disrupted during the cotton boom.

Environmental Change in the Southeast Since the Late-Wisconsin Glacial Period

Introduction

Various authors in recent years, Carbone (1974), Watts (1971), and Whitehead (1973), have presented summaries of the findings on environmental change in the Southeast since the Late-Wisconsin glacial. At present, the record of environmental change in the Southeast during the Holocene and late-Pleistocene is a general outline based on pollen analysis of lake sediments and buried organic layers. Such pollen analysis gives evidence of vegetational changes from which inferences are made about climatic change.

The model of climatic change which has usually been presented (Olafson 1971) calls for a gradual warming trend beginning at the end of the late-glacial period and climaxing in an Altithermal or Climatic Optimum about 5,000 to 3,000 B.C. after which there is a slow reversal to modern conditions.

An alternate model has been proposed (Bryson and Wendland 1967; Bryson, Baerreis, and Wendland 1970) in which climatic patterns remain stable during a climatic episode with rapid shifts at the end of episodes. After such climatic shifts, vegetation and other climate-dependent elements begin adjusting to the new climatic patterns. Depending on the response time of these environmental elements, the period of adjustment may continue throughout that episode. Thus in the case of an alternation between "glacial" and "non-glacial" climates, "vegetation may show the presence of a 'glacial' climate before the glaciers have grown to significant magnitude and 'post glacial' characteristics before significant glacial retreat has occurred" (Bryson and Wendland 1967: 277).

Using this model Bryson and Wendland (1967) attempted partial reconstruction of past climatic patterns for three periods: 11,000 to 8,000 B.C. during the late glacial period, and two periods during the post-glacial, 7,000 to 6,000 B.C. and 3,000 to 1,500 B.C., with climatic shifts occurring at some time between these periods. Their climatic reconstructions pertain to the Midwest, but the time periods correspond fairly well with periods constructed in the Southeast based on vegetational change. Further work by Bryson, Baerreis, and Wendland (1970) has divided the post-glacial into nine shorter episodes. At the present, Bryson's techniques have not been applied in the Southeast, and no corresponding short episodes have been defined for this region.

Four major climatic episodes since the Late-Wisconsin glacial have been defined for the Southeast: the full-glacial from 23,000 to 13,000 B.C.; the late-glacial from 13,000 to 8,000 B.C.; and two periods during the post-glacial from 8,000 to 3,000 B.C. and from 3,000 B.C. to the present.

23,000 to 13,000 B.C.

Research conducted by Whitehead (1965, 1973) in the South Carolina Piedmont and the Coastal Plains of southeastern North Carolina and southeastern Virginia indicates that the area now occupied by the mixed mesophytic community was boreal. The proportions of these boreal elements, as represented in pollen counts, differs between Virginia and North and South Carolina. In southeastern Virginia spruce was dominant (45% of the boreal pollen), followed by pine (40%), and some fir (3%). In southeastern North Carolina and northwestern South Carolina pine was dominant with only a little spruce (approximately 7%), and fir was very uncommon. Whitehead estimates that temperatures were about 15^{o}C lower in winter and 9^{o} C lower in summer than at present. Sparse pollen counts for this time period indicate relatively open vegetation in the Southeast, which suggests a relatively dry climate.

13,000 to 8,000 B.C.

The late-glacial period is characterized by a gradual change from a boreal forest type to a hemlock-northern hardwoods type. These changes took place earlier in southeastern North Carolina than in Virginia. In southeastern North Carolina the pine-spruce forests were replaced by forests with abundant oak, hickory, birch, hemlock, beech, and elm. By the close of this period oak and hickory were dominant, and percentages of beech and hemlock were declining.

8,000 to 3,000 B.C.

The oak-hickory forests in the Southeast attained their maximum development during this period. Again southeastern North Carolina was considerably earlier in reaching this maximum than was southeastern Virginia (Whitehead 1965). From about 5,500 to 3,000 B.C. the Coastal Plain of Georgia and north and central Florida was a mosiac of oak savanna and small prairies (Watts 1971). This is the time which has been characterized as the Altithermal or Climatic Optimum during which the climate was warmer and drier than now and supported relatively open vegetation. However, there is no solid evidence that the climate was actually warmer and drier than at present, at least in the Southeast. The open vegetation of the Georgia and Florida Coastal Plains at this time may have been the result of rapid loss of rainfall through the coarse sandy soils of the area to deep-lying water tables. Also, evidence from northwestern Georgia does not indicate a climate drier than today's for this time interval (Watts 1971: 686).

3,000 B.C. to the Present

Since about 3,000 B.C. the area covered by the oak-hickory forests has decreased. In the southeastern Piedmont it seems that these forests, with some pine development, particularly on poorer soils, have remained dominant. But, in the Coastal Plains, oaks and hickories have, for the most part, been replaced by other species. Within the Dismal Swamp area of southeastern Virginia, these forests were gradually replaced by a swamp forest rich in cypress (Taxodium), tupelo (Nyssa), maple (Acer), and various shrubs. Cypress and tupelo also became more important in North Carolina's Coastal Plain. According to Whitehead (1965) these developments may not reflect increased moisture as much as increasing oceanity and temperature. During this period there was also the development of the present pine-dominated forests of the Coastal Plains. Watts (1971) reports similar changes on the Coastal Plains of Georgia and Florida. The upland herb communities disappeared, and long-leaf pine forests took the place of oaks. Meanwhile, hammocks of mesic broad-leaf trees developed, and rising water tables resulted in the establishment of cypress swamps and shrub-bogs.

Conclusion

As mentioned earlier, the record of environmental change in the South-east during the Holocene and the late-Pleistocene is primarily a record of the changes in flora as determined by pollen analysis of sediments. While the flora may give some clues about the prevailing climatic conditions, these

clues may be misleading if other environmental variables such as level of water tables, soil development, etc. are not taken into account. For example, vegetational differences between the present and the "Climatic Optimum," at least in the Southeast, may be due to differences in water table level rather than significant differences in rainfall or temperature.

Another problem for our study is that most of the work on environmental reconstruction has occurred particularly in South Carolina, outside of the Piedmont. It is for this reason that we have only given an outline of environmental change for the Southeast in general rather than concentrating on the Piedmont.

Early Historic Environment

The descriptions of the early explorers and surveyors in the southern Piedmont of the United States present a different picture than can usually be seen in the Piedmont area of South Carolina today. The southern Piedmont at that time was an area of immense forests with clear streams flowing over rocky beds through narrow fertile valleys (Trimble 1972).

In the uplands the principal trees were pine, oak, hickory, and chestnuts. The denser woods were clear with little undergrowth, and the large trees were spaced so widely that wagons could be driven between them. In places where there was enough light and space, grass and wild legumes covered the forest floor. The loamy, humus-filled, granular soils of the uplands were held in place by the roots of plants and covered by a protective, absorbent layer of decaying vegetable matter. The dominant soil types of the region were sandy loams with a depth of 7 to 15 inches.

The characteristics of the upland soils allowed rainwater to filter slowly to the streams and rivers, which ran clear and carried little silt. Also, the slow release of water from the surrounding soils maintained a fairly even flow in the rivers, and the valleys were safe from destructive flooding. Eighteenth century surveying parties reported grass and cane growing in natural meadows along the streams. The bottomlands also supported stands of ash, yellow poplar, oak, hickory, sycamore, beech, birch, and occasionally black walnut (Rowalt 1937).

Historic Land Use

The first permanent settlers came to the South Carolina Piedmont between 1740 and 1760 (Hall 1940). These early settlers farmed and built their homes in the fertile bottomlands along streams. As the population increased during the cotton boom following the invention of the cotton gin in 1793, however, the uplands were also cleared for cultivation. Fields were usually clean-cultivated and planted in corn, cotton, or tobacco (Trimble 1972). Upland fields were often exhausted and eroded within a few years by these practices. But lands was considered cheap and plentiful so that one could always clear another field or sell out and move elsewhere (Hall 1940). The result of such attitudes was that these wasteful and destructive practices continued long after the frontier had passed (Trimble 1972).

By the early nineteenth century farmers in the Piedmont began to take notice of the damage being done by erosion. Various methods to prevent erosion and soil exhaustion were tried with varying success throughout the 1800's. These measures used both vegetative and mechanical means to protect the soil.

The vegetative methods had a twofold aspect. They were aimed both at preventing erosion and replenishing soil depleted by other crops. Methods such as plowing under legumes, alternation of winter cover crops with summer row crops, and strip cropping were advocated and discussed through the various agricultural societies in the state (Hall 1940). But these methods were not utilized to a great extent because the existing market demand was for row crops, such as cotton and corn, while there was little demand for small grains and other close growing crops (Hall 1949). Changing cultivated land to pasture by planting grasses, legumes, and other forage crops was also advocated as a way to prevent erosion and soil exhaustion, as well as making South Carolina independent of outside sources of livestock and feed. But, for reasons mentioned previously, this too failed to catch on widely (Hall 1940). Deliberate reforestation of abandoned fields was discussed as early as 1859, but few farmers attempted it until the U.S. Department of Agriculture began implementing such programs in the 1930's (Hall 1940; Trimble 1972).

When the South Carolina Piedmont was first cultivated, plowing was generally done in straight rows and did not cut very deeply into the soil. Often rows happened to run straight up and down hillsides so that plowing was difficult and barely scratched the surface of the soil. During showers, shallowly plowed soil would absorb little water so that the excess water ran quickly down the straight furrows carrying the shallow layer of loose soil with it (Hall 1949).

By 1815-1820 some farmers in the area were trying to prevent erosion on cultivated hillsides with horizontal or contour plowing, which consisted of plowing at an angle to the direction of the slope or along the contour. The horizontal furrows were supposed to hold the rain water long enough for it to soak into the soil rather than letting it run down the hillside washing away soil and forming gullies. Many farmers, however, were not careful about laying the rows on the horizontal and gave up the practice when improperly laid rows broke during heavy rains allowing the water concentrated in them to cut across the fields creating gullies. Even those who plowed exactly on the horizontal came to realize that their rows might not be able to hold the more intensive summer rains. To compensate for this rows were sometimes given a slight drop to allow water to drain into a convenient natural draw or gully (Hall 1940, 1949).

Hillside ditches were being used by 1830 to further modify and supplement contour rows so that excess water could be carried off gradually. Specifications as to size, length, grade, and spacing varied with supposed requirements of soil and climate and the fancy of individual farmers (Hall 1940). In some cases ditches were simply built down the sides or center of a field to carry off excess water from horizontal rows. Others had ditches cut across the field and empty into larger ditches running down the sides. Where possible these ditches were emptied into a small branch or creek. Care had to be taken to control the emptying of water at outlets. In cases where one ditch received water from several others, its bottom was sometimes paved with stone or sown in grass and

clover; gullies or natural depressions in the field that received water were sometimes covered in the same way. Unfortunately many farmers simply emptied ditches into the nearest fence row, road, or raw gully, often doing more harm than good (Hall 1949).

Hillside ditching was used more widely than contour plowing and apparently increased in popularity after the Civil War, but it did not stop erosion in clean tilled areas. The ditch itself might erode, and even if it did not, water flowing through it could carry soil eroded from the field. By experimenting with the hillside ditch the first terraces in the area were developed and were in use by the late 1860's and early 1870's (Hall 1949).

These early terraces, called bench terraces, were formed by making a wide ditch on an exact contour with the slope. Then the dirt was allowed to wash down from the slope above the ditch, eventually forming a level terrace. In some cases the ridge of a terrace was left unplowed and often sown with grass to prevent breakage and erosion. The height and width of the terrace depended on the degree of the slope. Bench terraces may be found in South Carolina that are as much as 6 feet or more in height on the lower side, on fields where the original slope was as much as 30 feet in a distance of 100 feet (Hall 1949). Continued experimentation eventually brought about the development of the broad-based terrace in the 1880's. Early ones were about 10-12 feet wide with a water channel on the upper side. The broad-based terrace did not begin to be used in place of bench terraces to a large extent until the advent of large farm machinery in the early twentieth century (Hall 1949).

Even with these measures, erosion continued largely unchecked in the South Carolina Piedmont through the 1800's up until the 1930's. As Hall (1940: 27) points out, "faulty construction and maintenance, and above all, continuance of clean tillage nullified the good results that were expected from these practices."

Erosion and Alluviation

Once land was cleared in the uplands, each rain sufficient enough to have runoff could cause erosion, and the clean-tilled row crops of corn, cotton, and tobacco did not provide enough root structure and ground cover to prevent erosion on the upland hillsides. Gullying the most obvious form of erosion in the Piedmont was not a problem when the area was forested; yet today there are countless gullies throughout upland South Carolina. These range in size from small washes resulting from a single rain to gullies large enough to swallow a train of railroad cars (Rowalt 1937).

Even if gullies did not form in a cleared area, the excess rain running across it could still carry with it a thin layer of surface soil. When this happens over and over in an area it is called sheet erosion. Although not as obvious as gullying, sheet erosion can strip an entire field of its topsoil and not be noticed until spots of clay or rock begin to show through on the surface. Some areas of the southern Piedmont are known to have lost all of their topsoil by this process within 30 years. Due to both types of erosion, 40% of the land in the South Carolina Piedmont has lost three-fourths or more of its topsoil (Rowalt 1937).

The clearing of the Piedmont uplands also had detrimental effects on the streams and bottomlands of the area. The streams and rivers became muddy colored from the erosional debris they were now carrying. Many streams began to fill up with sediment washed in from the hillsides. Also, clearing off the forests and the erosion of the more absorptive soils from the hillsides allowed rainwater to run more quickly into the sediment clogged stream channels. This rapidly increased the amount of disastrous flooding, so that many people had to leave their homes in the bottomlands and rebuild on the uplands (Rowalt 1937; Trimble 1972). Each time the streams overflowed they left relatively unproductive layers of silt and sand covering the more fertile bottomland soils. It has been estimated that the Piedmont valleys of South Carolina have been covered with modern sediment to an average depth of 1.2m or approximately 4 feet (Trimble 1972).

The heavier sediment loads and stream channel clogging due to erosion also created other problems in the bottomlands. These conditions could cause streams to cut into their banks more rapidly creating a new or several new channels through the bottoms. Clogging of the stream channel could also raise the water table to the point where fertile bottomland became swamp. This continued to such an extent that by the 1930's more than half of the bottomlands in the southern Piedmont area were classified as nonarable meadow. These wetlands are subject to frequent overflow and are covered for the most part with willow, alder, sweetgum, rushes, and blackberry (Fig. 5). Aside from the loss of fertile land, the swamping and flooding of the bottomlands also create health problems. "In an area previously considered 'healthy' malaria became a serious problem" (Trimble 1972: 455).

Old Field Succession

Due to the clearing of the forests for farming and lumber, almost all of the original Piedmont forests have disappeared. As cleared fields were abandoned because of erosion or retired from cultivation to prevent complete exhaustion and erosion of the soil, they were usually left bare, and the natural process of plant succession was allowed to reforest the upland hills (Hall 1940). It was not until the 1930's, under conservation programs sponsored by the U.S. Department of Agriculture, that many abandoned fields were purposely reforested (Trimble 1972). The result is that the Piedmont of today is a patchwork of land in various stages of plant succession.

Succession, as it is used here, is the sequence of plant communities which replace one another in a given area. This sequence begins with pioneer stages, i.e. the first nondomestic plants to repopulate the area. These stages are gradually replaced by a series of more mature plant communities until a relatively stable community in equilibrium with the local environment is developed. This last stage is called a climax stage (Odum 1971: 251).

During the late summer and fall, crabgrass usually begins growing in cultivated fields. If the field is not planted in a winter cover crop and is abandoned and not cultivated the following summer, crabgrass becomes the dominant plant in the field. During the first year after cultivation, horseweed begins to share dominance with crabgrass and due to its height is the more conspicuous species (Odum 1971: 261; Keever 1950). Aster becomes dominant

FIGURE 5: Flooding in Fishing Creek bottoms as a result of the increased sediment loads and stream channel clogging caused by erosion.

during the second year although crabgrass and horseweed continue to be present. In the third year after abandonment, broomsedge gains dominance. During the same year shrubs and pine seedlings may also appear. By the fifth year the pines may be taller than the broomsedge and may form closed stands in ten to fifteen years (Keever 1950).

Between 25 to 100 years after abandonment, the pines begin reaching maturity. During the early part of this period the undergrowth of broomsedge, shrubs, and vines begins to disappear, and a hardwood understory begins to develop. As the hardwoods develop the forest usually becomes more open with less undergrowth. Towards the end of this period the oaks and other hardwoods are starting to share dominance with the pines. The oak-hickory climax forest characteristic of the area has generally developed within a little over 150 years after abandonment of the field (Odum 1971: 261).

Prehistoric Archeology in the South Carolina Piedmont - Previous Research

The history of archeological research in South Carolina, including the Piedmont, has been recently summarized by Stephenson (1975). It should be emphasized that work in adjoining states has provided most of our knowledge of the culture-history of the region and the basic temporal-stylistic controls which have been and are continuing to be used for the analysis of prehistoric materials from South Carolina. The sequence used in the following discussion is mostly based on excavation at a relatively few stratified riverine sites. Of particular importance are Claflin's (1931) work at Stalling's Island on the Savannah River; the WPA excavations in the Ocmulgee bottoms at Macon, Georgia (see Kelly 1938; Fairbanks 1956: 8-16) and subsequent interstate highway salvage in the same locality (Ingmanson 1964); investigations by Caldwell and Miller (1948; Caldwell 1954) in the basin of Clark Hill Reservoir on the Savannah; and most significantly, excavations by Coe (1964) at sites along the Yadkin and Roanoke Rivers in North Carolina. These excavations and subsequent radiocarbon dates served to establish broad temporal-stylistic continuities within the South Atlantic Piedmont province and to correlate these with sequences based on work in the South Atlantic and Gulf Coastal Plains, the Appalachians and the Tennessee Cumberland drainage area. The few stratigraphic data that have been reported from the South Carolina Piedmont area (see especially Michie 1969) correspond to this sequence.

As Stephenson (1975: 6) points out, the WPA and River Basin Salvage programs largely bypassed South Carolina. In spite of the numerous man-made lakes in South Carolina, published archeological reports are available only from the basins of Clark Hill (Caldwell and Miller 1948) and Hartwell (Caldwell 1954), both on the Savannah. During the late 60's and early 70's some survey work was carried out in the basin of the proposed Richard B. Russell (Trotter's Shoals) Reservoir on the Savannah (Hutto 1970; Hemmings 1970).

Within the South Carolina Piedmont, prehistoric research has largely concentrated on the conspicuous South Appalachian Mississippian (see Griffin 1967; Ferguson 1975) sites in the valleys of major rivers. The spectacular mound groups and village sites on the Wateree near Camden have been the focus of archeological research beginning with the investigations of Blanding (1847) in the early nineteenth century (see also Thomas 1894; Stuart 1970). In the 1880's Palmer (n.d.) dug at the McCollum Mound on the Broad River in Chester County. Ryan (1971b) has recently tested the McCollum site while George Teague (1976) has recently conducted excavations at the Blair Mound on the Broad in Fairfield County. Another basic source of data on South Appalachian Mississippian in South Carolina are the excavations conducted by Coe (1952: 308-309; Reid 1967: v-xiv) at Town Creek on the Pee Dee River, in North Carolina. Information on South Appalachian Mississippian ceramics from the headwaters of the Catawba-Wateree river system is presented in Keeler's (1971) report of an archeological survey in Burke and McDowell Counties in North Carolina.

In contrast, the prehistoric record of the inter-riverine zones of the South Carolina Piedmont has been relatively neglected. A conspicuous exception to this generalization is Kelly's (1972) survey of a number of localities (in close proximity to the I-77 corridor) in the inter-riverine zone between the Broad and Wateree in Fairfield and Chester Counties. Some cursory investigations have been carried out by Wofford College students at rock shelters (Carpenter, et al. 1970) and soapstone quarries (Overton 1969; Lowman and Wheatly 1970) in the York County area and a few sites here and there have been recorded by non-professionals or by Environmental Impact Surveys. For most purposes, however, the inter-riverine Piedmont still remains terra incognita for prehistoric archeology.

In the last few years, new Federal environmental legislation has resulted in an increase in archeological activity in some areas of the Piedmont. A number of cultural resource management reports prepared by the Museum of Man at Wake Forest University (Woodall and Claggett 1974; Woodall 1975a, 1975b; Woodall and Newkirk 1974; Wellborn and Linthicum 1973) present an abundance of data from the Yadkin River area in north central North Carolina. Intensive archeological surveys of projected interstate beltline routes in Fall Line floodplains in South Carolina at Camden (Goodyear n.d.) and Columbia (Anderson, Michie and Trinkley 1974; Goodyear 1975b) have recently been conducted by the Institute of Archeology and Anthropology.

A review of the archeological literature from this part of the Piedmont indicates that the primary goal of most past research in the region has been what Willey and Phillips (1958: 11-12) have termed "cultural-historical integration." This is not to say that no data have been observed which are relevant to past lifeway reconstruction and the identification of important adaptational variables. These projects were, however, focussed on a narrow range of sites and primarily designed to yield trait lists for comparison of site components in time and space.

There have, however, been some attempts to ask other kinds of questions and to develop the appropriate techniques to do so. Hemmings (1970) attempts to define and interpret both Archaic and Ceramic period site variability and locational patterning in the Trotter's Shoals basin. McMichael and Keller (1960) and Kelly (1972) quantify archeological variables in sets of survey data and attempt to measure demographic change--or at least changes in intensity of utilization--through time in the Oliver Basin on the Chattahoochee in Georgia and Alabama and in the inter-riverine Piedmont in South Carolina, respectively. Caldwell (1958) cites a variety of archeological and environmental data from the Piedmont in explicating his hypothesis of "Primary Forest Efficiency" as the cause of the apparent longevity and stability of the Archaic hunting and gathering lifeway in eastern North America. And, very recently, Ferguson (1976), attempted to test several hypotheses of aboriginal utilization of a Fall Line creek valley during the survey of the Crane Creek sewer line project on the outskirts of Columbia in Richland County.

One important recent development in prehistoric archeology of the southern Piedmont region is the numerous attempts to develop archeological survey techniques which will enable us to operationalize the research design strategies outlined by Binford (1964) and Struever (1971) under the difficult survey conditions encountered by archeologists in the Piedmont and other wooded areas in the East. Experimentation in subsurface testing in site survey has been recently

carried out by Wood (1975) in the Laurens Shoals basin on the Oconee River in Georgia, by Ferguson and Widmer (1976) in the Savannah River floodplain near Augusta and by Ferguson (1976) on the Crane Creek Sewer project. The Highway Program of the Institute of Archeology and Anthropology is in the process of developing and evaluating methods for sampling the surface of plowed sites in highway corridors (Goodyear n.d.). The surveying experiments operationalized during the I-77 survey and the current survey of the Laurens-Anderson Connector Route are part of this continuing process.

An Outline of Prehistory in the South Carolina Piedmont

Summaries of various aspects of the prehistoric sequence in this part of the Southeast are presented by Wauchope (1966), Caldwell (1958), Phelps (1964), and Coe (1952, 1964). This brief summary will be organized in terms of a sequence of four prehistoric periods based on Griffin's (1952, 1967) general scheme for organizing information on eastern North American prehistory. It must be emphasized again that we know very little about even the sequence of artifact styles in the South Carolina Piedmont and most of our inferences are extrapolated from data from adjoining areas.

Paleo-Indian Period 14,000 (?)-8,000 B.C.

The Paleo-Indian Period is considered to represent hunting and gathering lifeways adapted to the environmental conditions of the terminal Pleistocene. Fluted points, considered diagnostic of Paleo-Indian occupation, are found throughout North America but in relatively small numbers, suggesting a very low human population density during Paleo-Indian times. Fluted points data from South Carolina, assembled by James L. Michie (n.d., Figs. 9-12) suggest that, though fluted points are found in the Piedmont, they occur much less frequently than in the Coastal Plain. Kelly (1972: 36-37, Fig. 7) reports finding 1 fluted point fragment at site 38CS26 in close proximity to the I-77 corridor in southern Chester County.

Archaic Period 8,000-1,000 B.C.

The Archaic Period is considered to represent a succession of adaptations of a non-sedentary hunting and gathering lifeway to changing post-Pleistocene environmental conditions. During the Archaic, human groups are thought to have gradually developed a number of highly efficient cultural adaptations to specific regional environments in eastern North America. Changing styles of hafted bifaces--referred to for convenience as "projectile points"--are considered to be diagnostic of different temporal divisions in the Archaic. The sequence of point types derived from Coe's (1964) excavations at stratified sites on the Yadkin and Roanoke Rivers in North Carolina seems to be useful for distinguishing these temporal divisions in the Archaic in the South Carolina Piedmont.

The end of the Archaic on the South Atlantic coast, ca. 2500-1000 B.C., has been called the Transitional period (Stephenson 1975: 10). The Transitional period is characterized by the appearance of Stalling's Island and Thom's Creek ware group pottery (South 1973)--apparently the earliest pottery in North America--steatite vessels, and the building of shell rings, suggesting increased

sedentism and the development of more complex social organization. The shell rings are strictly a coastal phenomenon and the distribution of fiber-tempered and Thom's Creek ceramics seems to be confined to the Coastal Plain. Developments underway on the coast during the Transitional period are, nonetheless, important to our consideration of Piedmont prehistory. Not only is a single point style (Savannah River) predominant in the late Archaic in both areas, but steatite, a frequent raw material for vessels and other artifacts on the coast, was evidently procured in the Piedmont.

A more thorough review of our knowledge of the Archaic in the Carolina Piedmont and adjacent areas will be presented in a succeeding portion of this section.

Woodland Period 1,000 B.C. - ca. A.D. 1000

The Woodland period is characterized by the first widespread manufacture of ceramics, construction of mounds, and widespread evidence of horticulture in the East. The agricultural complex of Woodland societies is thought to have been based on a hypothetical Eastern Complex--having its roots in the Archaic--involving native eastern North American plants and supplemented by maize and cucurbits, derived ultimately from Mesoamerica (Struever and Vickery 1973).

Coe (1964; 1952: 306-308) divides the Woodland period in the North Carolina Piedmont into three successive foci: Badin, Yadkin, and Uwharrie. The data available to Coe in 1952 suggested a gradual transition from an Archaic lifeway to one in which agriculture was important and fairly large numbers of people were living in stable villages in major river valleys. In 1964 (p. 124), however, Coe discerned a major discontinuity in artifact styles and technology between the late Archaic and the Badin period. The Uwharrie focus is considered to represent an agricultural lifeway with a significant increase in population over earlier periods.

Numerous kinds of grit or sand tempered pottery, in simple bowl or conoidal-based jar forms, and decorated by cord, fabric or net impressions, or by check stamping, seem to be good markers of Woodland occupation in the Carolina Piedmont. A review of the literature suggests, however, that the temporal and spatial distributions of various combinations of temper and decorative techniques are still very poorly known (see especially Keel 1972: 302-314). Rather crude, small triangular points, called Badin and Yadkin by Coe (1964: 45-49) also seem useful for recognition of the earlier part of the Woodland while small, narrow triangular arrow points seem to predominate in the Uwharrie Focus (Coe 1952: 308).

Returning to the South Carolina Piedmont, Woodland components are apparent at numerous sites on the Congaree floodplain at the Fall Line (Anderson, Michie and Trinkley 1974; Goodyear 1975b). Strangely enough, however, no Woodland sherds were recognized in the collections from sites along the Wateree River near Camden examined by Stuart (1970: 124-125). Kelly (1972: 65-71) found a small number of triangular points, roughly corresponding to the Badin and Yadkin categories, at widely-scattered loci during his survey in the Piedmont in Fairfield and Chester Counties. Kelly suggests that Yadkin points and linear check stamped, "Deptford-like," pottery are associated in this region. Plain

and linear check stamped sherds were found at two sites, 38CS29 and 38CS30, in close proximity to the I-77 corridor in southern Chester County.

Mississippi Period A.D. 1,000-1,600

The term "Mississippian" refers to the societies in the eastern United States in late prehistoric and protohistoric times which are believed to have had a primary dependence on maize agriculture for their basic storable food supply (Griffin 1967). Mississippian societies are thought to have had a higher population density, larger and more permanent settlements, and more complex social organization than earlier societies in the East. Griffin (1967) has defined a number of regional variants of Mississippian, based primarily on broad geographic zones of persistent ceramic style continuity. Archeological components in Georgia and the Carolinas which exhibit a persistence of complicated stamping into late prehistoric times in combination with platform mound construction and other Mississippian traits have been thus characterized as "South Appalachian Mississippian." A recent dissertation by Ferguson (1971) summarizes our knowledge of South Appalachian Mississippian.

The only intensively-studied Mississippian site in the Carolina Piedmont is Town Creek on the Pee Dee River in North Carolina (Reid 1967). Coe suggested (1952: 308-309) that Town Creek and the Pee Dee Culture represent a movement of Muskhogean-speaking peoples from the Savannah region on the Coastal Plain sometime after A.D. 1550 and that the Uwharrie Culture persisted in areas not directly dominated by the newcomers. Though the beginning of Pee Dee is now considered to date at least a century earlier, this reconstruction of events still remains a viable hypothesis (Ferguson 1971: 116).

As noted in the preceeding section, the conspicuous group of prehistoric mounds and village sites (including Adamson, Ferry Landing, Boykin and Mulberry) along the Wateree near Camden have been the focus of archeological research for more than 100 years. Very little has been published on these sites but a recent M.A. thesis by George E. Stuart (1970) presents descriptions of the sites, a history of their investigation, and brief analyses of collections from them. One ceramic assemblage, from the now destroyed Guernsey site, exhibits stylistic similarities to the Etowah and Savannah complexes of Georgia suggesting a date prior to A.D. 1450 (Stuart 1970: 125-126). The ceramic assemblages from other sites in this locality, however, more closely resemble the proto-historic Pee Dee and Irene complexes of the Coastal Plain and the contemporary Pisgah ceramics of the Appalachian summit (Stuart 1970: 126-133).

Mississippian sites to the west of the I-77 corridor, on the Broad River, are even less well known. Test excavations were recently conducted by Tom Ryan (1971) in midden areas at the McCollum site on the Broad in Chester County. The ceramics from the midden were similar to the Pee Dee, Irene, Pisgah and Savannah II complexes, suggesting a date of post A.D. 1400. Below the midden, numerous post holes and pits were found extending into subsoil. One of these pits yielded a mass of charred hickory nuts, corncobs, and other seeds, some of our first direct data on prehistoric subsistence from this region. Excavations were conducted by George Teague (personal communication) at the Blair site on the Broad in Fairfield County in 1972. This report is scheduled for publication in the fall of 1976.

Ethnohistory

The ethnohistory of the Catawba Nation has been compiled and discussed by Brown (1966) and Baker (1975). The Indian peoples of upcountry South Carolina may have been contacted by Europeans as early as the De Soto expedition in 1540. The De Soto chronicles' account of the Province of Cofitachiqui (Swanton 1952) portray what can be considered a thriving, pristine Mississippian society. Even at this early date, however, there had already been at least indirect contact with Europeans. Spanish weapons and other articles were seen by De Soto in Indian dwellings at Cofitachiqui, presumably derived from the Allyon colonization attempt on the South Carolina coast in 1526. The location of Cofitachiqui remains unknown but the description adequately matches the Wateree-Congaree Rivers area in South Carolina and "Chufaytachique" persisted as a name for this area until the late seventeenth century.

In any event, Indian groups of the Catawba River country were contacted by the Juan Pardo expedition in 1566 and 1567. This expedition built a fort among the people known as "Guatari" (Wateree) in what is thought to be the upper Catawba River area in North Carolina (Brown 1966: 42-46) or on the Pee Dee (Baker 1975: 61-62).

After Pardo's departure, there is a near-hiatus in the ethnohistoric record for nearly 100 years. Virginia traders are thought to have begun appearing in the Catawba River area by the mid-seventeenth century but regular contacts between the upcountry South Carolina Indians and the British were not established until after the founding of Charles Town in 1670.

The best early account of the Indians of the South Carolina upcountry is that of Lawson's travels in 1700-1701 (Lawson 1952). A discussion of this account and its relevance to the archeological study of South Appalachian Mississippian in this region has been prepared by Ferguson (n.d.). An ethnographic account of Catawba hunting, fishing, and trapping, based on interviews with elderly Catawba informants in the early twentieth century, is presented by Speck (1946).

The Catawba "Nation," which came into existence as a political entity in the early eighteenth century as a response to European contact, was an amalgamation of 22 smaller, primarily Souian-speaking groups. These include the Esaw, Wateree, Wateree Chickanee, Waxhaw, Santee, Sugaree, Congaree, and Pee Dee (Brown 1966).

The history of the Catawba Nation, recounted by Brown (1966), is a long and complex chronicle of fur and hide trading, slave raids, alliances, wars, and eventual expropriation by European settlers. By their last treaty with the Americans in 1840, the Catawba sold--for about 15¢ an acre--their remaining lands in South Carolina, a tract 15 miles square on both sides of the Catawba River in York and Lancaster Counties. By this time, most Catawba had already emigrated to the Cherokee country in North Carolina. Conflict with the Cherokee, however, led to the return of many Catawbas to South Carolina and in 1842, a 630 acre tract of hill land in York County was established as the Catawba Reservation. In 1959, this reservation and all ties between the Catawba Nation and the U.S. government were dissolved and the land and other assets of the Nation were divided among the remaining Catawbas.

Early History and Historical Archeology

Early History of the I-77 Corridor Area

The Indian trade

The earliest sustained European activity in this part of the Piedmont began at the end of the seventeenth century when trading paths were established between the English settlements of the coast and the Indian groups of the upcountry (Brown 1966: 69-123; McMaster 1946: 9). Carolina traders came from Charles Town by way of the Congaree Fort near present day Columbia, and then eastward and up the Wateree River to the Souian-speaking groups--predecessors of the Catawba Nation--on the upper reaches of the Catawba-Wateree River system. Virginia traders came by a northern route. The major commodities sought by the English traders were deer hides and other furs and pelts taken by the Indians. Brown (1966: 109) observes,

> The peltry trade carried on over the Great Trading Path was one of the basic businesses of Colonial America, involving hundreds of white men, thousands of Indians, and enormous profits....By the mid 1700's, the Golden age of the Indian Trade, the deerskins shipped out of South Carolina were worth more than the combined exports of indigo, beef and pork, lumber and naval stores. Charles Town was the principle mart of this trade empire whose promoters had by 1707 pushed its bounds 1,000 miles into the interior.

Early settlement

The nonaboriginal settlement of inland South Carolina began in the 1730's with the establishment of "Townships" on the major rivers. Settlement began at Fredericksburg Township on the Wateree at the Fall Line in 1737. The settlers included farmers, merchants, and tradespeople. A store was established at Pine Tree Hill in the Township by Joseph Kershaw in 1758. This was the start of the town of Pine Tree Hill, later Camden (Kirkland and Kennedy 1905; Oliphant 1964: 104-105).

The first major influx of settlers into the South Carolina upcountry, especially the inter-riverine zones, was triggered by attacks by Indians on the Scotch-Irish settlements in Pennsylvania and Virginia during the French and Indian War. A great wave of Scotch-Irish settlers, refugees from that area, poured into the upper Wateree region following the defeat of General Braddock in Virginia in 1755 (Oliphant 1964: 125). Available county histories indicate that most of the early settlers in Fairfield (McMaster 1946) and Chester (Chester News 1932) Counties were these Scotch-Irish refugees. One of these Scotch-Irish settlements in the vicinity of the I-77 corridor was centered around the Catholic Presbyterian Church in southern Chester County, organized in 1759 (Institute of Archeology and Anthropology site files).

The beginnings of political organization in the upcountry are seen in the "Regulators," armed bands of local residents who organized themselves to protect

upcountry farms and settlements against robbers and horse thieves (Oliphant 1964: 133). The mid-eighteenth century population of the Carolina backcountry was quite diverse in national origin and religious belief and the War of Independence in the region was characterized by intense and bloody local conflicts and guerilla campaigns (Ward 1952: 656-661). During the War, engagements took place at Brattonsville in York County, Rocky Mount and Fishing Creek in Chester County, and Dutchman's Creek in Fairfield County (Oliphant 1964; Wilkins, Hunter and Carrillo 1975; Chester News 1932; McMaster 1946), all within a few miles of the projected I-77 corridor.

The cotton boom

The invention of the cotton gin at the end of the eighteenth century led to far-reaching economic, demographic, and ecological changes in the Piedmont. Cotton growing in the region proved immensely profitable. Vast areas of forest were cleared for the first time. The diversified agriculture of the colonial era was replaced by cotton monoculture and the family farm by the plantation system (Oliphant 1964: 216-217). McMaster (1946: 36-37) cites U.S. Census data from Fairfield County showing the massive importation of slaves into the Piedmont in the nineteenth century to provide the labor required by the new economic system.

This system was ecologically disastrous. The massive forest clearing and cotton monoculture soon resulted in severe soil depletion and erosion. At the same time that the land was becoming poorer, however, its owners were becoming richer and could afford to compensate for the loss of soil fertility by expanding their holdings. By 1825 so much soil in the Piedmont had been washed away or depleted that the region could no longer adequately support the population and during the next few decades many planters gave up on their wornout farms in South Carolina and moved their family, slaves, and entire operation to new lands in Mississippi or elsewhere to the West (Oliphant 1964: 216-217). Fairfield County, in particular, was one of the most productive parts of the southern cotton country in the early nineteenth century and one of the most severely eroded and gullied by the late nineteenth century (McMaster 1946: 43). In spite of declining yields and profits and ecological damage, however, cotton cultivation remained widespread and important in the area into the twentieth century.

Following the Civil War

The defeat of the Confederacy and the end of slavery brought a number of economic changes to the Piedmont. After a period of disruption following the War, the old plantation system was modified in a number of ways. Farmers were financed by merchants under a "lien" system in which the merchant provided seed, fertilizer and other supplies in exchange for a lien on the crop. Along with the lien system, sharecropping developed (Oliphant 1964: 287-288). McMaster (1946: 53) points out that the average size of farms in Fairfield County decreased after the Civil War after having increased steadily over the preceeding decades. The financial and labor limitations of the smaller holdings and the sharecropping system impeded even the minimal attempts at soil conservation which were being implemented in the 1840's and 50's.

The diversification of the economy of South Carolina beginning in the late nineteenth century involved changing patterns of land use in the Piedmont. Manufacturing replaced farming as a source of income for many people and vast areas reverted to forest as increased emphasis was placed on pulpwood and other forest products. Today, most of the I-77 corridor area has a very low population density and consists mostly of forest and pine plantings with scattered patches of pasture and farmland.

Historical Archeology in the South Carolina Piedmont

Historical archeological research in the South Carolina Piedmont has been recently summarized by Stephenson (1975: 2-28) in his review of previous and current research in the state. It will be noted that most previous historical archeology research in the Piedmont, as throughout South Carolina, has involved well-documented historical sites, especially military sites, associated with conspicuous events in South Carolina history. These investigations have yielded much information on the material culture of the Colonial and early American periods in South Carolina and laid a basis for future anthropologically-oriented research using historic site data.

In the last few years, indeed, there has been an increasing emphasis on the use of historic site data from South Carolina in investigation of anthropological and general social science problems. Lewis' (1976) recent work at the site of the colonial town of Camden, South Carolina, is being carried out in conjunction with the testing of a "frontier model" of the development of colonial society in the South Carolina "backcountry" in the eighteenth century. Though Lewis' present investigations have been confined to the site of Camden, the "frontier model" has implications for the archeological record in the surrounding region, including the Interstate 77 corridor area.

Another anthropological problem domain, refuse disposal practices and the formation processes of the archeological record, has been the focus of Carrillo's investigations at the Bratton House, a late eighteenth and early nineteenth century Scotch-Irish house site in York County (Wilkins, Hunter and Carrillo 1975) and at the Howser House, an early nineteenth century German house site in Kings Mountain National Military Park in Cherokee County (Carrillo n.d.a).

The Archaic Period in the Southern Piedmont Area: Chronology, Culture, and Adaptation

Chronology

A chronological outline for the Archaic Period in the South Carolina Piedmont and adjoining areas is presented in Table 1. The phases are those defined by Phelps (1964). The dates indicated are estimates based on a relatively few radiocarbon dates from throughout the East assembled by Phelps. The dates available in 1964 are largely supported by more recent radiocarbon dates, especially the series from stratified Archaic levels at the St. Albans site in West Virginia (Broyles 1971).

TABLE 1.

SUMMARY CHRONOLOGY FOR THE ARCHAIC IN THE SOUTH CAROLINA PIEDMONT

	Dates BC		Phases (after Phelps 1964)	Climatic Episodes (after Bryson and Wendland 1967; and Bryson, Baerreiss and Wendland 1970)
Woodland	0		Deptford Phase	Sub-Atlantic
	1000		(Thoms Creek on the Coastal Plain)	
Late Archaic	2000	Coastal Phase	Stallings Island Subphase	Sub-Boreal
	3000		Savannah River Subphase	
Middle Archaic			Guilford Phase	
	4000		Morrow Mountain Phase	Atlantic
	5000		Stanley Phase	
Early Archaic	6000			
	7000		Kirk Phase	Boreal
			Palmer-Big Sandy Phase	
	8000		Dalton-Hardaway Phase	Pre-Boreal
			Paleo-Indian	Late Glacial

The phases are based chiefly on what appear to be wide-ranging temporal and stylistic continuities in "projectile" point forms. For many of these cultural-historical constructs, we know little more than the point forms (but not functions) and the approximate dates. In Table 1, this sequence is roughly correlated with the sequence of climatic episodes outlined by Bryson and Wendland (1967) and Bryson, Baerreis and Wendland (1970).

Different archeologists use slightly different definitions for the Archaic. The Archaic Period will be considered here to have begun about 8500-8000 B.C. with the Pleistocene-Holocene transition. As noted in the preceeding chapter, pollen and macrofossil data from diverse loci in North America indicate an abrupt transition in vegetational patterns at about this time. This roughly correlates with the disappearance of fluted point forms and the appearance of Dalton, Palmer, and related forms throughout much of the East. The Archaic will be considered to have ended in the Piedmont sometime after 1000 B.C. with the appearance of check stamped (Deptford or Cartersville) or other Early Woodland ceramic complexes in the region. A tripartite division of the Archaic into Early, Middle, and Late subperiods seems useful throughout the East.

The lithic industries of the Early Archaic exhibit strong technological continuities with those of the preceeding Paleo-Indian period. New technologies, however, are apparent (see especially Morse and Goodyear 1973) and there are indications that much higher human population densities were present in most areas. Phelps' Dalton, Palmer, and Kirk phases, representing an approximate 8500-5500 B.C. time period, are included in the Early Archaic. There is considerable overlap in the few available dates for Dalton and Palmer and they may be contemporary in whole or in part.

The Stanley, Morrow Mountain, and Guilford phases, representing an approximate 5500 to 3000 B.C. interval, constitute the Middle Archaic. The Middle Archaic in the southern Piedmont corresponds roughly to the "Old Quartz" complex discussed by Caldwell (1954, 1958). The term "Old Quartz," however, has fallen into disuse with the realization that the complex as defined by Caldwell includes some very old tool classes (for instance, "spinner" points) and that use of quartz as a raw material is not a particularly useful temporal indicator. Middle Archaic occupations are poorly known throughout the Southeast. Lithic technologies of Middle Archaic occupations exhibit marked discontinuities with those of the preceeding Paleo-Indian and Early Archaic.

Paleobotanic and geological data from many portions of North America (Wormington 1957: 10) have indicated a major shift toward drier and warmer climate during this general time period, roughly corresponding to the Atlantic climatic episode (Bryson and Wendland 1967; Bryson, Baerreis and Wendland 1970). More recent data, however, suggest that the situation is much more complex (Martin and Mehringer 1965: 443). As noted earlier, there is no evidence that the Southeast was warmer and drier during the Middle Archaic but there is evidence of environmental changes in some areas correlating with major climatic shifts in western North America. Climatic change has been repeatedly invoked in explanations for dramatic changes in the archeological record associated with the beginning of the Middle Archaic (Lewis and Lewis 1961: 20; Phelps 1964: 68-70; Morse 1969). In lowland northeast Arkansas, a complete absence of expected Middle Archaic point forms suggests a virtual abandonment of the region during the Middle Archaic (Morse 1969, 1975a).

The Late Archaic, here equated with the 3000-1000 B.C. interval, can be characterized by the appearance of ground stone tool technologies in most (though not all) areas of the East and by the appearance of intensive shellfish harvesting in many coastal and interior riverine areas. Some shellfish exploitation seems apparent by Early Archaic times in the coastal Northeast (Brennan 1974) but the earliest intensive exploitation of mussels along the interior rivers seems to have been by the Indian Knoll culture in the fourth Millenium B.C. (Winters 1974: xviii-xix). Evidence of mussel shell deposits associated with the Middle Archaic Eva component at the Eva site (Lewis and Lewis 1961) is ambiguous and is perhaps attributable to mixed stratigraphy but another site on the lower Tennessee reportedly has Morrow Mountain points in association with mussel shells (Morse 1967: 172-173). Mussel shell is, however, by no means associated with all Late Archaic occupations even when mussels were readily available. The possible role of mussel harvesting in Archaic subsistence will be discussed further below.

Phelps (1964: 89-98) divides the Coastal phase into a pre-ceramic Savannah River subphase and a fiber-tempered ceramic Stalling's Island subphase. The Stalling's Island and (probably) succeeding occupations with Thom's Creek ware group (South 1973) ceramics are grouped by Stephenson (1975: 10) and others into a "Transitional period" between Archaic and Woodland. Neither Stalling's nor Thom's Creek ware group ceramics are commonly found above the Fall Line and almost nothing is known about the terminal portion of the Archaic in the South Carolina Piedmont.

Physical Type and Osteology

Georg K. Neumann (1952: 17-20) classes most archeologically-known Archaic populations in the Southeast into the "Iswanid" variety or race. Individuals from a number of Late Archaic components have been described as "short, small, and gracile," though there seems to be considerable variation among middens and even between different levels in the same midden. It has been stated that there is considerable sexual dimorphism among Late Archaic populations in the Southeast but the evidence is somewhat ambiguous (Morse 1967: 222-226).

Stoltman (1972: 48) cites Claflin's (1931: 43) undocumented assertion that the Stalling's Island people were brachycephalic and notes that brachycephalism is practically unique on this time level in the Southeast except for the Kays phase in western Tennessee. Stoltman further suggests that the observed similarities in physical type between sites in the Southeast are accompanied by cultural similarities. He notes, however, that the data in the literature are very incomplete.

Subsistence

The term Archaic has long denoted a hunting and gathering lifeway adapted to post-Pleistocene environmental conditions. The reliance on non-domesticated plants and animals is overwhelmingly evident in the archeological record. Caldwell (1958: 17) has characterized the Late Archaic lifeway as "Primary Forest Efficiency" and suggests that it was the outcome of millenia of increasing knowledge of the subsistence potential of the Eastern Woodlands and that it was such an efficient adaptation that it was slow to be replaced by agricultural subsistence patterns that had developed at an early date in Mesoamerica and the Southwest. Whatever the ultimate fate of Caldwell's hypothesis as an explanation of events in the prehistoric East, the model of a lifeway based on efficient exploitation of seasonally available natural food resources is probably an apt characterization of much of Archaic culture.

Published data on Archaic subsistence is somewhat spottily available throughout the Southeast and is particularly sparse in the southern Piedmont area. Faunal preservation is restricted to sites with fairly neutral or alkaline soils, predominantly shell middens and caves. Faunal data, was, for instance, almost entirely lacking from the Archaic components excavated by Coe (1964) on the Yadkin and Roanoke rivers. Abundant faunal remains, however, were recovered--if only cursorily reported--from the Stalling's Island site (Claflin 1931). Data on exploitation of plant resources is recovered in quantity only when some past cultural process has resulted in charring of subsistence-related floral materials and when flotation recovery methods have been applied in excavation. Pollen, a possible economic indicator in the case of non-wind pollinated species, tends to be very poorly preserved in almost all archeological depositional contexts in the East.

Since data on Archaic subsistence are so sparse in the archeological literature of the Piedmont, this discussion will rely heavily on data from sites elsewhere in the Southeast and adjacent areas. The relevance to the Piedmont of any models based on these data, of course, remains to be demonstrated by future research.

Faunal inventories from diverse Archaic sites including Indian Knoll (Webb 1974: 333-340), Riverton and related sites (Parmalee 1969), Eva (Lewis and Lewis 1961), Robinson (Morse 1967), Stanfield-Worley (DeJarnette, Kurjack, and Cambron 1962: 262-263), Modoc (Fowler 1959), Allen (Morse 1967: 262-263) and Stalling's Island (Claflin 1931: 12), to cite only a few of the better reported examples, strongly indicate primary reliance on white-tailed deer as a source of animal protein. Other important species represented in most of these faunal lists are raccoon, turkey, opossum, turtle, and waterfowl. Many other species, including elk, bear, and squirrel are sometimes represented by smaller numbers of bones.

The frequent occurrence of domesticated dog burials in Late Archaic middens suggests that dogs were highly prized and may have been important in Archaic hunting strategies. From the contrasting low frequency of dog burials in Mississippian sites, Smith (1975: 102-110) infers that Mississippian dogs were held in low esteem and probably played only a minor role in hunting.

Fish remains are present at most riverine-located sites with faunal preservation but the importance of fish has probably been underestimated due to relatively poor preservation and lack of the appropriate archeological recovery techniques. Fish hooks, gorges, net sinkers and other fishing gear present in many Archaic sites are further evidence of intensive exploitation of fish. Stone fish traps, possibly attributable to Archaic occupations, are present in a number of rivers in the Piedmont (Hemmings 1972; I.A.A. site files). There are, however, records of numerous fish traps being constructed in Piedmont rivers during historic times.

As noted above, mussel shells are abundant in many interior, riverine, Late Archaic middens. Both Morse (1967: 233-235) and Parmalee and Klippel (1974), however, cite qualitative and quantitative nutritional data to demonstrate that the importance of fresh water mussels in Late Archaic diet has probably been overestimated.

Recent data indicate that significant utilization of acorns and hickory nuts was underway by Early Archaic times. Flotation of features from Le Croy horizons, dated about 6500 B.C. at the Rose Island site in Tennessee yielded quantities of charred hickory nut and acorn hull fragments (Chapman and Yarnell 1974). Similarly, charred nut hull fragments have recently been recovered from Dalton levels in the Sullivan site in southeast Missouri (Price and Krakker 1975: 34) and from Kirk levels at the St. Albans site (Broyles 1971: 93-95).

Charred floral remains were sporadically recovered and identified from Late Archaic components even before the widespread application of flotation to midden samples. Evidence of use of acorns, hickory nuts and walnuts was observed in this way at Indian Knoll (Webb 1974: 243), Riverton (Winters 1969: 102), and Robinson (Morse 1967). Flotation of a large number of midden samples from Middle to Late Archaic levels at the Koster site in Illinois yielded many thousands of charred nut hull fragments. These fragments were mostly of hickory nut hulls but acorns, pecans, black walnuts,butternuts, and hazel nuts were also represented (Asch, Ford and Asch 1972). Asch, Ford and Asch (1972: 10) note that nutritionally, acorns and hickory nuts are complementary; acorns being rich in carbohydrates while hickory nuts are rich in protein and fats. Charred seeds were also recovered from Archaic levels at Koster. Marsh elder, chenopodium, and grape seeds were most common. Charred seeds seem to be much more common in Woodland than in Archaic components in the Illinois Valley (Asch, Ford, and Asch 1972).

The association of both native cultigens (chenopodium, marsh elder, sunflower) and tropical cultigens (maize, cucurbit, and gourds) with Early Woodland occupations in the Midwest strongly suggests that the roots of horticulture in eastern North America extend well into the Late Archaic. Struever and Vickery (1973) have hypothesized the existence of an "Early Eastern" agricultural complex involving native cultigens which predates the introduction of tropical cultigens into the East. Evidence of Late Archaic and Early Woodland domestication of plants is extremely sparse; we know of no such evidence from the southern Piedmont.

Tools and Facilities

All comprehensive reports on sites of intensive Archaic habitation describe a broad range of stone and, when soil conditions permit, bone tools. Relatively little functional analysis of Archaic tool classes has been carried out. Projectile point studies by Ahler (1971), Michie (1973), and Goodyear (1974: 19-39) are conspicuous exceptions to this generalization.

The chipped stone tool inventory of some Early Archaic complexes in the Southeast shows remarkable continuities with the preceeding Paleo-Indian complexes (see especially Michie 1970; Morse 1973; Goodyear 1974; DeJarnette, Kurjack and Cambron 1962: 82-85). Finely-made chipped stone adzes appear to be associated with some Dalton components both in the Mississippi Valley (Morse and Goodyear 1973; Price and Krakker 1975) and South Carolina (James L. Michie, personal communication), indicating a significant increase over Paleo-Indian in heavy-duty woodworking.

A major discontinuity in projectile point forms marks the beginning of the Middle Archaic. The apparent association of finely made endscrapers with Palmer but not Kirk levels at the St. Albans site (Broyles 1971: 35, 49), however, suggests that major adaptational shifts were underway by 6,000 B.C. or so. Relatively little is yet known about the "toolkit" associated with Morrow Mountain and Guilford Points. A glimpse at the Morrow Mountain toolkit is provided by two burials at Stanfield-Worley. Artifacts in these two graves included, in addition to Morrow Mountain points, a bone atlatl hook, bone projectile points, bone awls, some uniface scrapers, and some large trianguloid bifaces (Dejarnette, Kurjack and Cambron 1962: 80-82). At some riverine sites in the North Carolina Piedmont, chipped stone axes seem to be associated with Guilford points (Coe 1964). Mortars, presumably plant processing tools, were associated with the Stanley and Guilford components at the Doerschuk site (Coe 1964: 52).

Abundant data on Late Archaic tools have been recovered. A cursory examination of published sources on Late Archaic lithic, bone, and antler industries (for instance Claflin 1931; Lewis and Lewis 1961; Coe 1964; Morse 1967; Winters 1969; Webb 1974) will show that even single sites have yielded a remarkable variety of specialized tools. Chipped stone tools include the ubiquitous hafted bifaces known as "projectile points" (some of which seem to have actually functioned as projectile points), unhafted knives, adzes and gouges, "drills," and scrapers. In the southern Piedmont and Coastal Plain, Savannah River points (Coe 1964: 44-45) and similar forms seem to be associated with almost every Late Archaic occupation. Examination of wear and resharpening patterns on Savannah River points suggests that these broad-bladed stemmed bifaces probably functioned as knives. Coe (1964, Fig. 40) also notes that some Savannah River bifaces were probably knives. Ground stone tools common in the South Carolina Piedmont and elsewhere in the East include full and three-quarter grooved axes; atlatl weights ("bannerstones"); mortars, mullers and pestles; and pitted cobbles. Frequently occurring classes of bone and antler tools include atlatl hooks, several varieties of projectile points (see especially Webb 1974: 293-296, 309-311; Claflin 1931: 26, Plate 41), fish hooks and gorges, scrapers, hair (?) pins, awls, and flakers and drifts for knapping stone.

The manufacture of steatite vessels in the southern Appalachians is thought to have begun sometime after the appearance of fiber tempered pottery, ca. 2500 B.C. (Ford 1974: 399). A number of steatite quarries and vessel workshops are known in the general vicinity of the I-77 corridor. Quarries in Spartanburg County, South Carolina, have been reported by Overton (1969) and a possible steatite quarry is present at site 38YK6 about 3 miles west of the I-77 corridor in southern York County (I.A.A. site files). Steatite sherds appear to be frequently encountered at Late Archaic riverine sites in the southern Piedmont and Fall Line (Coe 1964: 122; Ingmanson 1964; Stuart 1970: 33; Ryan 1971, 1972; Goodyear 1975b). Steatite vessel fragments are fairly common on some Late Archaic/Transitional sites on the South Atlantic Coastal Plain, suggesting well-established exchange networks between that area and the Piedmont. Oddly, however, steatite vessel sherds seem to be lacking in the Late Archaic levels at Stalling's Island and at nearby sites, even though steatite "net sinkers" are present (Stoltman 1972).

Relatively little is known of structures or other facilities in Early and Middle Archaic. Hearths are known in Early Archaic contexts throughout the Southeast. Kirk hearths, many containing quantities of burned rocks, were common at Hardaway (Coe 1964) and at St. Albans (Broyles 1971). Morrow Mountain and Guilford points, respectively, were found in clusters associated with hearths at the Thom's Creek site (Michie 1969). The writer knows of no evidence of Early or Middle Archaic houses in the southern Piedmont but their former existence is highly probable since evidence of houses as early as Paleo-Indian has been recently found in the Shenandoah Valley of Virginia (Hall 1974).

Evidence of Late Archaic houses is sparse but widespread suggesting that permanent houses were present in many locations but are difficult to recognize archeologically. Hearths and prepared clay floors are common in Late Archaic middens. Morse (1967: 166) suggests a common, if seldom recognized pattern in Late Archaic middens is the presence of numerous hearths representing houses, in the center of the midden, and numerous burials representing cemetery interment, around the edges. The association of axes, adzes, and gouges with Late Archaic components is strong evidence of heavy-duty woodworking such as would be involved in construction of houses or dugout canoes. Another common type of Late Archaic feature is a large midden-filled pit (Morse 1967: 165; Winters 1969: 81-88), presumably dug for storage and subsequently used for refuse disposal. Fire-cracked rock, presumably representing use of hot rocks for cooking in earth ovens, is very plentiful on many Late Archaic sites throughout the Southeast (Webb 1974: 242; Winters 1969; Morse 1967: 14-17; House and Smith 1975). Though "hot rock" cooking apparently persists into at least Woodland times, fire-cracked rock seem to be most strongly associated with Late Archaic occupations.

Culture Ecology and Social Organization

As Caldwell (1958: 8) observed, the Southeast is "living country," a region of abundant natural animal and plant food resources--for those who know how to exploit them. Reconstructing the cultural ecology of Archaic societies in the Southeast, and understanding them as adaptational systems in their natural and social environments involves not only knowledge of the subsistence potential of local environments, but knowledge of the appropriate technologies to exploit those environments and the accompanying social organizations of those technologies. The cultural-ecological study of Archaic societies is only beginning to be attempted. Nonetheless, an increasing emphasis on environments, technology, and theoretical approaches to human ecology and population dynamics is beginning to provide some tentative answers and even more exciting hypotheses.

Seasonal movements of Archaic populations within a territory or range, analogous to those documented ethnographically for hunting and gathering populations, are usually assumed but are very difficult to document archeologically. Winters (1969), however, presents faunal data indicating differential seasonal occupation of a set of sites of the Riverton culture in southern Illinois.

Caldwell (1958), as noted above, has hypothesized that the Archaic represents a continuum of gradual change from pre-Archaic through Archaic times. He suggests that the major mechanism of culture change during this time was progressive discovery of potential resources and the establishment of seasonal cycles.

Lewis and Lewis (1961: 17-24), on the other hand, interpret data from the Eva site as indicating major discontinuities in Archaic subsistence patterns. They suggest that an increase in shellfish exploitation by Middle Archaic times was a response to more arid conditions during the Altithermal and a reduction in deer population. They further hypothesize that the decreased dependence on shellfish by the time of the Late Archaic Big Sandy phase at Eva represents a decreased availability of mussels when river volume increased with the return of wetter conditions during the Medithermal. They observe, however, that throughout the occupation of the Eva site, the technology seems to have been largely directed toward hunting deer and the utilization of bones, antlers and hides of deer as well as the meat.

Morse (1967: 246-258) develops the hypothesis that the settlement and subsistence pattern of Shell Mound Archaic society was largely based on the annual cycle of white-tailed deer. Morse notes that in the more northerly portion of the Eastern Woodlands, white-tailed deer exhibit "yarding" behavior, a restriction of range during periods of heavy snowfall to a small portion of the annual range. Though it is not clear that deer in the Middle South actually yarded during winters in Late Archaic times, Morse hypothesizes that winter habitations were established along rivers in order to take advantage of such a seasonal deer concentration. Mussels, then, could have served as a "back-up" food resource during mild winter when deer did not concentrate in the valleys, a situation analogous to reliance by certain Northwest Coast groups on shellfish during years of poor salmon harvest.

In recent years there has been a trend toward more consideration of the social and biological aspects, as well as the technological aspects, of human adaptation in constructing hypotheses of the culture ecology of Late Archaic populations. Asch, Ford, and Asch (1972) note that the Archaic inhabitants of the Koster site seem to have relied upon a relatively narrow range of plant resources but that these resources (hickory nuts, acorns, etc.) are some of the most abundant, easily harvested and most nutritionally complete in the environment. Citing Boserup's (1965: 117-118) contention that the development of labor-intensive economic systems is usually a response to population increase--and not vice versa--Asch, Ford and Asch hypothesize that the Late Archaic economic system operated under conditions of very low population density. In contrast, the apparent heavier reliance on seeds by Woodland populations in the Illinois Valley suggests a much more labor-intensive economy. The prolonged stability of the plant exploitation patterns indicated by the Koster data suggests factors operating to keep Archaic population densities well below the theoretical "carrying capacity" of the environment. In a later article, Ford (1974: 392-395) suggests that the importance of plant food in the aboriginal diet increased steadily through the Archaic. Increasing sedentism and lessened physical stress would have resulted in gradual population increase (cf. Birdsell 1968; Binford 1968) which in turn might have resulted in smaller band territories and a more labor-intensive economy. Extensive intergroup trade in stored "valuables" such as marine shell beads and copper ornaments might also have served to buffer the effects of unpredictable local yields of non-domesticated food stuffs.

Winters (1974) presents a "harvesting economy" model for the Indian Knoll culture and other Late Archaic occupations in the East. The model predicts extensive exploitation of a narrow range of plant and animal species, some division of labor beyond age and sex categories, and methods of banking (storage) in order to level out subsistence crises in the annual cycle.

Large numbers of Late Archaic burials have been excavated and both the grave goods and the skeletons themselves provide a wealth of data on which to begin reconstructing social organizational parameters of Late Archaic adaptations. The exotic raw materials of some grave goods indicate the existence of exchange networks extending over hundreds and even thousands of miles. Conch shells originating on the South Atlantic or Gulf Coast have been found in Archaic graves as far north as Ontario and copper from the Great Lakes area is found throughout the Midwest. Hematite and certain cherts were also exchanged widely. Winters (1968) implies that certain of these goods did have a recognizable value and were exchanged with a preconceived rate schedule in mind. Furthermore the differential "richness" of grave goods within single Late Archaic sites strongly suggests differential statuses within the communities represented.

Discernment of patterning in association of grave goods by age and sex categories is complicated by lack of reliable aging and sexing of most Late Archaic burial populations. From Morse's (1967: 291-293) discussion of artifact associations in Shell Mound Archaic burials, it appears that in general there are patterned differences in the artifact classes buried with males and females, respectively. This suggests primarily achieved statuses beyond age and sex categories and is consistent with our expectations for non-ranked, band or segmentary tribal level society. There are some instances of "adult male" tools, especially atlatl hooks and weights, in graves of women and children and infants. Morse (1967: 291) notes that in these cases the artifacts seem to have been broken and nonfunctional at time of burial. Their occurrence may nonetheless indicate a somewhat more complex distribution of statuses than we would expect in egalitarian society.

Biological data relevant to the social aspect of Late Archaic adaptations are discussed at length by Morse (1967: 286-295). Of particular interest is the evidence of warfare and raiding. An estimated 10-15% of the males in the Indian Knoll skeletal population died violent deaths. Embedded projectile points, both stone and antler, in Late Archaic skeletal elements are not common but are found throughout the East. In a number of cases these points were considered "foreign-looking" by investigators, implying that they were inflicted in conflict with an outside society. These data suggest a fairly high level of intergroup competition and conflict.

Conclusion

From the foregoing discussion it will be noted that while our knowledge of human adaptation in the Southeast during the Archaic period is generally quite sketchy, our knowledge of the Middle Archaic is particularly sparse. In the southern Piedmont we know very little more than the sequence of projectile point styles for this 2500 year interval. While the exact nature of climatic changes in the Southeast during the Holocene remains rather obscure, artifactual data suggest that major shifts in technology and adaptation tended to accompany major climatic shifts. It will also be noted that our knowledge of Archaic sites in most regions is largely restricted to areas along major rivers; there are very few rigorously collected data available from the inter-riverine zones which comprise most of the land area of the Southeast.

Analyses of available faunal assemblages from Archaic sites indicate that in virtually all sites and in all regions and in all times within the Archaic, white-tailed deer seem to have been a major focus of subsistence activity. Evidence of the importance of nuts in Archaic diet is becoming available as flotation and similar fine recovery techniques are being applied to Archaic midden samples.

And finally, it is becoming increasingly obvious that the Late Archaic includes cultural adaptations that are much more complex than the stereotype of a hunting and gathering culture would imply. Winters (1974: xxiii-xxiv) observes that the normative understanding of the Archaic as a hunting and gathering "stage"--encompassing both the Kwakiutl and the Paiute, to cite polar extremes-- may be obscuring a great deal of diversity in human adaptation. Winters suggests that with respect to such variables as complexity of technology, extent of involvement in trading and exchange of exotic raw materials, and size of sites, it is not improbable that some Archaic societies of the Eastern Woodlands approached the level of complexity of the Kwakiutl and other Northwest Coast groups.

METHODS

Survey Methods and Contract Requirements

The general goal of the Interstate 77 survey, as stated in the agreement between the South Carolina Highway Department and the Institute of Archeology and Anthropology, was to inventory and assess the significance of the archeological resources in the proposed corridor and to obtain information about those resources for use in planning any needed research to mitigate the impact of the proposed consturction upon those resources. The methods employed during the survey were intended to fulfill these contract requirements within the research framework outlined by Goodyear (1975a) in the General Research Design for Highway Archeology in South Carolina.

The environment of the I-77 corridor, the inter-riverine Piedmont, is one which is known to be rather homogenous--or at least repetitious--and one in which previous survey experience has lead us to expect large numbers of small, lightly-occupied prehistoric sites. Major early historic sites in and near the corridor, on the other hand, were considered to be in most cases readily identifiable by the use of maps and other documentary sources. For these reasons and because of the heavy vegetational cover and relative inaccessability of much of the corridor, it was considered impractical and unnecessary to attempt to totally survey the corridor. We chose then, to sample the corridor, both probabilistically and nonprobabilistically.

It was felt that intensive investigation of a portion of the corridor, within the framework of a probabilistic sampling strategy, would yield much more reliable estimates of the total resource base than would the alternative of cursory examination of the whole corridor. Though we chose to rely on probabilistic sampling as our major source of information on the corridor, it was decided to supplement the probabilistic sampling with investigation of selected other portions of the corridor. In this way, the margins of the streams crossed by the proposed route were checked for prehistoric habitation sites and areas along early roads were checked for sites of early historic homesteads or other settlements.

Research Designs Implemented by the I-77 Survey

As pointed out by Goodyear (1975a: 6-8) and others, efficient and effective archeological research--within "contract" as well as "pure research" contexts--requires the explicit formulation of research designs relevant to the problems to be investigated. Careful formulation of research designs allows the integration of method and theory and tends to guarantee that the data units observed and collected in the field can ultimately be related to the questions being asked by the investigator.

Though the research designs for the I-77 survey were not completely finalized at the beginning of the fieldwork, a number of problem domains had been isolated and the general survey strategy and relevant data classes had been chosen. The first weeks of the fieldwork proceeded slowly and cautiously as a set of specific field techniques was tailored to the survey conditions we were encountering.

The methods and techniques employed by the I-77 survey were chosen with regard to the following research problems:

1. Estimation of the nature and extent of the archeological resources in the corridor of I-77.

2. Testing and evaluation of a set of field techniques designed to gather reliable data on the archeological record in heavily wooded zones in the Piedmont.

3. Identification of the general time periods and archeological culture units represented by the prehistoric archeological materials in the I-77 corridor.

4. Investigation of patterns of aboriginal utilization of the inter-riverine zones of the South Carolina Piedmont. This was the most ambitious of the I-77 research designs. It involved the formulation of a number of general hypotheses about the nature of prehistoric adaptations to the whole range of Piedmont environments, both riverine and inter-riverine, and the selection of broad sets of both archeological and environmental variables to be observed during the fieldwork and subsequent analysis. These hypotheses and their test implications will be presented later in this report.

5. Testing the hypothesis that prehistoric sites tend to be concentrated in close proximity to permanent streams.

6. Identification of raw materials used for manufacture of stone tools in the I-77 corridor and elucidation of variability in lithic raw material utilization among different cultural periods, tool classes, and portions of the corridor. As will be noted such information can be relevant to reconstruction of a number of aspects of a past cultural system.

7. Investigation of early historic settlement patterns in the inter-riverine Piedmont. This would complement research being carried out by Lewis (1975) on frontier towns in South Carolina and would supplement data on this topic available from historic sources.

8. Investigation of early historic agricultural land modification in the South Carolina Piedmont. This region has been settled by nonaboriginal peoples for 150-200 years and, until this century, saw extremely intensive agricultural use. The residual effects of this use, in terrace and ditch systems and even gullies and vegetational communities in preclimax successional stages (cf. Braun 1950; Oosting 1942), can be considered as part of the archeological record of historic land use and amenable to study using archeological survey data.

These research designs and the relevant data gathered during the survey will be discussed in more detail in succeeding sections of this report. It was anticipated that the I-77 survey would not provide conclusive answers to any of the research questions outlined above. The selection of these problems looked backward to the current concerns of prehistoric and historic archeology in this part of the Southeast; it also looked forward to the probability of mitigation stage research in the I-77 corridor and other future research in the South Carolina Piedmont. These problems were also selected so that their data requirements would, in part, overlap and could be harmonized within the scope of the planned survey.

Field Methods

Overview of Field Methods

The agreement between the South Carolina Highway Department and the Institute provided nine weeks for the completion of the fieldwork on I-77. These time constraints required that a number of choices be made concerning which data categories could be recorded and what level of intensity of survey could be attempted. During the first weeks of the survey, work proceeded slowly as a number of techniques were experimented with and a final set of techniques was chosen and streamlined. The shortcomings of these methods and techniques and the limitations of the resulting data base are reviewed in the section entitled Evaluation of Survey Techniques. It was hoped that, in spite of the numerous technical difficulties encountered, consistent application of technique would lead to recognition of meaningful and credible patterning in the archeological record in the corridor.

The field techniques employed on the I-77 survey will be described in detail below to facilitate evaluation of the techniques themselves and of the data they generated. The techniques used in the three major data gathering strategies, (1) the 20% random sample, (2) the investigation of stream crossings, and (3) the additional reconnaissance, will be described first. Then the collection techniques will be outlined. Finally, the relevance of the data classes and analytical units observed and collected will be discussed and related to the research designs outlined above.

The Location of Survey Units: Problems of Spatial Control

The sampling frame employed in the survey was constructed with the use of excellent aerial photographs in the planning document for the route (Systems Design Concepts Inc. 1972). These maps were of large scale (800' to the inch) and the proposed route (alignment "D") was indicated with a numbered engineering grid which allowed the frame for the 20% random sample to be readily put together. These maps also indicated approximately 50 streams crossing the corridor. These were to serve as the list of streams whose margins were to be investigated in addition to the 20% sample.

When the fieldwork actually began, however, a number of difficulties became apparent. First, it was found that the maps in the highway planning document were out of date; the actually staked route on the ground was as much as 1/4 mile from the mapped route in many places. We requested more up-to-date maps but were informed by the Highway Department that, other than cumbersome and extremely detailed construction blueprints, no such maps existed.

We chose then, to rely on finding a staked route on the ground and locating our sampling units on the staked route in positions corresponding as closely as possible to those in the original sampling design. These route changes also necessitated some revision of the list of streams to be investigated.

In most cases the cleared line of sight and staked centerline could be found by determined searching along roadsides in the vicinity. In some cases, however, the line had been cleared and staked so long ago that we were unable to find it. In these cases we located on the ground the spot indicated on the aerial maps and surveyed that, even though it might not actually be in the corridor. For purposes of estimating the general nature and extent of the resources in the corridor, these data are probably quite adequate. This meant, however, that we may have missed some sites--actually in the corridor and subject to destruction--which should have been considered for mitigation stage investigation.

A related problem was the presence of more than one staked centerline in the vicinity. In these cases, the most recent-looking line was chosen for the location of the survey units.

The location of the survey units in terms of the mapped route and/or one or more of the on-the-ground staked lines was always recorded. In spite of numerous difficulties, and occasional discrepancies in locating survey units where we intended to, precise spatial control over all data observed and collected was ultimately established.

Probabilistic Sampling: 20% of the I-77 Corridor

A stratified random sampling scheme with a 20% fraction was chosen for investigation of the I-77 corridor as a whole. Using the engineering grid on the plans prepared by Systems Design Concepts, Inc., the corridor was divided into 49 one-mile long sampling strata plus one partial mile stratum on the north end. These 50 strata were numbered 0 to 49 from south to north (Fig. 1). This large number of strata was designed to provide for a high degree of dispersal in the sample and even coverage of the corridor.

Each stratum was divided into five sampling units (Stratum 49 contained only 3). These units were numbered I to V from south to north, and consisted of 650' x 650' quadrats, an area equal to 20% of a segment of corridor 1 mile long and 400' wide. Each potential sampling unit was centered on one of five equidistant points along the projected centerline each mile. Then one sampling unit in each mile was chosen with the use of a table of random numbers. This sampling design is illustrated in Figure 6.

This 20% fraction was considered sufficient to generate a large number of sites in a manner which would reliably elucidate the proportions of the most frequent types of sites. It was considered that this sample of sites would, in turn, yield artifact assemblages representative of the major classes of artifacts in the corridor. The even dispersal of sampling units was designed to encompass the environmental variability within the corridor.

Though the archeological remains encountered in the corridor were to be recorded for the purpose of record-keeping as archeological sites, it was expected that in many cases no distinct, spatially-discrete clusters of artifacts would be present. Therefore, a nonsite survey strategy (cf. Thomas 1975; Goodyear 1975c) was considered appropriate for measuring properties of the archeological record in the corridor. Thus the sampling quadrats themselves--

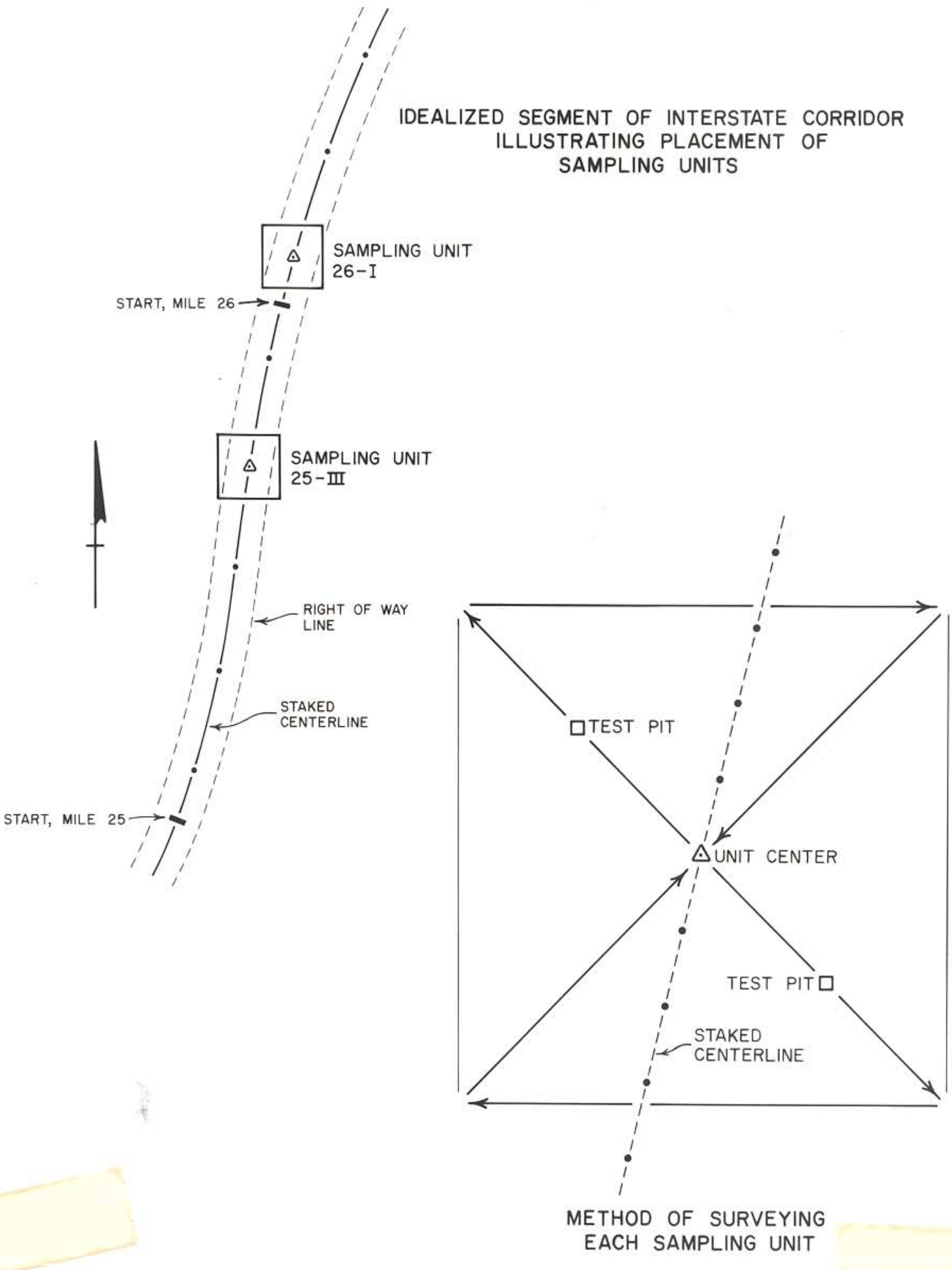

FIGURE 6: Probabilistic sampling design for the Interstate 77 survey.

rather than "sites"--were intended as the basic analytical unit for measuring parameters such as density of classes of archeological phenomena. Due to the vegetation, however, this proved very difficult to operationalize in the field.

Once the center point of each quadrat was located on the ground and marked by tying a colored plastic ribbon to a convenient tree, the corners of the unit were established. From the center a radial was run at a bearing of 45°, 135°, 225°, or 315°. A Brunton compass was used to establish the bearing. Because of the dense vegetation, a new compass sighting was required every 100-200' to complete the running of any given line. The distance from the center to a corner (460') and all distances were measured by pacing. From the corner, a line along the side of the sampling unit was run to an adjacent corner. From this second corner, a radial was run on the diagonal back to the center. On many occasions, this line was measured carefully to assess the error in measurement. The error in returning to the centerpoint was variable but usually on the order of 50'. Once back at the center, the process was repeated for the other two corners. The last diagonal, however, might be omitted if that portion of the unit had been investigated on the initial approach. This technique of outlining the sampling units is illustrated in Figure 6.

As the corners of the unit were being determined, we carefully checked for any areas of exposed ground within the unit. If any such areas (logging roads, cultivated fields, active gullies) were encountered, they would be intensively investigated after the corners had been established. When sites associated with sampling units were collected, materials were collected separately from within and without the unit. All prehistoric and historic remains in each unit were given a single site number. Separate loci within a unit were distinguished and designated "A," "B," "C," etc.

Certain classes of environmental data were recorded in each sampling unit whether or not any archeological data were observed. A sketch map was prepared showing, in addition to any archeological phenomena or modern cultural features, the general topography and vegetational zones in the unit. The composition of vegetational zones was recorded in general terms, "almost pure pines on oldfields," "mixed hardwoods; white oak, post oak, hickory; some cedar," etc. Of particular importance was the recording of the presence of exposed soil within the unit. At the time of the survey an impressionistic assessment of the visibility in the unit, "nil," "almost nil," "poor," "good," etc., was recorded. An additional variable, the natural occurrence of residual chunks of solid, uniform, relatively unweathered vein quartz was also recorded, especially when any prehistoric materials were found in association with the unit.

In conjunction with the sampling units, subsurface investigation consisted of excavation of a 1 x 1 m test pit at the midpoint of the first and third radial from the center of the unit (Fig. 7). When significant areas of exposed soil were present near the designated location, a test pit was considered redundant and was omitted. These test pits were excavated into subsoil (usually 4"-6"). The soil removed was not screened but was examined carefully. Any probable prehistoric material or relevant historic material found was collected.

FIGURE 7: Subsurface investigation: David Ballenger digging a 1x1m test pit on the southeast radial of sampling unit 37-I.

Nonprobabilistic Sampling: Investigation of Stream Crossings

The second part of the survey sampling strategy was intensive investigation of the margins of all of the streams crossed by the proposed route. Previous survey experience has indicated that in many areas, there is a strong tendency for prehistoric sites to be located along streams. Comparison of the data from stream margins with that from random sampling units would test the hypothesis that in the I-77 corridor, at least, prehistoric sites are indeed concentrated along streams.

One of the disadvantages of random sampling is that the rarer types of sites, which may be nonetheless important, are easily missed by these techniques. Investigation of stream crossings was considered to be strategy that might minimize the chance that especially important prehistoric sites, such as Archaic middens or late prehistoric villages, would remain undiscovered by the survey.

The streams crossed by the proposed I-77 route are quite variable in size and presumably likewise variable in associated biotic resources. Water for people and animals would be a critical abiotic resource available for all of the streams, but another abiotic resource, soil suitable for cultivation by aboriginal techniques, would be differentially associated with streams of various sizes. Quantitative and qualitative differences in the archeological resources associated with streams of various ranks would be relevant to inference of the kinds of resources being exploited by prehistoric groups in the inter-riverine Piedmont.

Operationalizing this part of the sampling program entailed preparation of a list of streams. This list originally consisted of all named streams plus those simply designated as "streams" on the plans for alignment "D" (Systems Design Concepts, Inc. 1972). As the actual staked route was located, this list was modified slightly. In all, 38 stream crossings were investigated. These streams varied from small, possibly intermittant branches in channels 2 or 3 feet across to small rivers (such as Fishing Creek and Big Wateree Creek), 80 feet across with a quarter mile wide floodplain. These streams were subsequently ranked by the drainage ranking system in Strahler (1964), Morisawa (1968: 152-156), and Weide and Weide (1973).

In the field, the basic technique of investigation consisted of examining the ground surface in the corridor on both sides of the stream. Investigation was concentrated on the higher terraces and hillsides adjacent to the alluvial bottoms rather than in the floodplains of the streams. When, as was usually the case, no ground surface was visible along the stream margin, a 1 x 1 m test pit was excavated on the first fairly level piece of high ground back from the stream.

Certain attributes of the stream were recorded in the field in every case, whether or not investigation revealed any archeological evidence. These attributes, measured by estimation, were: (1) channel width, (2) channel depth, (3) nature of stream bed (sandy, rock, etc.), (4) amount of water present at time of survey, and (5) width of floodplain. These data are presented in Appendix F of this report.

Additional Reconnaissance

The two kinds of systematic sampling described above were the major foci of the I-77 survey. Some additional portions of the corridor, however, were investigated as well. Some areas along early roads, as indicated in Mills' Atlas (Mills 1965) were investigated in search of early historic sites. Mills' Atlas also indicates some early homesteads in close proximity to the route; we attempted to locate these. This reconnaissance for historic sites was analogous to investigation of stream crossings for prehistoric sites; we hoped to thereby minimize the risk of missing important historic sites in the 80% of the corridor not intensively investigated.

We also recorded some archeological remains in the corridor that we encountered while going to and from the sampling units and stream crossings. In this way we located some prehistoric sites which exhibited a fairly high artifact density and which are to be considered for mitigation stage research. In addition, a few sites outside, but in close proximity to, the corridor were recorded and collected.

Ground Surface Visibility and the Survey Sampling Fraction

It should be emphasized that our actual sampling fraction, in terms of the percentage of the surface of the archeological record in the corridor actually examined, was significantly lower than the 20% comprising the random sampling units plus the estimated 10% comprising the stream crossing survey units. Ground surface visibility in the corridor was, on the whole, very poor and the actual sampling fraction is significantly below the ca. 30% encompassed by the sampling design, perhaps on the order of 5%.

Collections

The collection of samples of prehistoric cultural material from sites in the corridor was required by a number of project research designs. These include (1) the cultural identification of prehistoric groups represented by archeological materials in the corridor, (2) investigation of prehistoric lithic raw material procurement and utilization, and (3) testing of hypotheses of the aboriginal utilization of the inter-riverine Piedmont.

In making collections an emphasis was placed on obtaining representative samples of the totality of aboriginally modified materials at any given locus. Ideally, this would entail probabilistic sampling of areas designated as sites, or sampling of the entire corridor by a "nonsite" strategy (cf. Thomas 1975; Goodyear 1975c). Ground surface visibility within the corridor, however, was limited to road cuts, logging roads, areas of active gullying, newly cleared pine plantings, and an occasional field margin or over-grazed pasture. The collection strategy, then, was directed toward a total collection of prehistoric materials from these circumscribed zones of visibility. On logging roads and newly cleared pine plantings, more concentrated areas of prehistoric material might be distinguished and intensively collected. In every case, a record was kept of the size of the area collected so that crude, relative estimates of density could be made.

These total surface pickups were designated controlled collections. In some cases specimens of certain artifact classes were collected from beyond the controlled collection zone. These were designated grab samples.

The strategy outlined above was applied to most of the corridor. In sampling units 46-IV and 47-I near Rock Hill, construction work had proceeded to the point that the corridor had been cleared with bulldozers but construction of the road bed had not yet begun. Thus we were afforded with a look at the archeological record without the typical interference from the vegetation. A different sampling strategy was applied at these units. Light scatters of tools and debitage were found throughout these areas but some areas of concentration were observed and collected.

Residual chunks from weathering-out of quartz veins are widespread in the inter-riverine Piedmont and in some cases it was difficult to reliably distinguish naturally-occurring quartz from angular quartz debitage. This was particularly difficult at those sites interpreted as quarries for the extraction of this raw material. Relative whiteness, glossiness, and generally unweathered appearance were relied upon to distinguish angular, early reduction stage debitage from naturally-occurring unmodified chunks. This criterion cannot be considered foolproof since the availability of solid, uniform, relatively unweathered chunks of vein quartz at a locus was undoubtedly the major determinant of the location of prehistoric quarry activity.

Another class of prehistoric modified lithics, fire-cracked rock, cannot be said to have been reliably distinguished in the field. Quantities of fire-cracked rock were recognized at only one site in the corridor, 38FA100.

Historic material was systematically collected only when it was present in low density and careful examination was required to determine whether or not it represented early historic types. Sherds of pearlware, a late eighteenth and early nineteenth century type (Noël Hume 1970: 129-133), were recognized in a number of collections during laboratory analysis.

Relevant Data

The site attributes and environmental variables observed and recorded and the collection methods employed at archeological sites were designed to generate the kinds of data required by the management goals and research designs of the I-77 survey. And, as noted above, many kinds of environmental data were recorded at each of the survey units (sampling quadrats and stream crossings), even in the absence of observed archeological evidence.

A word is in order on the definition of archeological site employed by the I-77 survey. An archeological site is defined here as any location with observable physical evidence of past cultural behavior. The relevant behavior here is all prehistoric Indian activity or early historic activity. All loci of prehistoric activity--even isolated biface fragments or a few flakes--were recorded as archeological sites if they occurred within a sampling unit or at a stream crossing. The chronological cutoff point for historic behavior was 1900, though the exact dates of a given set of historic remains could not be established precisely. Prehistoric and early historic remains outside the survey units were

noted but not designated as sites and issued permanent numbers unless it was considered desirable to have them on record. Within survey units, some classes of historic agricultural modifications were systematically recorded, though not issued site numbers.

The goal of establishing minimal chronological controls over the prehistoric data was served by the collection of a few classes of artifacts, especially projectile points, which seem to be "diagnostic" of gross time periods in the prehistory of the Carolina Piedmont (cf. Coe 1964). The goal of subsystem reconstruction and cultural-ecological analysis, however, entailed data requirements which are much more complex and difficult to operationalize.

Reconstruction of the lithic resource procurement and utilization subsystems of past cultural adaptations required collection of representative samples of lithics from all environmental zones in the corridor. The reliability of measurement of parameters of artifact variability within the corridor or any part of it is, of course, a function of the adequacy of the samples as an indicator of the population of artifacts sampled. The collection methods employed were designed to provide the most representative samples possible within the constraints imposed by time and vegetational cover. Though we were forced to make numerous compromises in rigor, records were kept of the exact techniques used in collecting each sample.

A number of hypotheses and test implications are outlined in the discussion of aboriginal patterns of utilization of the inter-riverine Piedmont. The testing of these hypotheses calls for the same kinds of controlled collections required by the lithic resource utilization research design. Analysis of representative artifact samples was intended to elucidate intersite functional variability (cf. Binford and Binford 1966; Binford 1973; Wilmsen 1970: Thomas 1973; House 1975: 55-59).

These hypotheses also required observation and recording of site attributes and environmental variables. Site attributes recorded in the field include the extent of the site (if it could be determined) and the presence of midden staining. At historic sites, cultural features such as standing buildings, chimney piles, and dump areas were sketch-mapped. Environmental variables include the landform, local topographic position, distance to streams, slope, general nature of the soil, and proximity to water of the specific site location. These attributes pertaining to the environment on the site itself, would probably correspond to determinants of habitational loci; the space and shelter requirements of the minimal social group (cf. Binford and Binford 1966). Other environmental variables would be more pertinent to inference of extractive activities and target resources. Present-day vegetation was recorded. Though the environment of the Piedmont has been drastically altered by 200 years of intensive nonaboriginal use, the general successional vectors of the regional climax and the various edaphic climaxes have been studied (Oosting 1942; Braun 1950). It is probable that knowledge of the present-day vegetation is relevant to inference of prehistoric biotic communities. While some environmental variables were measured in the field, others were measured after-the-fact by the use of maps. The technique of site catchment analysis (Jarman, Vita-Finzi, and Higgs 1972) was used to measure properties of the environment in what are assumed to approximate exploitive territories associated with sites.

A number of parameters of archeological phenomena were crucial to testing of the cultural-ecological hypotheses but proved extremely difficult to estimate. These related primarily to the density of elements on both the intrasite and intracorridor levels. Records of the approximate area covered by controlled collections and the ground-surface visibility in those areas were designed to facilitate rough estimation of intrasite densities. The testing of hypotheses about target resources, however, requires information on the density of sites themselves--or, alternatively, in a nonsite framework, the density of elements--within various environmental zones. The intensive survey of areally-bounded sampling quadrats was designed to generate data on density of elements. Due to the heavy vegetational cover, however, the I-77 survey cannot claim to have measured these last parameters in more than a very crude, impressionistic way.

As noted above, a number of historic agricultural features were recorded in the sampling units even though they were not assigned site numbers. These included terraces, hillside ditches, gullied areas, and rock piles. These data were required by the research design on early historic utilization of the inter-riverine Piedmont.

Last but not least, a number of data categories recorded in the field related specifically to cultural resource management concerns. The relationship of each site to the interstate corridor was carefully recorded. The present use of the site (woodlands, pasture, etc.) and any apparent damage were noted. Also, preliminary assessment of the site's research potential was made and some general or specific recommendations for mitigation-stage research were outlined.

Time Requirements of the Survey Methods

This discussion would not be complete without an estimation of the time required by these field methods. The time required to survey a sampling quadrat was a function of both the nature of the vegetation and whether or not the quadrat produced any archeological data which had to be recorded. It varied from a minimum of about one hour to a maximum of over five hours. Excavation of each test pit involved 15-20 minutes of digging, examining soil and backfilling. The investigation of each stream crossing took a half hour to 45 minutes.

The number of survey units which could be completed in a day's work was a function of not only survey conditions but driving time from Columbia. On the northern end of the corridor, this driving time totaled three hours or more, round trip. Two sampling units and three or four creek crossings were about the maximum which could be completed in a day even when relatively little archeological data was encountered. On many days, one sampling unit and one or two creek crossings and the recording of a number of sites filled the workday. The site data form and daily field notes were begun in the field but considerable subsequent work in the laboratory was often required to complete the day's records.

THE NATURE AND EXTENT OF THE ARCHEOLOGICAL RESOURCES IN THE INTERSTATE 77 CORRIDOR

Summary of Archeological Site Data

The data generated by the I-77 survey and the subsequent analyses of artifactual and environmental variables are presented in Appendixes A-H. Fifty-nine loci were designated as archeological sites and recorded by permanent site numbers in the files of the Institute of Archeology and Anthropology. None of these sites was previously recorded in the Institute of Archeology and Anthropology site files. Fifteen of these sites had early historic components; 51 had prehistoric aboriginal components. The permanent site numbers and defining criteria of each of these sites are presented in Table 2.

Estimation of the Total Archeological Resources in the I-77 Corridor

From Table 2, it can be seen that 22 of the archeological sites were in sampling units, and 20 were on stream crossings. These sets overlap; site 38CS77 was located on a stream crossing in a sampling unit. Twelve additional sites were located by reconnaissance elsewhere in the corridor (as closely as the corridor could be determined at the time of survey) and seven were recorded immediately outside the corridor.

Twenty-two archeological sites, comprising 19 prehistoric components and 5 historic components, were recorded in the sampling units, which represent a 20% stratified random sample of 43 miles of corridor. Extrapolating from this, one arrives at a minimum estimate of 110 archeological sites in this 43 miles of corridor. It must be emphasized, however, that this 110-site estimate can in no way be considered highly reliable. In addition to the usual problems of sampling error, the heavy vegetational cover encountered in almost every survey unit severely restricted our ability to observe the archeological record.

The visibility data recorded during the survey of all 43 sampling units and 38 stream crossings are presented in Appendix A. It is obvious that the surface visibility of the archeological record was, on the whole, very poor. The subsurface testing carried out during the I-77 survey was only minimal and can be considered to have given reliable results only for fairly dense sites. The estimate of 110 archeological sites in the portion of the corridor under consideration, then, could be readily doubled or tripled.

The total area encompassed by the 43 sampling units is roughly .4 square miles. Doubling, for a conservative estimate, the 19 prehistoric sites in this area, to compensate for poor ground surface visibility, one arrives at 38 prehistoric sites (as defined in this study) in this .4 square mile area. This yields a prehistoric site density estimate of 100 prehistoric sites per square mile.

TABLE 2.

ARCHEOLOGICAL SITES RECORDED BY I-77 SURVEY

Site Number	Description
Sites in sampling units	
38 FA 99[1]	nineteenth-twentieth century house site
38 FA 104[1]	isolated biface fragment
38 FA 107[1]	prehistoric lithic scatter and historic ceramic fragments
38 FA 108	nineteenth century house site and scatter of historic material
38 FA 110	prehistoric lithics in test pit and logging road
38 FA 117	prehistoric lithics in test pit and scatter
38 FA 119	prehistoric lithic scatter
38 FA 112	prehistoric lithic scatter
38 FA 114	prehistoric lithic scatter
38 CS 93	1 biface fragment and pieces possibly from same fragment
38 CS 89	eighteenth-nineteenth century house site
38 CS 88	1 Morrow Mountain base
38 CS 71	prehistoric lithic scatter
38 CS 64	prehistoric lithic scatter
38 CS 68	1 flake in test pit
38 CS 67	prehistoric lithic scatter
38 CS 83	prehistoric lithic scatter
38 CS 82	prehistoric lithic scatter
38 CS 80[2,3]	prehistoric lithics in test pit
38 CS 77	prehistoric lithics in test pit
38 YK 25	4 areas of prehistoric lithic scatters and scatter of historic material
38 YK 24	3 areas of prehistoric lithic scatters
Sites at stream crossings	
38 FA 100	prehistoric lithic scatter
38 FA 102[1]	prehistoric lithic scatter
38 FA 105[1]	prehistoric lithic scatter and 1 flake in test pit
38 FA 115	prehistoric lithic scatter and scatter of historic material
38 CS 90	1 biface fragment
38 CS 91	prehistoric lithic scatter
38 CS 92	several scatters of prehistoric lithics and ceramics and some historic material
38 CS 86	prehistoric lithics in test pit
38 CS 72	1 Guilford point in test pit and prehistoric lithic scatter
38 CS 65	prehistoric lithic scatter

38 CS 69	prehistoric lithics in test pit
38 CS 81[2,3]	prehistoric lithic scatter
38 CS 77	prehistoric lithics in test pit
38 CS 78	nineteenth century historic rock ford
38 CS 94	prehistoric lithic scatter and scatter of historic material
38 YK 39	prehistoric lithic scatter
38 YK 38	nineteenth-twentieth century house site
38 YK 37	prehistoric lithic scatter
38 YK 40	prehistoric lithic scatter

<u>Sites in remainder of corridor</u>

38 FA 109	scatter of historic ceramics
38 FA 116	prehistoric lithic scatter
38 FA 118	prehistoric lithic scatter and a few historic ceramics
38 FA 113	nineteenth century house site
38 FA 106	prehistoric lithic scatter and scatter of historic material
38 CS 70	early historic cemetery
38 CS 87	prehistoric lithic scatter
38 CS 66	prehistoric lithic scatter
38 CS 84	prehistoric lithic scatter and scatter of historic material
38 CS 85	prehistoric lithic scatter
38 CS 76[4]	prehistoric lithic scatter
38 YK 26	prehistoric lithic scatter

<u>Sites just outside corridor</u>

38 RD 104	prehistoric lithic scatter
38 FA 101	prehistoric lithic scatter
38 FA 103[5]	prehistoric lithic scatter
38 CS 73[5]	prehistoric lithic scatter
38 CS 79	prehistoric lithic scatter
38 CS 74	prehistoric lithic scatter
38 CS 75	prehistoric lithic scatter

[1]site in right-of-way as shown on aerial photos in Systems Design Concepts, Inc. 1972, but may not be in right-of-way as finally planned.
[2]site in <u>both</u> sampling units and stream crossings.
[3]found to be outside right-of-way when staked center line was located later.
[4]probably in corridor, staked centerline not found in vicinity.
[5]site not in right-of-way as shown on aerials, but staked centerline could not be located in vicinity.

This figure is higher, but on the same order of magnitude, as the 29.6 prehistoric sites/mile^2 minimum estimate for the inter-riverine Piedmont arrived at by Kelly (1972: 5,11) using a rather different site definition and different survey techniques. It is imperative, we think, to point out again that in an environment like the Piedmont, estimates of the density of cultural elements (points, sherds, etc.), derived from a nonsite sampling strategy, would be a much better measure of variables of past cultural behavior than would estimates of density of archeological sites.

Other Data

As noted in the section on Methods, some classes of historic data were systematically recorded during the survey but not issued permanent site numbers. These classes consisted of various kinds of evidence of past agricultural activity in presently wooded areas. These data are tabulated in Appendix H and are discussed in the section on Historical Archeological Resources in the I-77 Corridor.

EVALUATION OF SURVEY METHODS

Introduction

The present survey is the first intensive survey of a large number of dispersed randomized survey units in an inter-riverine zone in the South Carolina Piedmont. These data, in conjunction with previously-recorded data from investigation in riverine zones in the Piedmont and on the Fall Line, provide a preliminary basis for defining the range of prehistoric and historic site variability and broad outlines of settlement patterning for the region as a whole.

The kinds of questions about past human behavior now being asked by archeologists world-wide require reliable, quantified data on site location, site variability, and density of cultural elements and features on a regionally extensive basis (cf. Binford 1964; Struever 1971). One of the main research goals of the I-77 survey was further refinement of our repertoire of methods and techniques for gathering these kinds of survey data from heavily vegetated environments such as the South Carolina Piedmont.

This chapter will evaluate and explore the limitations of the data generated by the I-77 survey in terms of their adequacy for answering questions about the prehistoric and early historic past in the region. This chapter will also attempt to evaluate the specific techniques, methods and strategies employed by the I-77 survey as a means for acquiring data for testing hypotheses about past cultural adaptations.

This further consideration of methodology is important to the overall cultural resource management goals of the Highway Archeology Program of the Institute of Archeology and Anthropology. Evaluation of the present data base is vital to our estimates of project impacts and assessments of the significance of known archeological resources in the corridor. These considerations are also vital to our decisions on the nature and scope of needed mitigation in the I-77 corridor and to research design and budgeting considerations for future surveys in the South Carolina Piedmont.

Limitations of the Present Data

Comprehensiveness of the Corridor Survey

The major constraint on the comprehensiveness of the survey data from the 81 survey units (43 sampling units and 38 stream crossings) was the heavy vegetational cover in the corridor. Table 3 summarizes the vegetational cover from the sampling units. Over 80% of the units were predominantly wooded, though in a few of these wooded units, ground surface visibility was ameliorated by recent logging and ground surface disturbance. Most of the remaining units were in pasture.

The survey units also ranked by relative ground surface visibility deriving from various causes. These rankings are summarized in Table 4. From this table, it can be seen that the ground cover in over half the stream crossings and a third of the sampling units was so complete as to allow hardly a glimpse of the underlying soil. In most of the remaining units, ground surface visibility was only slightly better.

TABLE 3.

VEGETATIONAL COVER TYPES IN SAMPLING UNITS IN THE I-77 CORRIDOR

Vegetational cover type	Number of units	%
Mostly wooded, no recent logging	30	70
Wooded with recent logging disturbance	5	12
Mostly pasture	5	12
Mostly under cultivation	1	2
Cleared for I-77 construction	2	5
	43	101

TABLE 4.

RELATIVE GROUND SURFACE VISIBILITY IN THE SURVEY UNITS IN THE I-77 CORRIDOR

Visibility rank	Number of units	%
Sampling Units:		
0	15	35
1	26	60
2	2	5
	43	100
Stream Crossings:		
0	20	53
1	14	37
2	4	11
	38	101

0 = no exposed ground surface
1 = ground surface exposure in small percentage of unit
2 = ground surface exposure in extensive portion of unit

An evaluation of the subsurface investigation methods employed by the I-77 survey will be presented in a later section of this chapter. At this point it will only be noted that the subsurface testing did locate sites and did augment the comprehensiveness of the survey. The intensity of this subsurface testing, however, was not sufficient to locate "all" of the sites that may have been concealed below the ground cover in the areas investigated.

Another major constraint on the visibility of the archeological record is the probability that some sites in the corridor have been buried by recent alluvium. Trimble (1972) notes that the massive forest clearing and expansion of agriculture in the Piedmont in early historic times resulted in severe erosion of uplands and vast accumulation of the resulting alluvium in the floodplains of streams. It is likely that a number of sites deposited on low-lying floodplain surfaces in prehistoric and early historic times in the I-77 corridor are now deeply buried beneath Historic period alluvium and were innaccessible to survey by the techniques we used.

All areas with exposed ground in the survey units were covered at intervals of 50' or less. The writers believe that, given this level of intensive coverage, very little archeological data observable on the surface went unrecorded.

The Corridor and the Region

As noted by Goodyear (1975a: 10-11) the survey of highway corridors has a number of limitations as a source of data for regional studies. Narrow, ribbon-like transects cannot be expected to contain statistically accurate representation of the microenvironments in a region and their associated exploitive activities. Thus, prehistoric and historic site variability cannot be expected to be adequately represented either. Highway transects are, nonetheless, often extensive, encompassing a wide range of environmental diversity. The bias in highway location within a region can be specified within certain limits and certain kinds of qualitative site data pertinent to cultural identification, past activities, and techno-environmental associations may be generated.

As noted above, the I-77 corridor is located completely within an inter-riverine portion of the Piedmont. Most parts of the corridor are several miles from any major river valley. The topography within the corridor is nonetheless quite diverse, including ridges and ravines, extensive upland flats and broad floodplains along major tributaries of the Broad and Catawba-Wateree river systems. The projected centerline, as actually staked on the ground, follows a rather straight route, apparently not greatly influenced by localized topography.

We conclude then, that though the I-77 corridor does not encompass the range of environmental variability within the South Carolina Piedmont, it probably does encompass most of that variability within the inter-riverine zone in which it is located. Accordingly, the I-77 site sample probably includes examples of at least the more common types of prehistoric and historic sites within this zone. It cannot be assumed, however, that this site sample accurately indicates the frequencies of each site type in the underlying site population.

Evaluation of the I-77 Sampling Design

The I-77 sampling design, described in detail previously, consists of three parts:

1. A 20% fraction stratified random sample of the corridor as a whole, the sampling units consisting of 650' x 650' quadrats.

2. Investigation of both sides of all streams crossed by the I-77 route to test the hypothesis that prehistoric sites have a tendency to be located on streams.

3. Investigation of selected additional areas in the corridor which were thought to have a good likelihood of containing sites of early historic activity.

The data yield of this sampling design was constrained by the site visibility problems outlined above. At this stage of our experience in regional sampling in the East, it is impossible to specify with assurance the reliability of a given sampling design in terms of confidence intervals and other concerns of sampling theory. It is quite probable, though, that our best confidence intervals in this kind of sampling are much broader than those considered optimum in other disciplines which employ space sampling techniques (cf. Thomas 1975). This discussion will primarily address itself then, to logistical considerations and the appropriateness of the I-77 sampling design to the environmental conditions and time limitations encountered by the project.

First, an 9.7 acre (3.9 ha) quadrat may sound like a rather small area but the writers can attest to its vast size when viewed from the middle of a heavily wooded, briar-entangled Piedmont creek bottom. The survey of a quadrat required a usual minimum of two hours of fighting green briars and honeysuckle and making numerous short compass sightings through the dense understory. Due to the heavy vegetational cover in nearly half of the survey units, this two or more hours was frequently unproductive of any archeological data, positive (demonstrating the presence of cultural remains) or negative (demonstrating their absence). The method in this light seems rather inefficient.

Resolution of the dilemma of time limitations vs. sampling reliability might be approached in a number of different ways:

1. The sampling unit size might be decreased and the intensity of subsurface sampling increased. This would yield more reliable data per unit but with a much smaller fraction. As noted below, decreasing unit size might, on the other hand, decrease survey efficiency in environments in which it was difficult to locate the units in the first place.

2. An investigator might resort to a nonprobabilistic sampling design in which areas of potential ground surface visibility identified in aerial photos (i.e., logging roads, cultivated fields, gullied areas)

constitute the basic survey unit. This scheme would have a greater data yield per unit survey time. The biases inherent in the sample could be specified and even quantified by comparison of relevant environmental attributes of the set of survey units with comparable attributes of a set of randomized points or vectors in a region. These variables, land form, slope, soil, proximity to streams, could be measured on maps, without in-the-field observation. This strategy is being employed in the survey of the Laurens-Anderson Connector Route (Goodyear and Ackerly, personal communication).

3. We suggest that the optimum approach to designing a sampling program would be employment of a multistage strategy in which the final choice of survey methods was made only after a brief reconnaissance had revealed the general nature of the vegetational cover and current land use patterns in the project area. For instance, Strategy Two might have been optimum for the survey of the I-77 corridor which, we realize now, is located in one of the most sparsely populated and heavily wooded zones in the South Carolina Piedmont.

In any event, the choice of techniques and the allocation of time and funds to a given sampling design should be a function of the level of reliability required by the research and cultural resource management objectives of the project.

Parts 2 and 3 of the I-77 sampling design seem, in retrospect, appropriate to the research objectives they were designed to fulfill. Part 3 might have been somewhat more effective if project time had allowed more exhaustive checking of early maps and other documentary sources for potential early historic site locations in the corridor.

Subsurface Investigation: Experimental Testing at 38FA100

Subsurface investigation was not originally part of the I-77 survey design. The limited program of subsurface testing described previously was appended to the set of survey techniques to be employed only after it was realized that extremely poor ground surface visibility would be encountered in most of the survey units.

Evaluating this technique involves two questions: (1) Will excavation of 1x1m test pits reliably discover archeological sites which are present but not visible on the surface? and (2) Will the excavation of two such pits in a sampling unit or one on each side of a stream crossing be a reliable indicator of the presence of sites in a survey unit?

The answer to the second question is obviously "no." Sites may be quite small and the excavation of two 1 m^2 test pits in an area of 39,000 m^2 is pretty poor odds. The significance of the subsurface testing program to the I-77 survey is that it augments the data from logging roads and other exposed areas in indicating the abundance of archeological remains in the corridor and it generated a number of sites in the impact zone which should be considered for mitigation stage work. To answer the first question, five such 1x1m test pits were excavated in heavily-overgrown portions of a known site which had been discovered in the I-77 corridor.

Site 38FA100 is located on a gently sloping, south-facing hillside overlooking the floodplain of Cedar Creek. In one place, a fairly level-topped spur of the hillside extends out into the floodplain in close proximity to the creek. The soil is a red clayey loam. Much naturally occurring residual rock is present on the steeper slope on the western edge of the site but the spur seems to be devoid of this material. The site was in neglected pasture; the vegetation was primarily broomsedge and other grasses and weeds with scattered young pines and cedars and an occasional large hardwood.

When first visited by the writers in September 1975, bridge construction for I-77 was already underway south of the site. The ground cover on various parts of the hillside had been disturbed by movement of heavy equipment. Prehistoric chipped stone tools, fragments, and debitage were observed in many of these disturbed areas near the small spur. The surface collections included Morrow Mountain, Guilford, and Palmer points and a variety of other bifaces and flake tools. No prehistoric ceramics were found. Exposure of this material seemed limited to the hillside; none was observed on the floodplain. The extent of the site could not be determined but cultural material was observed in disturbed ground throughout an area at least 100 yards in diameter.

On October 1, we returned to 38FA100 to test the hypothesis that excavation of 1x1m test pits, by the method outlined above, within the boundaries of a known site would consistently yield cultural material. Five pits were located on a north-south line across the center of the site, on the level crest of the spur, and on the slope immediately to the north. These pits were all within the boundaries of the site as defined by the presence of prehistoric cultural material in disturbed areas.

The artifact yield from the five pits is presented in Table 5 and compared with the yield from intensive surface collection of a 600 ft^2 area in the center of the site.

TABLE 5.

ARTIFACTUAL DATA FROM TEST PITS AND CONTROLLED COLLECTION AT 38FA100

Provenience	Fire* Crkd.	Chunks	Other Flks.	Thin Flks.	Point Fr.	Bif. Blnks.	Flk. Tools	Unif.	Core Tool
Controlled (ca. 600 ft^2)	487g	20	38	2	1	2	3	1	1
Test pit 1	338g	1	2	5	0	0	0	0	0
Test pit 2	20g	5	5	4	0	0	0	0	0
Test pit 3	9g	0	0	0	0	0	0	0	0
Test pit 4			(no artifacts)						
Test pit 5	911g	6	8	8	1	0	0	0	0

*Most of this "fire-cracked rock" consists of cracked and seemingly discolored fragments of metamorphic schistose rock. This material may not all actually be fire-cracked but stratigraphic data indicated that it was introduced to the site by human activity.

Though all of the pits were within the boundaries of the "site" as defined above, their artifact yield was quite varied. Pits 1, 2, and 5 seem to have intercepted a small concentrated habitational area with an abundance of fire-cracked rock. Pits 3 and 4, located less than 50 feet to the north and in immediate proximity to disturbed areas which yielded artifacts, produced almost no cultural material. The stratigraphy of these units is also of interest. All artifacts occurred in a zone of reddish-brown clayey loam which extended to a depth of 4 to 6 inches below surface. This is interpreted as a plowzone. Below this was a sterile, extremely compact red clay subsoil. This subsoil was devoid of any rock, indicating that the abundant nonartifactual rock in the plowzone was brought to the site by human beings. Most of this material has been tentatively identified as fire-cracked rock.

We conclude then, that the probability that test pits of this type will serve to discover sites in woods or pasture is primarily a function of the density of the sites. These pits will probably reliably indicate dense concentrations of artifactual material associated with habitation or other relatively intensive use. The probability of site discovery decreases, however, with a decreasing density of material. Many sparse sites which would be recorded and collected if found in cultivated areas, gullies, or logging roads would be missed by the kinds of blind test-pitting we employed. The discovery of ten prehistoric sites by this technique--out of 119 test pits--seems in this light somewhat remarkable. We suggest that most of these test pits represent fairly dense sites and that this proportion of positive tests dug by the blindest of blind sampling indicates a fairly high density of prehistoric cultural material within the I-77 corridor as a whole.

A Review of Subsurface Investigation

Subsurface investigation as a site discovery technique has been around for some time but it is only recently being integrated into probabilistic regionally-extensive sampling designs in the East. The decision to attempt subsurface investigation on the I-77 survey was influenced by the success encountered by George Teague (personal communication) in the 1972 survey of the Parr-Frees Nuclear Power Facility in Fairfield and Newberry Counties. Teague's subsurface investigation method was a response to heavy vegetational cover. It involved scraping away vegetation in an area 10 m in diameter and digging 1x1m test pits at randomized points in the survey area. Seven out of 30 of the locations tested in this manner produced prehistoric artifacts (Teague 1976).

Other recent applications of probabilistic subsurface testing in wooded environments are described by Lovis (1976) and Wood (1975). The former involved excavation of 1 x 1 ft. shovel test at intervals in a forested area in Michigan. The sampling program described by Wood involved excavation of 10 cm core samples from as deep as 1.5 m below surface at randomized intervals averaging 100 m in 500 x 500 m sampling quadrats in the future Laurens Shoals Reservoir basin on the Oconee River in north central Georgia. This design also has the advantage of testing for sites obscured by alluvium as well as by vegetation. Both surveys demonstrated the usefulness of subsurface investigation by discovering large numbers of sites of which there was no evidence on the surface. The Institute of Archeology and Anthropology is currently carrying out experimentation in subsurface survey techniques in conjunction with work at Fort Johnson near

Charleston, South Carolina (Stanley South, personal communication) and the Bobby Jones Expressway near Augusta, Georgia (Ferguson and Widmer 1976).

The decision to use intensive subsurface survey techniques entails a number of considerations:

1. As in the case of regional sampling, the reliability of any given technique remains yet to be rigorously evaluated empirically.

2. Wood (1975) suggests that in heavily wooded environments, larger sampling units may be more efficient than smaller units because of the time required to locate any unit on the ground, regardless of size.

3. The choice of the specific subsurface sampling unit; 1x1m pits, 1 x 1 ft. pits, 4" diameter cores, etc.; is a matter of the data requirements of the project research designs. The various programs carried out so far suggest that small test units can reliably discover middens and very dense sites, probably representing intensive habitation. But the data from the experiment at 38FA100 suggest that if the data requirements include reliable information on low density outputs of extractive activities, then even 1x1m test pits may be too small for reliable discovery.

Evaluation of Units of Data Collection and Analysis

As noted by Schiffer (1975a: 108) the assumption that archeological "sites," observable phenomena of the archeological record, are isomorphic with past behavior spaces and structural poses of a past society involves an unwarranted merging of archeological and systemic contexts. An observable concentration of archeological remains may represent an episode of intensive, prolonged use of a location, or it may represent many successive, and even behaviorally diverse, ephemeral uses of that location. Also, not all kinds of human behavior can be assumed to result in archeological outputs within a circumscribed area which can be distinguished as an archeological "site." For these reasons, sampling strategies which measure the density and distribution of cultural elements, rather than more ambiguous and synthetic archeological sites, would be the optimum means of measuring and defining the spatial organization of past human behavior in a region. Examples of such "nonsite" survey strategies are presented by Thomas (1975) and Goodyear (1975c).

The use of sampling quadrats in the I-77 survey was intended to measure densities of cultural elements (points, biface fragments, thinning flakes, etc.) and features (field clearing rock piles, hillside ditches) within the I-77 corridor. This strategy proved, however, virtually impossible to operationalize --especially for prehistoric remains--within the logistical framework of the survey. It proved more convenient to designate the sporadic and fortuitous exposures of cultural material by erosion, logging roads,etc., as archeological "sites" and treat these sites as our basic units of data collection and analysis. As will be seen from the discussions of site content, considerable intrasite variation in artifact content seems to be present within some of these loci.

On the few occasions when extensive areas of ground surface in the corridor were exposed, the scattering of prehistoric cultural material was almost continuous over hundreds of acres with occasional small, higher density "hot spots." This pattern was especially evident in the cleared portions of the corridor associated with sampling units 46-IV and 47-I in York County. A similar pattern in distribution of prehistoric material also seems apparent in many areas investigated by Goodyear and Ackerly (personal communication) in the corridor of the Laurens-Anderson Connector Route, where ground surface visibility is consistently better than in the I-77 corridor. We can at this time suggest no solution to this problem; it seems evident, however, that a nonsite survey strategy would be most appropriate for measurement of variables of past cultural behavior at least in inter-riverine zones in the Piedmont.

CULTURAL IDENTIFICATION OF PREHISTORIC ARCHEOLOGICAL REMAINS IN THE I-77 CORRIDOR

Introduction

This section will attempt to relate the prehistoric archeological data recovered by the I-77 survey to the sequence of prehistoric cultural periods outlined previously in this report. The culturally-historically "diagnostic" artifacts recovered on the survey will be relied upon to minimally indicate human occupation during these time periods.

The proveniences of these and other prehistoric artifacts are tabulated in Appendix C. The artifact "types" referred to here are normative and somewhat intuitively defined. Their general utility in recognition of broad temporal horizons in the prehistory of this part of the Southeast seems, however, to have been demonstrated. Most of these types refer to "projectile points," hafted symmetrical bifaces.

There is, of course, always room for uncertainty and debate in the assignment of individual artifacts to normative types. In hopes of partially remedying this problem, all of the relatively complete points and point fragments are illustrated in Figures 8,9,11,12 and 13, and raw material and metric data for these specimens are presented in Appendix D.

These data indicate that some prehistoric sites in the corridor area seem to represent reoccupations of the same loci during more than one cultural period. Other sites, in contrast, yielded no such "index fossils" permitting assignment of the occupation to a specific prehistoric period. This is to be expected. The samples in many cases are quite small and, furthermore, these "diagnostic" artifacts were also elements of functioning tools and facilities and their deposition in archeological context at a locus of past activity would be contingent on whether or not that activity entailed the use, breakage, discard or loss of that particular artifact class.

The present discussion then, is a minimal attempt at reconstruction of the culture history of the corridor area. The data generated by the I-77 survey will be compared with the larger, if somewhat less versatile and statistically reliable, set of data collected by Kelly (1972) in this same inter-riverine zone.

The Paleo-Indian Period

No fluted points or other artifacts attributable to Paleo-Indian occupation were found by the I-77 survey. As noted earlier, fluted points have been found in small numbers throughout the Piedmont and one probable fluted point fragment is reported from a site in close proximity to the I-77 corridor in southern Chester County. The absence of Paleo-Indian materials in the I-77 collections is to be expected given the apparent sparseness of such materials in the region as a whole.

The Archaic Period

Almost all of the prehistoric materials recovered by the survey are readily attributable to Archaic period occupation. Since this 7000 year interval undoubtedly encompasses a series of significant environmental changes and even more important cultural changes, it is desirable to distinguish a number of temporal divisions within the Archaic.

Early Archaic

A few artifacts recovered by the survey appear to represent occupation during this interval of roughly 8000-5500 B.C. Two probable Palmer point fragments (Coe 1964: 67-69; Phelps 1964: 53) were found at two different sites. A basal fragment was found at 38FA100 (Fig. 8a) and a blade mid-section of a serrated, resharpened "spinner" point was found at 38CS72 (Fig. 8b). Two probable fragmentary Kirk Stemmed points (Coe 1964: 70) were found on either side of Stream number 43, at sites 38YK24 and 38YK39 (Fig. 8c and d). One additional artifact, a fragment of a steep-angled end scraper of light grey, probable Ridge and Valley Province chert from 38FA116, resembles end scrapers frequently found in Paleo-Indian and Archaic components in the East.

These artifacts suggest widespread but relatively sparse Early Archaic occupation throughout the I-77 corridor area. This is consistent with Kelly's data. A variety of topographic locations is represented in this site sample. Sites 38FA116 and 38CS72 are located on high ridge tops while 38FA100 and the two probable Kirk Phase components are located beside permanent streams.

Middle Archaic

The interval represented by Stanley, Morrow Mountain, and Guilford points can probably be bracketed between 5500 and 2500 B.C. The I-77 data are consistent with Kelly's data indicating comparatively intensive occupation during Middle Archaic times.

Two points from sites in the corridor in York County are tentatively identified as Stanley points (Coe 1964: 35). A specimen from 38YK39 (Fig. 8e) very closely resembles those illustrated by Coe but the fragment from 38YK37 (Fig. 8f), though corresponding to the Stanley type in outline, more closely resembles the Savannah River type in flaking pattern.

Nine points are assigned to the Morrow Mountain type (Coe 1964: 37-43) and 7 to the Guilford type (Coe 1964: 43) (see Figs. 9 and 11). Morrow Mountain points and Guilford points, as defined and illustrated by Coe, tend to intergrade slightly. The attribute of discernable shoulders on the lateral edges was used here to distinguish Morrow Mountains from round-based Guilfords. It should be noted here that assignment of all of these contracting stemmed points from the I-77 survey to the Morrow Mountain type may be questionable. Small contracting stemmed points, called "Garys" by Phelps (1964: 95) were closely associated with fiber tempered ceramics at the Stalling's Island site (Bullen and Greene 1970: 13-14).

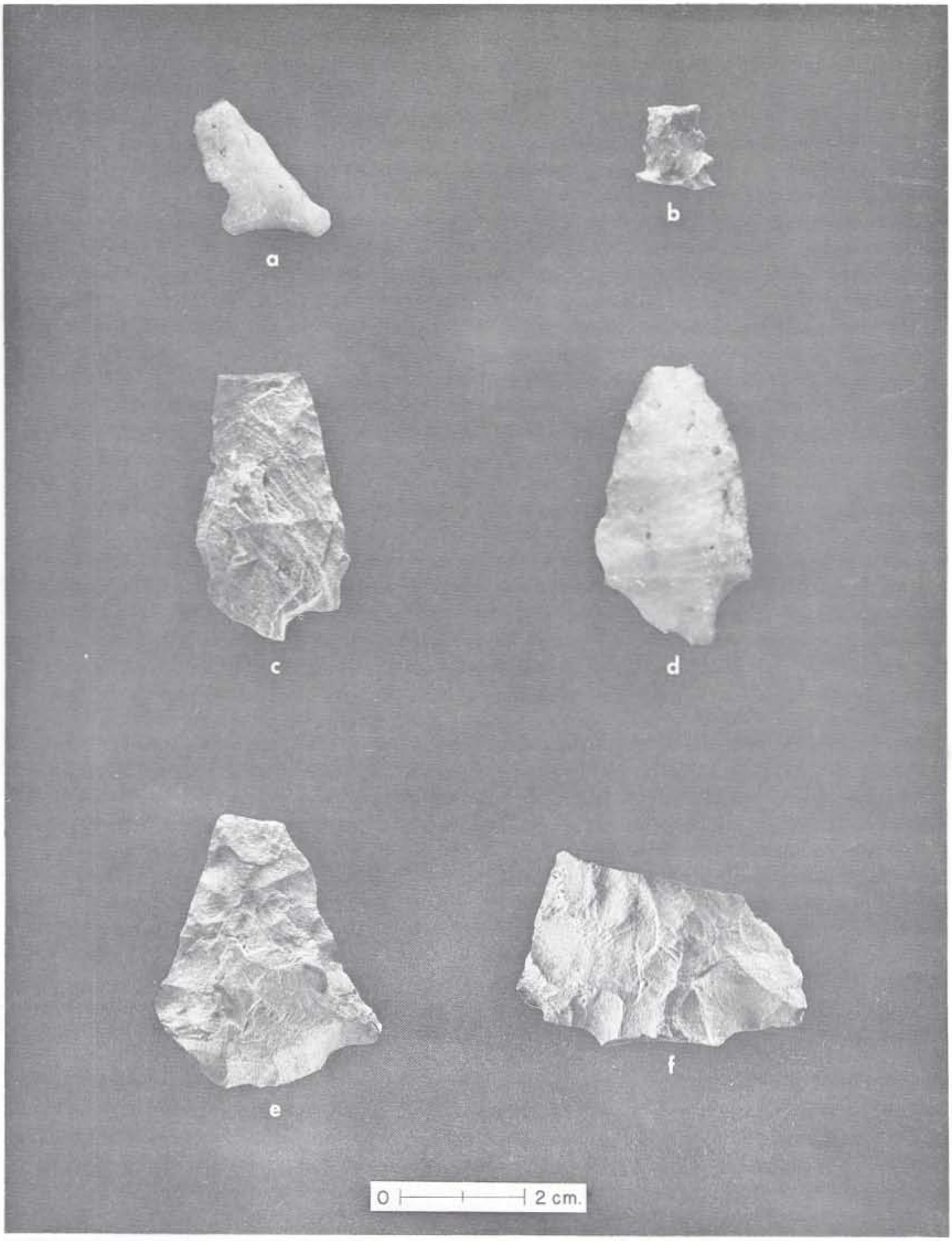

Figure 8.

Miscellaneous Early and Middle Archaic points from sites in the Interstate 77 corridor: a. Palmer base, 38FA100, controlled collection; b. Palmer blade midsection, 38CS72, controlled collection; c. Kirk stemmed point, 38YK39, grab sample; d. unclassified stemmed point, possibly Kirk, 38YK24, grab sample; e. Stanley point, 38YK39, grab sample; and f. Stanley point (?), 38YK37, controlled collection.

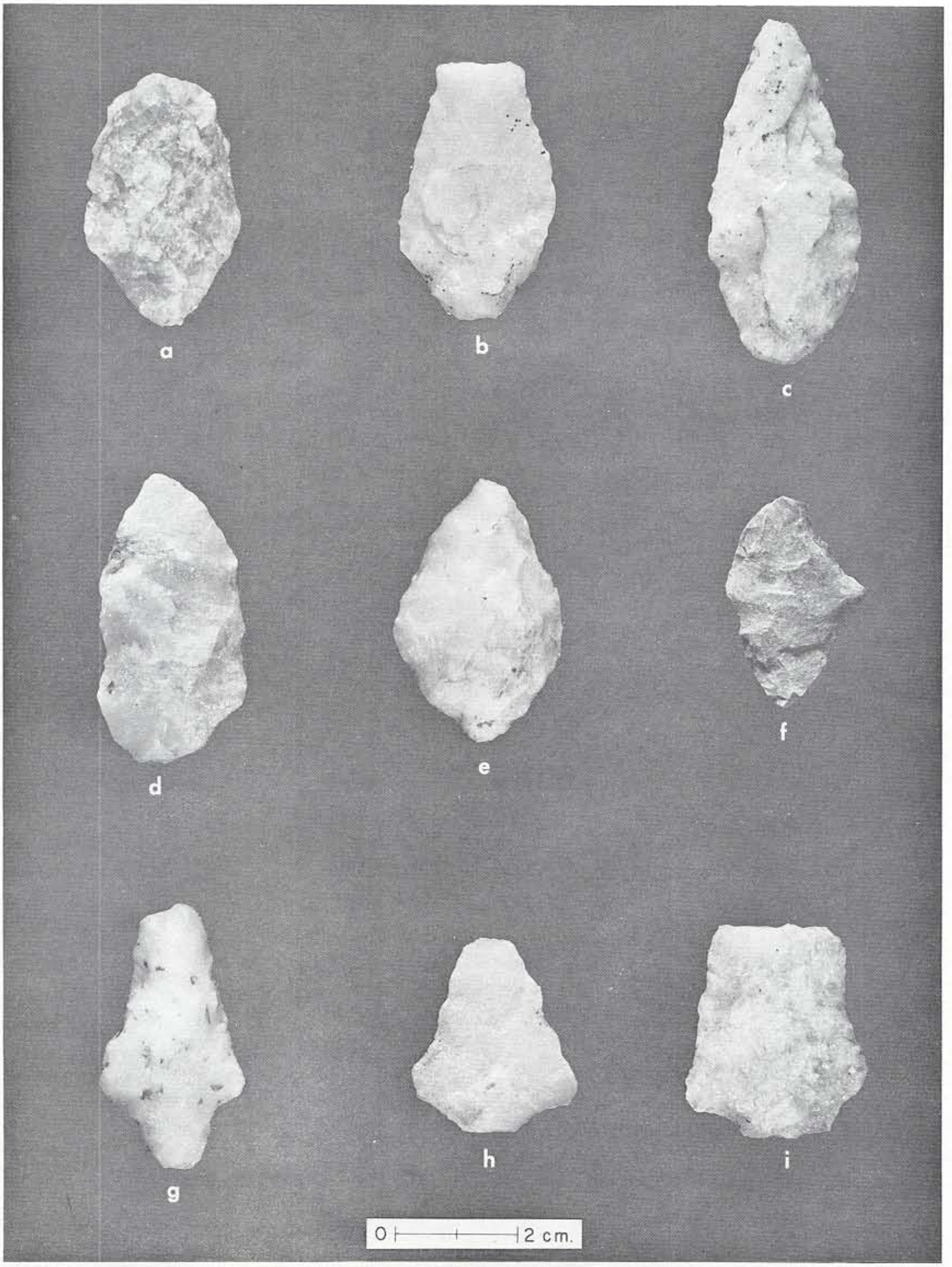

Figure 9.

Morrow Mountain points from sites in the Interstate 77 corridor: a. 38CS73; grab sample; b. 38YK24B, controlled collection; c.-e. 38FA100, grab sample; f. 38YK26, grab sample; g. 38FA100, grab sample; h. 38FA118, controlled collection; and i. 38CS88, isolated find.

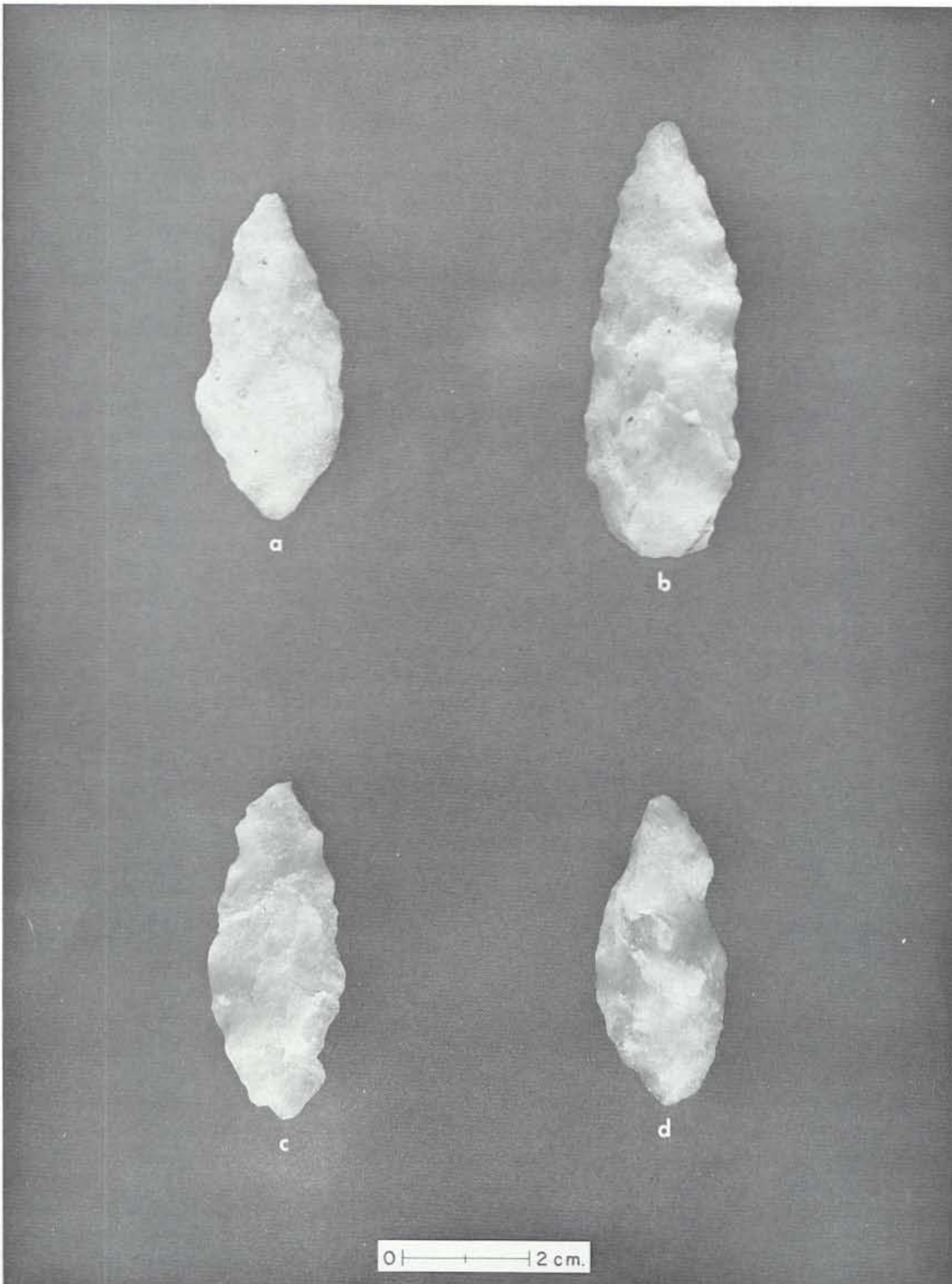

Figure 10.

Probable Morrow Mountain preforms from sites in the Interstate 77 corridor: a.–b. 38YK24, grab sample; and c.–d. 38YK40, grab sample, (d. may actually be a crudely finished tool).

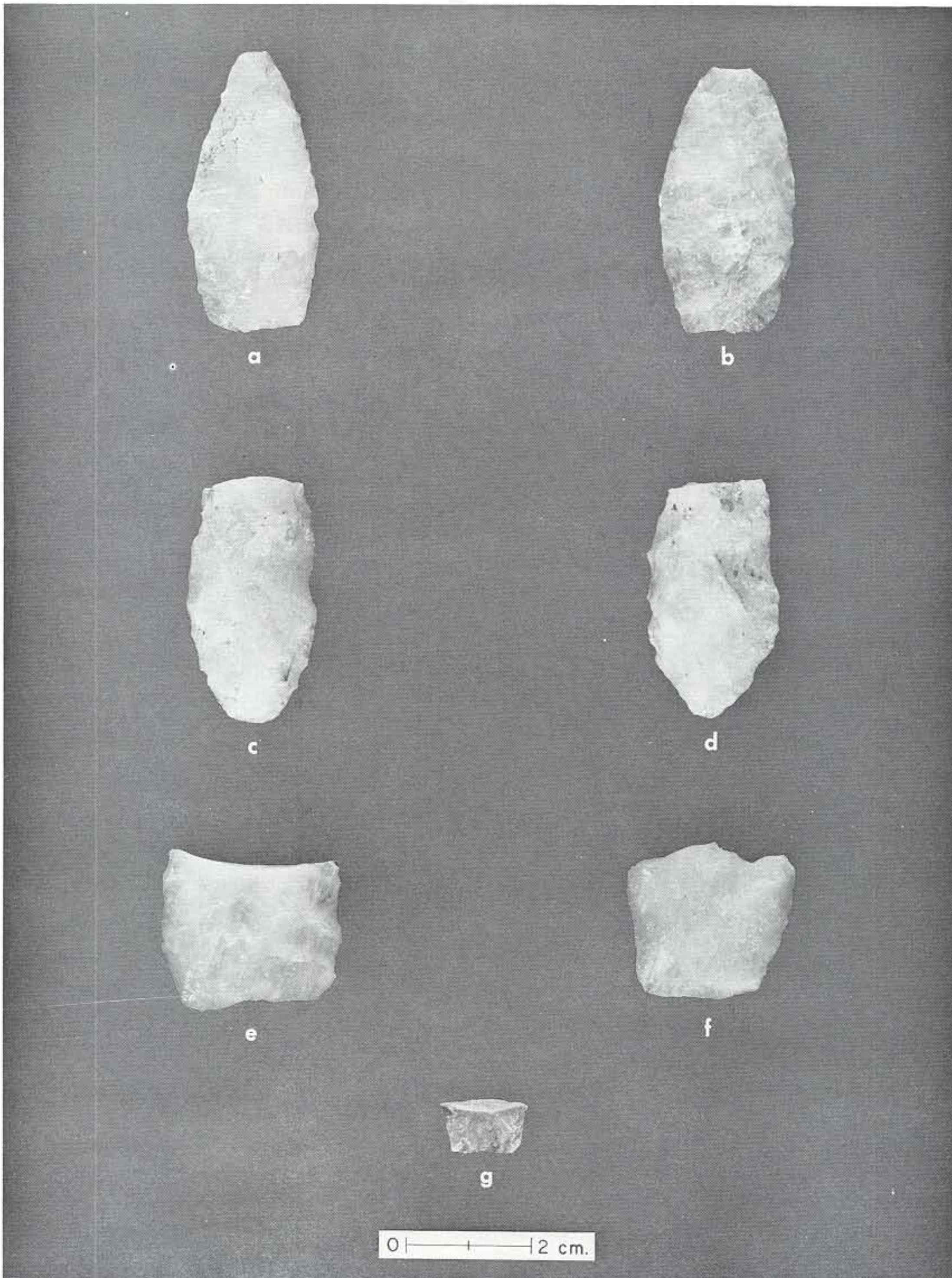

Figure 11.

Guilford points from sites in the Interstate 77 corridor: a. 38YK40, grab sample; b. 38CS72, test pit; c.–d. 38FA100, grab sample; e. 38CS90, isolated find; f. 38FA102, controlled collection; and g. 38FA118, controlled collection.

A number of long,narrow, Morrow Mountain-like bifaces which lack evenly-retouched blade and stem edges are tentatively identified as Morrow Mountain point preforms which broke and/or were discarded in the final stage of manufacture. These are illustrated in Figure 10. No other artifacts recovered by the survey can be confidently assigned to Middle Archaic occupation. It is highly probable, however that a high proportion of the numerous unclassified biface fragments present at sites throughout the corridor area represent mid-sections,tips, and other small fragments of Guilford and Morrow Mountain points.

The function of Morrow Mountain points remains obscure. A cursory examination of Morrow Mountain points from the present survey and elsewhere in Piedmont South Carolina reveals the presence on many specimens of dulling and rounding of blade edges, a category of edge damage indicative of light duty cutting and sawing functions (cf. Ahler 1971: 86-88). Discontinuous zones of blade edge dulling over-ridden by subsequent flake scars is also occasionally observed on Morrow Mountain points. This attribute is strongly suggestive of resharpening of blade edges. Some edge dulling has also been observed on Guilford points.

The two possible Stanley points are from sites beside permanent streams in York County. Guilford and Morrow Mountain points were found throughout the corridor in a wide variety of topographic locations. The co-occurrence of Guilford and Morrow Mountain points at the same site in a number of cases is suggestive of a similarity in the utilization of the environment by the makers of the two varieties of points.

Late Archaic

Nine large, broad, stemmed points were tentatively identified with the Savannah River type (Coe 1964: 44-45). These are illustrated in Figures 11 and 12. This point style spans the preceramic-ceramic transition on the South Atlantic coast (Phelps 1964: 89-95) implying a temporal range of roughly 3000-1000 B.C. The number of Savannah River points found by the I-77 survey is also in line with Kelly's (1972) data. A single broad expanding-stemmed point found at 38FA100 (Fig. 12b), though not resembling the Savannah River type, may also represent late Archaic occupation. A large biface fragment of Carolina slate from 38YK26 (Fig. 12e) appears, on technological grounds, to be a blade fragment of a Savannah River point.

That many, if not all, Savannah River points functioned as knives is apparent from observation of blade edge damage on many specimens (cf. Coe 1964, Fig. 40). A technological analysis of Savannah River points has been recently carried out by Quentin Bass (personal communication to Albert C. Goodyear). Bass hypothesizes that Savannah River points represent a tool manufacturing technology well adapted to the coarse-textured lithic raw materials available within the Piedmont area. He notes that resharpening of Savannah River points seems to have been usually accomplished by hard-hammer percussion resulting in detachment of thin, flat flakes which rapidly expand from the platform.

Identifiable Savannah River points and point fragments were found at four sites on the I-77 survey: 38CS74, 38CS75, 38CS94, and 38YK25A. The latter site is especially interesting since it yielded six quartz Savannah River points (see Fig. 12) and a variety of flake tools, debitage, biface blanks and cores within an area less than 100' diameter. Though only four sites, all in the Fishing Creek Watershed in the northern half of the survey area, produced Savannah River points, debitage analysis suggests that the actual scope of late Archaic occupation in the corridor may have been somewhat greater. Broad, thin, flat, expanding flakes of Carolina slate or ignimbrite were found at a number of additional sites. The size and morphology of these flakes strongly suggests detachment during the resharpening of Savannah River points. The absence of any fragments of Carolina slate Savannah River points at these sites (with the exception of the possible blade fragment from 38YK26) may reflect curation vs. discard of tool fragments of this "expensive" non-local material (Fig. 13).

Three of the four sites yielding Savannah River points are in close proximity to major streams; 38CS74 and 38CS75 are adjacent to the floodplain of Fishing Creek while 38CS94 is on a hillside overlooking the South Fork of Fishing Creek. Site 38YK25, however, is on a low rise with only quite small streams in the immediate vicinity.

Woodland Period

No linear check stamped prehistoric sherds or triangular (Badin or Yadkin) projectile points were found on the I-77 survey. Evidence of Woodland occupation of the region recognized by Kelly (1972) was, similarly, quite sparse.

Mississippi Period

Evidence of Mississippian occupation was confined to one, or possibly two, sites. Five late prehistoric Chicora Ware Group (South 1973) sherds were found at 38CS92. One of these weathered sherds exhibited faint complicated stamping. No arrow points were found at this site, but the debitage flakes included a number of black, unweathered pieces of Carolina slate or ignimbrite. The presence at this site of much older, quite weathered flakes of this same material, however, indicates the presence of an earlier Archaic component as well.

A possible arrow point fragment of unweathered Carolina slate was found at 38YK24, Area B. This suggests at least some Mississippian utilization of this site.

With these two exceptions, however, Mississippian remains were conspicuous by their absence. This is quite interesting in light of the close proximity of the I-77 corridor to zones of intensive and prolonged Mississippian occupation on the Broad and especially the Wateree River.

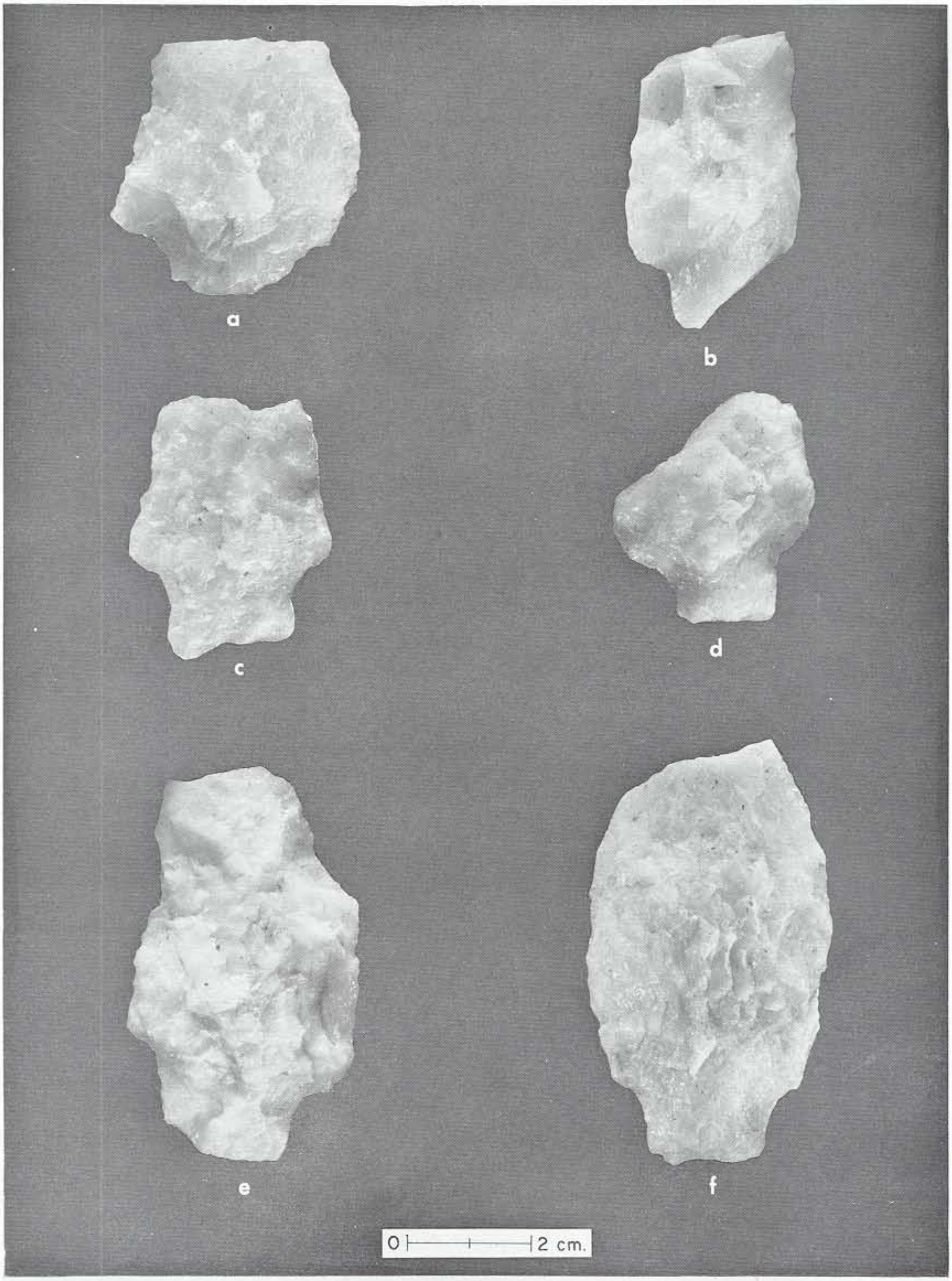

Figure 12.

Six quartz Savannah River points from site 38YK25A.

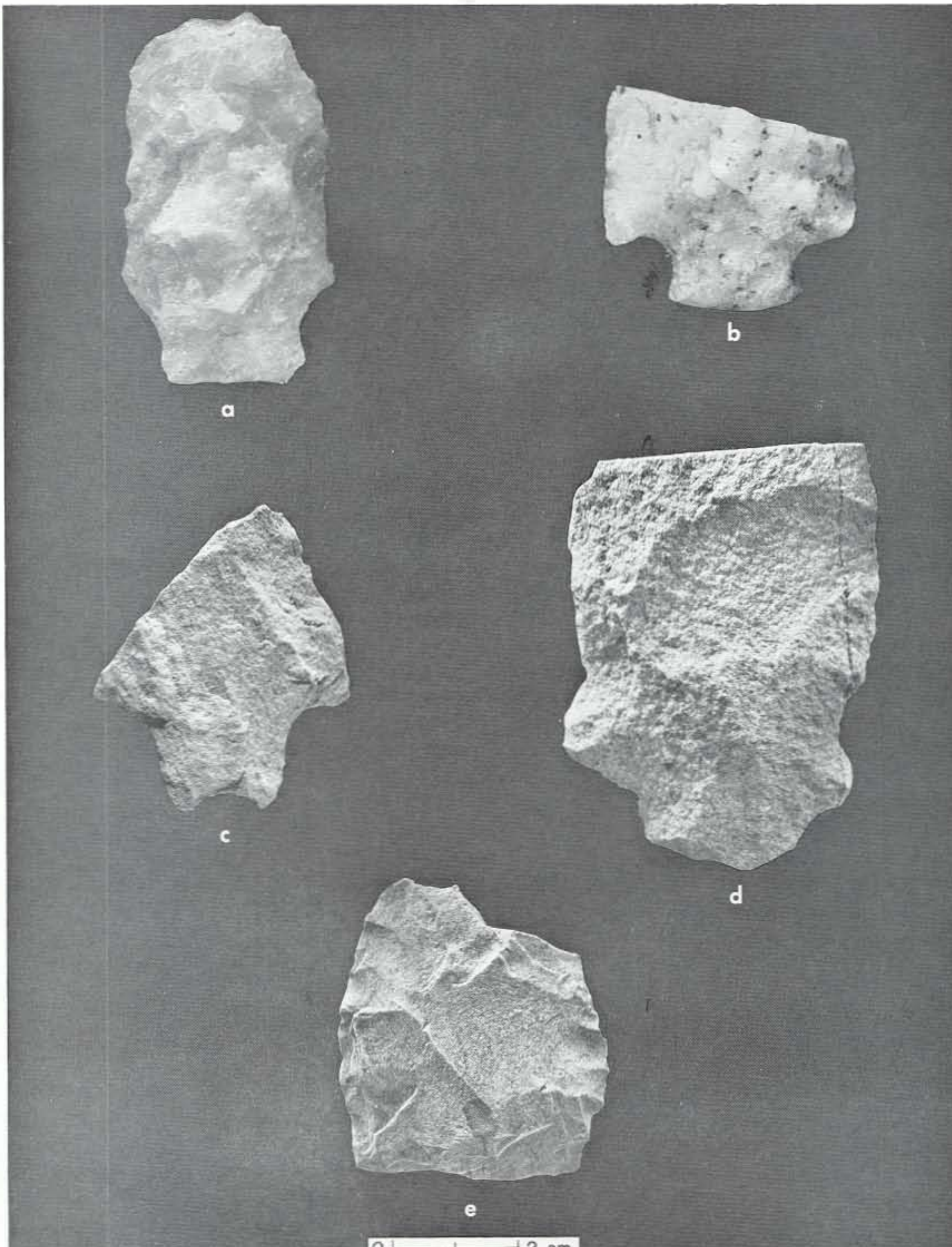

Figure 13.

Savannah River and other broad-bladed points from sites in the Interstate 77 corridor: a. Savannah River point, 38CS94, controlled collection; b. unclassified broad-bladed point fragment, 38FA100, grab sample; c. Savannah River point fragment, 38CS75, controlled collection; d. Savannah River point fragment, 38CS74, grab sample; and e. probable Savannah River point fragment, 38YK26, grab sample.

Ethnographic sources indicate that the Creek frequently either completely or partially abandoned their villages during the fall and winter months and occupied remote hunting camps (Canouts 1971: 72-73). Hypothesizing that this practice was also shared by late and protohistoric Mississippian peoples in the South Carolina Piedmont, we expected to encounter sites yielding small triangular arrow points. The absence of such components in the I-77 site sample tends to disconfirm this hypothesis. The single definite Mississippian component recorded on the survey was located not in an upland zone which might be considered optimum for fall and winter deer hunting (cf. Smith 1975: 21), but adjacent to a broad floodplain which might have been suitable for maize agriculture. An unexplored possibility is that recent alluvium may obscure other floodplain associated Mississippian farmsteads or hamlet sites in the corridor. This possibility is not likely but cannot be ruled out at this time.

Conclusion

The results of the I-77 survey pertinent to the cultural-historical identification of prehistoric human societies in the corridor area are remarkably consistent with the data reported by Kelly (1972) from diverse localities in this same inter-riverine zone. The I-77 site and artifact sample is, of course, much smaller than Kelly's. Mitigation stage research in the corridor would provide an opportunity to further identify the cultural systems which occupied this zone in the prehistoric past and to bring the behavioral content of these occupations into sharper focus.

ABORIGINAL UTILIZATION OF THE I-77 CORRIDOR AREA

Introduction

The hypotheses presented below were formulated with the foreknowledge that they might not be wholly testable within the framework of the I-77 survey due to (1) sampling bias in the location of the corridor, (2) the heavy vegetational cover, (3) lack of adequate reconstruction of prehistoric environments, (4) low numbers of sites, and (5) small artifact samples from sites. It was hoped, nonetheless, that this attempt would indicate broad modalities in the archeological record in the corridor and would, in spite of numerous sampling and measurement problems, reveal any really strong underlying patterning in artifact-environment associations.

As indicated in the preceeding section, stylistic data indicate that almost all of the prehistoric materials recovered by the I-77 survey represent Archaic occupations. In the following analysis, these Archaic occupations will be lumped, albeit reluctantly, as a single cultural entity. It is not known yet to what extent various successive adaptations during the Archaic in the Piedmont exploited the same target resources with similar organization and technology. Hopefully future research in this region will elucidate any differences in the utilization of the environment during different temporal subdivisions of this 7,000-year interval.

The hypotheses outlined below are based on what is currently known or generally hypothesized about prehistoric subsistence activities in eastern North America--especially for the Archaic (see Section 3)--and on general themes which have been identified in the social and economic organization of low energy cultural systems in general. These specific hypotheses incorporate a very generalized model proposed by Binford and Binford (1966) for interpreting functional variability among sites and site samples representing hunting and gathering groups. They suggest that it is possible to distinguish between <u>maintenance</u> and <u>extractive</u> tasks, "the former involving activities related to the nutritional and technological requirements of the groups and the latter activities related to the direct exploitation of environmental resources" (Binford and Binford 1966: 291). They further suggest that the tasks should be differentially distributed about the landscape and that it should be possible, on the basis of artifact assemblages and locational variables, to distinguish sites of base camps and work (or extractive) loci as two types within the settlement system.

It should also be emphasized that these hypotheses involve the entire range of environments in the Piedmont, both riverine and inter-riverine, and not just those encompassed by the I-77 corridor. Completely testing these hypotheses, then, will require comparable sets of data from the full range of environments in the South Carolina Piedmont.

The research strategy employed by the writers to test these hypotheses involves a number of analytical stages and the articulation of diverse categories of data. This strategy is illustrated graphically in Figure 14.

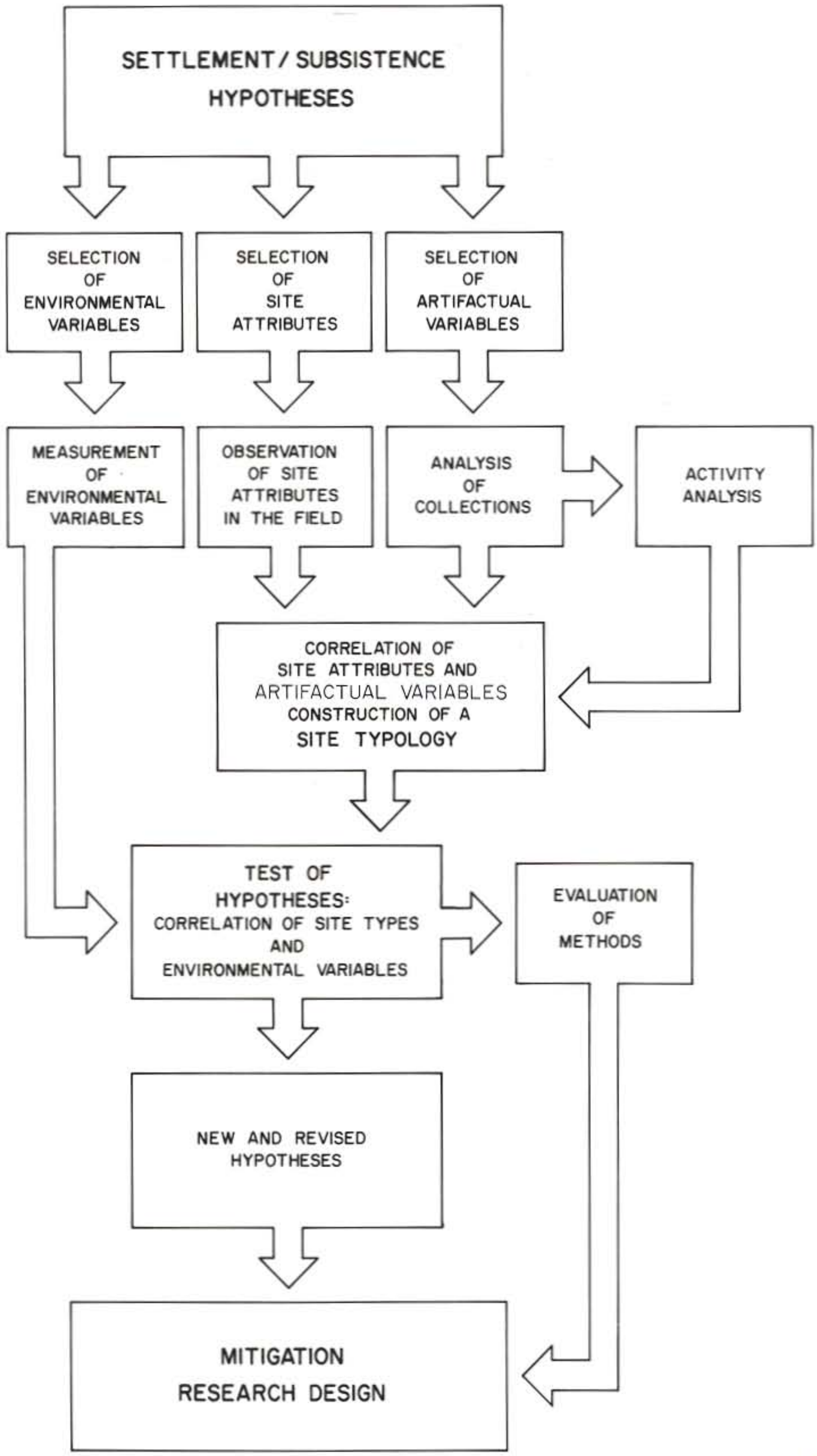

FIGURE 14: Research strategy for investigation of the aboriginal utilization of the Interstate 77 corridor area.

Hypotheses and Test Implications

Patterns of Exploitation (alternative hypotheses)

H-1. No exploitation of the inter-riverine Piedmont (with durable technology).

I-1. No cultural materials attributable to a given time period in corridor.

H-2. Exploitation of the inter-riverine zone limited to areas directly accessible to river valleys.

I-1. Density of cultural material found to be inversely proportional to distance of a given portion of the corridor to the Broad or Catawba Rivers.

H-3. Exploitation limited to sporadic exploitation of a few resources throughout the inter-riverine zone.

I-1. Many small, dispersed sites (extractive sites, see below) throughout the corridor with a low density and narrow range of artifacts.

H-4. An exploitation patterning involving permanent or prolonged seasonal occupation of the inter-riverine zone and exploitation of a wide variety of resources.

I-1. Habitational sites (see below) in the site sample.

I-2. Sites located in a wide variety of topographic positions.

I-3. A broad range of artifacts present in the corridor.

Structural Poses and Site Variability

H-1. Intensive habitational sites present.

I-1. Sites present exhibiting midden staining.

I-2. Sites present containing artifact classes strongly suggestive of habitation; i.e., fire-cracked rock, steatite sherds, ceramics.

I-3. Presence of a wide variety of tools and debitage at sites, representing a wide variety of past maintenance activities.

I-4. Sites with the above contents in favored locations; level, on a spacious topographic feature, sheltered (south facing?), close proximity to a permanent water source.

I-5. Sites with a high density of artifacts and debris.

H-2. Less intensive habitational sites present (without permanent structures).

I-1. Sites in a favorable location, especially close proximity to water.

I-2. Wide variety of tools and debitage present indicating performance of maintenance tasks.

I-3. A relatively high density of cultural material present.

H-3. Specialized sites for the extraction of specific biotic resources are present.

I-1. Sites located in less favored locations; not particularly accessible to water, on fairly steep slopes and narrow ridge tops.

I-2. A narrow range of tools and debitage present at these sites.

I-3. A low density of artifacts at these sites.

I-4. Sites corresponding to the above especially numerous in certain environmental zones.

H-4. Extractive sites for various lithic resources are present. (All implications should apply in all cases.)

I-1. Sites in close proximity to the natural occurrence of the lithic resource.

I-2. A high density of debitage of the given raw material representing early stages in the reduction of nodules, cobbles, or tabular chunks.

I-3. Presence of rejected or fragmentary "blanks" or "preforms"--especially very early stage blanks.

Identification of Specific Biotic Resources Exploited by Prehistoric Societies in the Inter-Riverine Piedmont

H-1. White-tailed deer exploited.

I-1. "Hunting camp" sites exhibiting a limited range of artifacts, representing light duty cutting functions, in numerous loci and low densities.

I-2. The above sites in loci corresponding to zones of (at least seasonally) optimum deer habitat.

H-2. Acorns and hickory nuts harvested and processed in inter-riverine zones.

I-1. Numerous sites with a limited range of artifacts centrally-located in zones of high nut productivity.

I-2. Stone plant processing tools (mortars, pestles, etc.) present at these loci.

I-3. Or, alternatively (if wooden rather than stone plant processing tools were used), small numbers of broken and exhausted heavy-duty woodworking tools present at these sites.

H-3. An exploitive subsystem centered on the distinctive biotic resources of major creek valleys (possibly fish, turtles, racoons, opossums, lowland acorns).

I-1. Numerous extractive sites located in close proximity to large creeks and their associated bottoms.

Selection and Measurement of Environmental Variables

As indicated in Figure 14, one possible approach to the identification of the resources which were the target of past subsistence activity, is the analysis of the location of archeological sites in relation to environmental variables. This derives from the assumption that sites of extractive activities will be closely associated with the occurrence of the specific resources being extracted and perhaps even centrally located in relation to the distribution of that resource. Sites of habitation on the other hand, would tend to be centrally located in relation to a diverse set of resources required by the group (cf. Binford and Binford 1966; Hill 1972: 90-92).

The strategy employed here is to:

1. Attempt to identify the location about the landscape of the specific hypothetical target resources named in the preceeding section. This location will be designated in terms of gross topographic features (i.e., stream bottoms, uplands) for lack of any more reliable and specific paleo-environmental reconstructions. These features will constitute the environmental variables to be quantified.

2. Use catchment analysis (Jarman, Vita-Finzi and Higgs 1972). The size of the catchment is important. A comparatively small, one-half mile radius catchment was selected by us on the assumption that most of the prehistoric sites represent extractive activity rather than habitation. This specific one-half mile radius is arbitrary but a small catchment was selected in accordance with Binford and Binford's (1966: 291) hypothesis that loci of extraction are very closely associated with the resource being extracted. Fruitful previous uses of catchment analysis in the Southeast are presented by Peebles (n.d.) and Smith (1975). Measurement of variables within catchments was done on maps by the use of a polar planimeter, in the case of areally-extensive phenomena, or by simply counting relevant features such as streams. The value of variables within catchments was then compared for different types of sites and for a randomized set of points (all sampling units) within the corridor.

The catchment data for both sampling units and sites are presented in Appendix G. These data are articulated with other categories of data in the final section of this chapter.

It should be emphasized that thorough evaluation of these hypotheses will require, in addition to archeological data: (1) more reliable vegetational reconstructions, and (2) Piedmont-specific data on the diet and seasonal habits of the relevant animal species. Examination of early historic land survey records might fulfill the first information need while a review of available South Carolina ecology and wildlife management literature might be helpful in fulfilling the second.

Fall and Winter Deer Hunting: Upland Hardwood Forest

White-tailed deer seem to have been a major target species of Archaic subsistence throughout the Southeast and during the entire Archaic sequence. Nearer to our study area, intensive Archaic deer exploitation is indicated by Claflin's (1931: 12) summary of faunal remains at Stalling's Island.

In the following discussion we have essentially borrowed and adapted Bruce Smith's (1975: 17-42) model interrelating white-tailed deer dietary habits, population and behavior, and Middle Mississippi subsistence strategies. Its relevance to Archaic deer hunting strategies in the South Carolina Piedmont entails two basic assumptions: (1) a similarity in deer ecology between the oak-hickory forests of the Ozarks and the oak-hickory forests of the Piedmont, and (2) an absence of major differences between the Archaic and precontact environments in the Piedmont.

Deer territories tend to be relatively small, less than 2 mile^2, but deer exhibit seasonal movement within their territories according to seasonal availability of different plant foods. A generalized annual round for deer in the Ozarks is presented in Figure 2 of Smith's dissertation (1975). This round involves concentration in stream bottoms and cedar glades during the spring and summer when herbaceous plants and twigs on shrubs and bushes are most available. (The scrubby, open post oak--black jack oak forest type described by Oosting (1942: 111) might provide a Piedmont analogue to the Ozark cedar glades.) With the beginning of acorn mast availability in August, however, acorns become the primary deer food and there is a high concentration of deer in upland hardwood zones. This concentration might persist through the winter in years of abundant acorn yield. It might be noted in passing that wild turkeys, another important Archaic subsistence item, may also have been concentrated in upland zones in the fall for the same reason (Smith 1975: 86).

Smith (1975: 36-39) notes that two factors of white-tailed deer behavior make fall and early winter the optimum season for aboriginal deer hunting. First, there is a high and predictable concentration of deer within upland hardwood zones. Second, there is a "personality" change especially in male deer, during the fall rutting season; deer may be decoyed within bow and arrow (or atlatl and dart?) range by rustling bushes with a stuffed deer head or the use of similar tactics.

Concentration of aboriginal deer hunting in the fall and winter is indicated by both the archeological data from Middle Mississippi sites analyzed by Smith (1975, Fig. 7), and by ethnohistoric data from throughout the Southeast (Swanton 1946). No comparable study of deer remains from Archaic contexts is yet available. Morse (1967: 254) notes that antler data from Robinson and other Shell Mound Archaic sites indicate at least some spring and summer as well as fall and winter deer hunting. And as noted earlier, dog burials in Archaic middens throughout the East suggest a possibility of major differences between Archaic and Mississippian hunting strategies. Parmalee (1969: 141), however, notes an unusually high proportion of deer bones in the Robeson Hills site, an evident winter settlement site of the Riverton culture in southern Illinois. Whatever the differences between Archaic and Mississippi overall patterns of deer exploitation, it seems highly probable that fall and winter deer hunting was a major emphasis in the Archaic as well as the Mississippian adaptation.

For these reasons, one of the implications of the hypothesis that fall and winter deer hunting was a major activity in the inter-riverine Piedmont would be the presence of extractive sites throughout the upland hardwood zones. To test this hypothesis, we will measure the proportion of uplands vs. creek bottoms within one-half mile catchments of each of our hypothetical extractive sites and compare these with randomized catchment data for this variable. These data will then be articulated with site attribute and artifactual data to further test the hypothesis.

Fall Nut Harvesting: The Upland Ravine Systems

The intensive harvesting and processing of nuts, primarily the abundant acorns and hickory nuts of Eastern deciduous forests, is a well documented theme of late Archaic subsistence and new data are indicating that at least some exploitation of these resources took place in early Archaic times. If Archaic nut harvesting activities extended into inter-riverine zones in the Piedmont, archeological sites representing gathering and/or processing of acorns and hickory nuts should be found centrally located in relation to the distribution of nut-bearing trees in the I-77 corridor area.

A wide variety of oaks was present throughout the range of Piedmont environments, but it is hypothesized here that due to low tannin content, the white oak acorns would have been the first choice for acorn harvesting (cf. Asch, Ford and Asch 1972; Harris 1971). White oaks, though widespread throughout the uplands, are concentrated in more mesic environments (Oosting 1942: 90). Our own observations suggest that the greatest concentration of white oaks in the uplands is on the north-facing slope of ravines. Oosting (1942: 90) notes a tendency for hickories to be concentrated in zones of high white oak density; this also corresponds to our observations in the I-77 corridor. Oosting notes, however, that some hickory species are present in stream bottoms.

Oosting (1942) emphasizes repeatedly that the effects of historic land use in the Piedmont, both logging and cultivation, may be distorting our picture of the original vegetational patterns. Accepting the adequacy of the above reconstruction for the time being, however, we predict that if sites of upland acorn

and hickory nut gathering are associated with upland ravine systems, there should be a high correlation of these sites with the number of Rank 1 and Rank 2 drainages (Strahler 1964; Morisawa 1968) within one-half mile catchments.

It will be noted that the site location implications for the hypotheses of fall and winter deer hunting and nut harvesting are quite similar; the Rank 1 and 2 streams are concentrated in the upland hardwood zones. The deer of the first hypothesis would be exploiting some of the same resources as the humans of the second hypothesis. The choice between these two hypotheses then, would primarily devolve on analysis of site content rather than site location. And if only gathering, but not processing of the nuts took place in the zones of their availability, then harvesting activities would probably not be associated with durable archeological outputs; i.e., they would not result in archeological sites.

Exploitation of Stream Bottom Resources

Eight of the streams crossed by the I-77 corridor had wide, deep pools of water in their channels and strips of floodplain averaging about 200 yards wide or wider. These are the Rank 3, 4 and 5 streams by Strahler's (1964) classification system (Dutchmans Creek in Fairfield County is included here since it becomes a Rank 3 immediately below the corridor). Two groups of resources might be associated with these stream bottom areas. First, fish and turtles, known important items of Archaic subsistence at some sites, would probably have been available in the streams and sloughs themselves. Second, a number of animal species, also known to have been a part of Archaic subsistence, are concentrated in stream bottoms. These include racoons and opossums (Smith 1975: 42-86) and, possibly seasonally, deer and turkey. In addition there may have been important floral resources in stream bottoms that we presently do not know about.

If fish were a major target resource in the inter-riverine Piedmont, then there should be association of extractive sites with the channels of streams (especially the largest streams) in the corridor. Estimating the potential fish resources of prehistoric streams in the Piedmont, however, may be difficult because of major changes in Piedmont stream morphology caused by historic land use (cf. Trimble 1972).

The site locational implication of the hypothesis that bottomland forest biota were being exploited is the converse of that for the hypothesis of upland deer hunting. In this case the extractive site locations should be associated with a high value of the area of bottomland in the catchments.

Two major problems in the measurement of these variables are evident. First, the archeological outputs of extractive activity might be obscured by those of habitation. These creeks would be centrally located in relation to the total range of environments within the inter-riverine Piedmont. And close proximity to permanent water is a predicted attribute of habitation sites. Secondly, extractive vs. habitation sites associated with creek bottoms may have been located on the floodplain rather than in more secure locations on high terraces or spurs overlooking the bottoms. If such sites were ever present, they are probably buried by historic period alluvium or washed away by the historic period shift to a braided, alluvial fan-like, channel pattern in many of these floodplains (cf. Trimble 1972).

Selection of Site Attributes

A number of attributes of prehistoric sites were chosen to be observed in the field and subsequently articulated with other data categories to test the hypotheses outlined at the beginning of this section. These attributes are considered to relate directly to the nature of the hypothesized past activities at the site and especially to the implications of the maintenance/extractive model of site variability. The values for these attributes at the prehistoric sites recorded by the I-77 survey are presented in Appendix B.

Topographic Position

The observation of this attribute gives a fine grained view of the location of the site in its environment and would probably be relevant to inference of site function in a number of ways. Ridge tops, for instance, might have been trail routes for both humans and game animals. Locations on high terraces or hillside spurs overlooking creeks would have been much more secure from flooding than would locations immediately adjacent on the floodplain proper.

Slope Direction and Magnitude

This pair of attributes would have a number of probable relationships to the location of past activities. South facing slopes would have almost certainly been favored for performance of almost any activity--but especially habitation--during the colder months of the year. Choice of locations for habitation would also probably favor level to gently-sloping pieces of ground while extractive activities might take place on relatively steep slopes if a given location was optimally situated with respect to the resource being extracted. Slope magnitude was measured by estimation in terms of slope percentage--the number of feet elevation difference per 100 feet horizontal distance. It must be emphasized that our set of prehistoric sites may be biased toward level locations; many of these sites were found in logging roads which tend to follow ridge tops and other relatively level features.

Distance to Permanent Water

It is considered highly likely that sites of prolonged habitation, involving the presence of the whole kin group and the performance of cooking, eating, and a variety of maintenance tasks, would be located in close proximity to reliable water sources. Extractive activities, on the other hand, of a temporary nature and involving only a segment of the group, would not necessarily be located close to water. This variable was measured, crudely, by the distance from the site to the nearest "permanent" or "intermittent" stream indicated on a USGS quadrangle. We observed that virtually all of the so-called "intermittent" stream beds contained a flow of water from seep springs even during the dry autumn of 1975. During the wetter months of the year, it is probable that many more of the ravines in the survey area held good water sources.

Site Extent

This variable was measured by observing the dimensions of the more-or-less continuous scatter of artifacts at a site. Drawing site boundaries was somewhat subjective at best. Also, many of the sites were observed only in a test pit, a gully, or a short stretch of logging road in which case no attempt was made to measure the site extent.

As noted in an earlier section, the extent of an archeological site, observable in the present, does not necessarily correspond to the extent of a past behavior space. Indeed, it is probable that most of the extensive, low density artifact scatters we recorded represent a number of temporally discrete but spatially overlapping occupational episodes. On the other hand, it is likely that the smaller scatters, those less than 100 feet in diameter, represent single episodes. Comparison of the site extent from Appendix B with the controlled collection inventories as presented in Appendix C will provide a very crude measure of overall artifact density at sites.

Selection of Artifactual Variables

Three of the research designs presented earlier require analysis of the artifact samples collected by the I-77 survey. Comparison of certain artifacts from the survey with temporally-diagnostic types defined in the literature forms the basis of the foregoing section on cultural identification. In the present section, information on the artifact content of sites will be articulated with information on site attributes and location in the environment to test the hypotheses outlined at the beginning of this section. In the following discussion, artifactual data from the I-77 survey will be used to investigate patterns of lithic resource procurement in the corridor area.

Prehistoric Ceramics

A total of five prehistoric sherds, all from 38CS92, was found on the I-77 survey. These sherds are identified as belonging to the Chicora ware group and represent South Appalachian Mississippian occupation.

Strategy of Lithic Analysis

The functional typology presented below was used to divide the lithic assemblages into a number of fairly readily distinguishable categories which are considered to represent distinct tool functions or distinct processes in the manufacture or use of tools and facilities. The relative proportions of different classes in a controlled sample will be treated as archeological variables to be used for indirect measurement to past cultural systemic variables. Within these functional classes, parameters of metric attributes in samples will be similarly treated as variables (cf. Fritz 1972; Schiffer 1976).

Lithic Raw Materials

A preliminary analysis of the lithic raw materials in the I-77 survey samples is presented later in this report.

A Functional Typology for Analysis of Lithic Samples

This typology presents presumed correlates between observable physical attributes of artifacts in the present and variables of human behavior in the past. The category "biface thinning flakes," for instance, will be used to measure the amount of biface manufacture and modification represented by an assemblage. While we cannot determine the past behavioral context of an artifact with certainty (we weren't there), we feel that this typology is a useful tool for approximate measurement of past systemic variables. It is also true that some of these functional debitage "types" actually represent sequential stages in one continuous process. A certain amount of error in classification, in terms of the attribute definitions below, is probable.

Fire-cracked rock

Pieces of rock, usually quartz, which have very irregular fracture surfaces. They are often but not invariably reddened. The presence of quantities of fire-cracked rock at a site is considered to reflect habitation and use of "hot rocks" for cooking in earth ovens and perhaps by stone boiling. Fire-cracked rock is often difficult to distinguish from unmodified residual quartz and we cannot claim to have consistently recognized this class during the I-77 survey.

Chunks

Angular pieces of debitage, variable in size. They are distinguishable from flakes by lack of observable striking platforms and other characteristics of flakes. They are distinguishable from cores by the lack of scars of detached flakes.

Flakes

Pieces of chipped stone debitage which if whole, have observable striking platforms. They are usually fairly flat and have observable flake scars on their dorsal face. The distinction of primary, secondary, and tertiary flakes is considered irrelevant in the case of the I-77 materials since almost none of the raw material seems to have been procured in the form of nodules or cobbles. This class includes thinning flakes and other flakes.

Thinning flakes (Fig. 15)

These flakes are assumed to have been removed during the process of thinning or resharpening bifaces. They are relatively flat, have broad, shallow flake scars (from detachment of previous thinning flakes) on the dorsal face, and tend to exhibit "feathering-out" of lateral margins. When the platform is present, it usually exhibits a high angle and/or crushing and grinding.

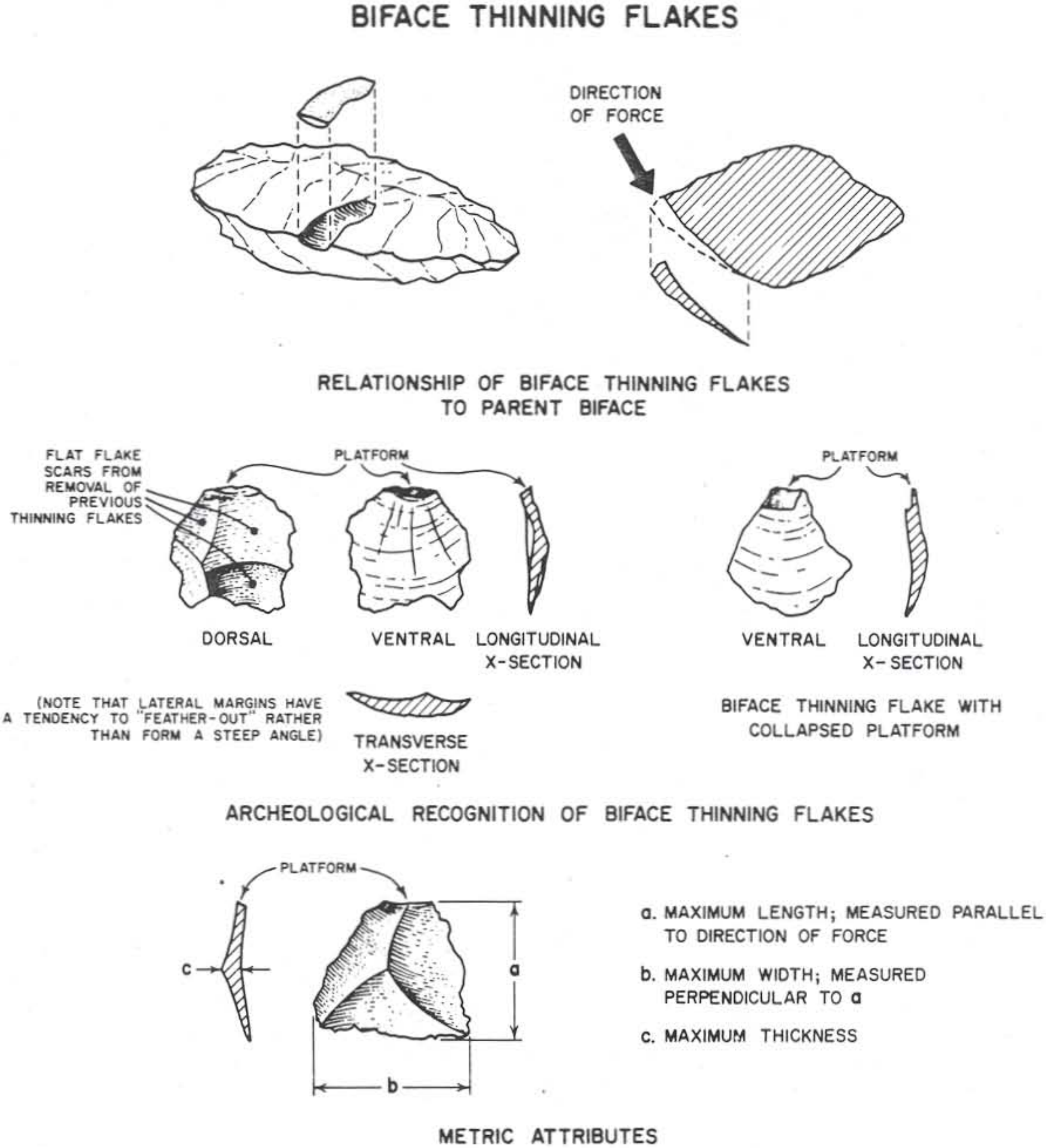

FIGURE 15: Biface thinning flakes.

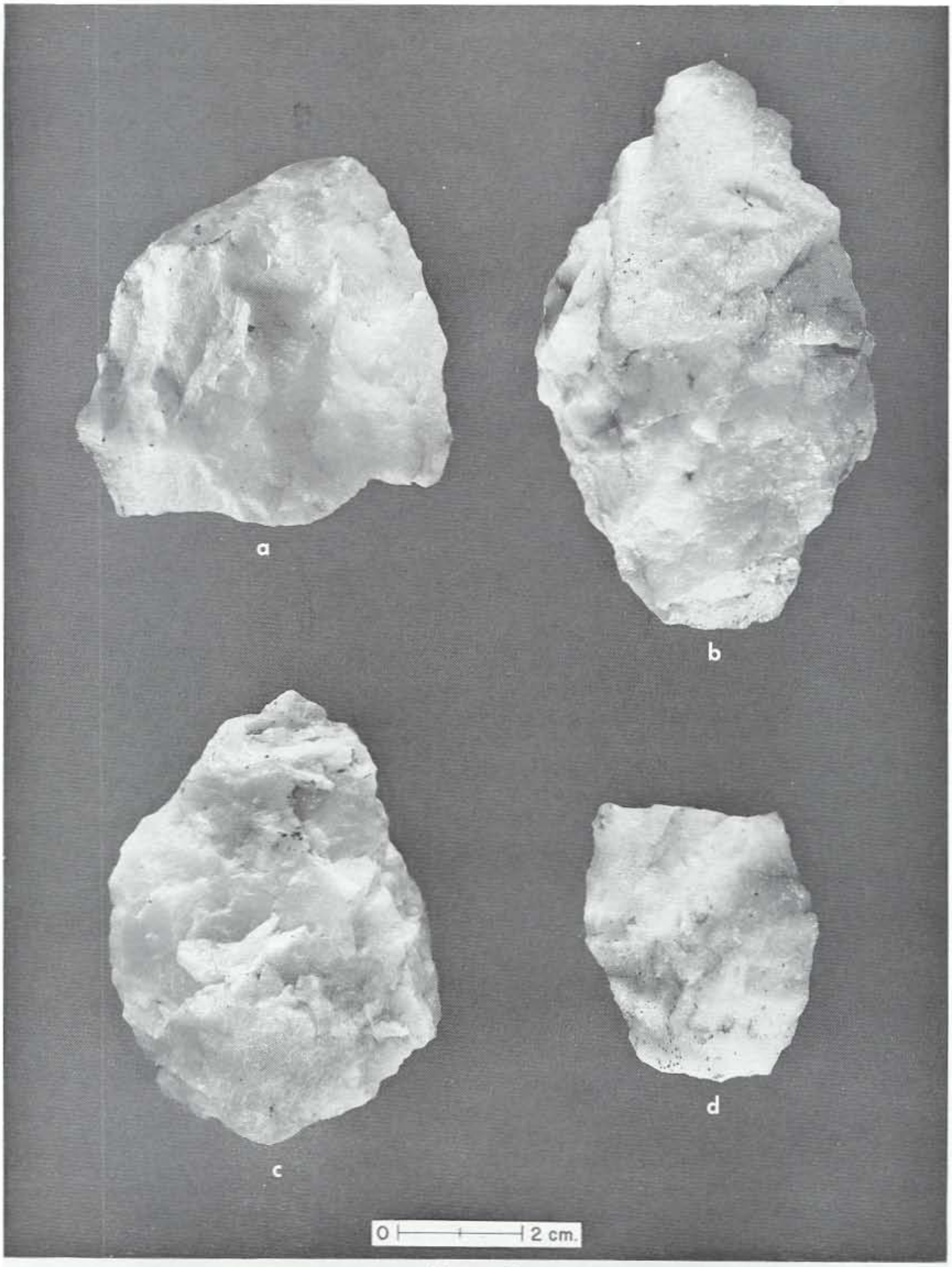

Figure 16.

Biface blanks from sites in the Interstate 77 corridor: a.–b. 38YK24B, grab sample; c. 38YK25A, controlled collection; and d. 38YK24B, grab sample.

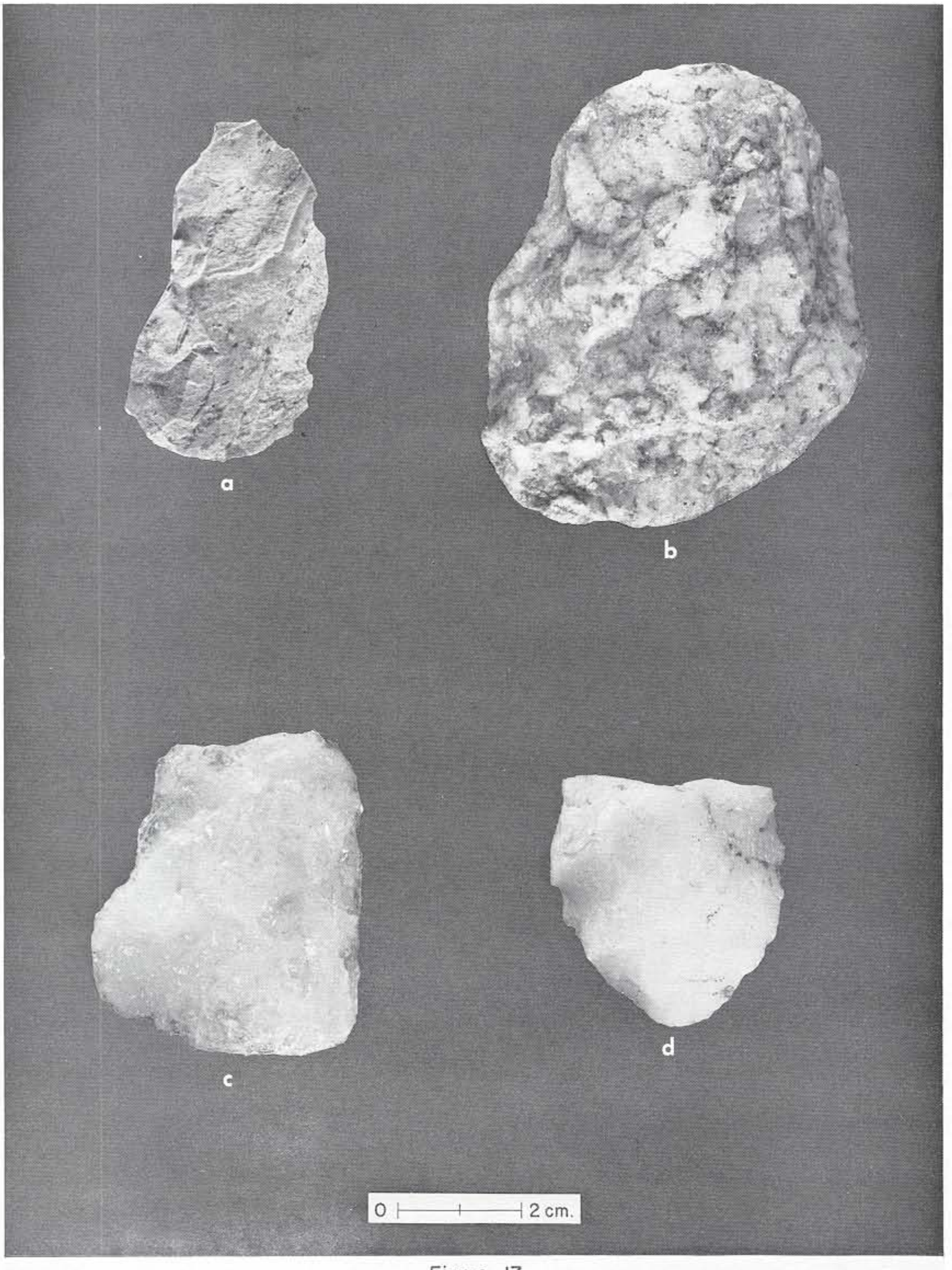

Figure 17.

Other bifaces from sites in the Interstate 77 corridor: a. probable wood-working tool, 38FA118, controlled collection; b. 38FA100, grab sample; c. 38CS92, controlled collection; and d. 38YK39, controlled collection.

Tool edges on flakes

Marginal modification of flake edges in the form of fairly regular sets of flake scars less than 2 mm long. This is interpreted as edge damage caused by the use of the flake as a tool in modifying fairly hard materials such as bone or wood (cf. Tringham et al. 1974).

Unifaces

These are unifacial tools with regular steep marginal retouch producing flake scars averaging greater than 2 mm long. This is interpreted as the result of intentional retouch to produce a unifacial working edge of a desired shape. This category subsumes a number of specialized tool forms.

Core tools

Large pieces of stone with modification to produce a tool edge, or edge damage on unspecialized edges suggesting use of the piece as a tool. These presumably represent heavy-duty cutting, chopping, or dicing functions.

Flake cores

Masses of material exhibiting flake scars resulting from the removal of one or more flakes. The piece must lack the characteristics stated above as diagnostic of core tools. These may represent cores for production of flake tool blanks or simply amorphous by-products of the earliest stage of biface or uniface production.

Bifaces

Bihedral pieces of chipped stone with two faces and flake scars on both faces. This class includes points, biface blanks, and other bifaces.

Points

Symmetrical, pointed bifaces which are modified, on the end opposite the pointed tip, for hafting. These may or may not have actually functioned as projectile points. Edge damage analysis suggests that many of these actually functioned as hafted knives or saws.

Biface blanks (Fig. 16)

Bifaces which lack even, regular edges formed by careful retouching. These are usually asymmetrical and thick, and are interpreted as representing unfinished biface tools, usually as pieces that were rejected and discarded during manufacture. Some biface blanks approximate the morphology of points and other finished biface tools but lack carefully-formed edges. These are considered preforms (see Fig. 10).

Other Bifaces (Fig. 17)

Bifaces which have regular, finished edges but are not points as described above. This category subsumes a number of specialized tool forms.

The results of the typological analysis of the I-77 artifact samples are presented in Appendix C.

Selection of Metric Attributes

As Wilmsen (1970: 5-7) points out, use of metrical attributes and interval scale measurements lithic analysis may provide a much stronger basis for cultural inference than would complete reliance on types and discrete, non-metric attributes. The modality and range of metric attributes may reveal much more about past behavioral parameters than would an intuitive breaking of a continuum of variability into a set of ideal "types."

In the present study, only biface thinning flakes have been subjected to this kind of attribute analysis. Goodyear and House have been entertaining for some time the hypothesis that biface thinning flakes found in archeological contexts represent two distinct processes which might be associated with two distinct behavioral contexts.

This is the hypothesis: Manufacture of biface tools would be initiated at quarry/workshops but would, in the majority of cases be completed at base camps or habitation sites. Resharpening of dulled biface tool edges would, on the other hand, take place primarily at loci of the use of the tool. Manufacturing of bifaces would result in assemblages with a comparatively high mean and Coefficient of Variation (C.V.) (McMillen 1952: 297-302) for the length, width, thickness, and weight of thinning flakes, while resharpening would generate assemblages in which the values of both the mean and C.V. for these attributes were relatively low. This might serve to archeologically distinguish sites of habitation, involving manufacture as well as use of biface tools, and sites of some extractive activities, involving only use and resharpening of biface tools. This hypothesis, which will be referred to here as the "Thinning Flake Model," deserves further investigation by the use of replicative experiments and the analysis of more controlled archeological data sets.

When these biface thinning flake data have been articulated with raw material data, they might provide opportunities to test hypotheses about raw material procurement systems. The relative thinness and weight of biface thinning flakes in certain materials should provide fairly direct measurements of the "expensiveness" of an imported raw material; reduction of the mass of a piece imported a great distance would probably be minimized in both manufacture and resharpening. This model will be applied to I-77 data later in this report. Gould (1974) suggests, on the basis of ethnographic data, that the presence of quantities of debitage of imported vs. local material at a site may be a useful measure of habitation vs. extraction.

Activity Analysis

In the "General Research Design for Highway Archeology in South Carolina," Goodyear (1975a: 23) defines activity analysis as explanation of the content, form, and structure of the archeological record in terms of past human behavior and natural processes. Goodyear notes that this kind of analysis necessarily entails behavioral correlates between past activities and their archeological outputs and the application of models of the cultural formation processes of the archeological record; i.e., primary or secondary refuse disposal, loss, abandonment or curation, scavenging and recycling, and rejuvenation of tools (cf. Schiffer 1972, 1976). The use of such models in turn requires quantitative data.

In the present discussion, activity analysis will be treated as reconstruction of past behavior on a very basic level, inference of what (archeologically visible) behaviors took place at a given site, disregarding for the moment, the articulation of these behaviors with the whole of the ongoing cultural system. We will ask, for instance, "Does this assemblage contain evidence of heavy-duty woodworking?" or "Does this assemblage represent only use, breakage, and resharpening of bifacial light-duty cutting tools?"

The basic unit of analysis in this discussion will be a controlled collection from a prehistoric site. Again this analysis is undertaken in hopes that in spite of the shortcomings of the data base, some broad modalities will emerge which can form the basis of useful and credible inferences or at least hypotheses for further investigation.

The following discussion of the data in terms of hypothetical activity sets is based on the behavioral correlates outlined in the lithic typology. Some of the data discussed here will also be related to the "Biface Thinning Flake Model."

The underlying assumption of this discussion, in terms of cultural formation processes, is that the I-77 artifact assemblages do not represent a sample of all of the durable cultural elements that were ever in use in the corridor area, but that they represent only waste products, discarded, and abandoned objects associated with past activities. It is particularly important to distinguish artifacts which would have been abandoned after use from those which would probably have been curated (Binford 1973: 242). The assumption is also made that these materials represent primary refuse, that they were discarded and abandoned more or less at the location of their use or production.

Outputs of Habitation

The most marked interassemblage difference among the I-77 artifact samples is in the presence of fire-cracked rock. Both the controlled collection and test pit samples from 38FA100 contained relatively large quantities of probable fire-cracked rock. Site 38FA100 is, in fact, in a class by itself with respect to this variable. Minor quantities of probable fire-cracked rock were also found at two other sites, 38CS69 and 38YK39.

Quantities of fire-cracked rock can probably be considered a good indicator of habitation and perhaps whole-kin group activity. As a variable, however, it is difficult to operationalize. First it is extremely difficult to reliably distinguish fire-cracked rock. We cannot claim to have even recognized its presence in every case. Second, the rate at which it is produced in systemic context seem to vary greatly from raw material to raw material (cf. House and Smith 1975: 78-79).

Another class which might be of use in distinguishing at least Late Archaic habitation sites is steatite sherds, as steatite sherds are frequently encountered on riverine Late Archaic sites in the Piedmont. Steatite vessels, in contrast to fire-cracked rock, were probably carefully curated but the total absence of steatite in the I-77 samples, and its near absence from Kelly's (1972) samples may be quite significant since a probable aboriginal steatite quarry has been recorded in close proximity to the I-77 corridor.

Evidence of post-Archaic occupation of any sort in the I-77 corridor is quite sparse. The presence of Chicora Ware Group sherds at 38CS92 suggests, however, at least temporary Mississippi habitation at this site.

Analysis of the Biface System

From the data in Appendix C, it is apparent that a relatively narrow range of activities is probably represented by most of the samples. The prevalent artifact classes are chunks, other flakes, biface thinning flakes, biface blanks, points, and small biface fragments probably derived from points. It should be noted that a small number of apparently finished biface tools other than points were also found. In the aggregate, the occurrence of these classes can probably be attributed to three basic, interrelated activity sets: (1) all stages in the manufacture of chipped stone tools, especially bifacial tools, (2) use, breakage, and discard of small biface tool elements, especially points, and (3) probable resharpening or other modification of small biface tools. Functional differentiation among assemblages with respect to these artifact classes can be approached in a number of different ways.

First, a number of sites, 38RD104, 38CS66, 38CS82, 38CS83, and 38YK24C, were recognized in the field as almost certainly loci of extraction of vein quartz and manufacture of biface blanks of this material. These sites and the criteria for their designation as "quarry/workshop sites" are described later in this report.

To further explicate the past activities at these and other prehistoric sites, a number of analyses of specific artifactual variables were carried out. In order to distinguish assemblages primarily representing manufacture of bifaces from those representing mostly use (and breakage, exhaustion, discard, etc.) of bifaces, two indexes using discrete artifact class frequency data were set up. These indexes were calculated for all of the controlled collections which had relatively large numbers in the relevant artifact classes. These indexes are the Index of Biface Discard (BD) and the Index of Early Stage Reduction (ER). A high value of BD would suggest a high degree of biface tool use, exhaustion, breakage, and discard vs. biface manufacture in the assemblage. A high value of ER would indicate the opposite. The values of these indexes at some of the I-77 prehistoric sites are presented in Tables 6 and 7.

It will be noted that the Index of Biface Discard for all four of the hypothetical quarry/workshop sites at which controlled collections were made was .00; no finished bifaces were present, suggesting that comparatively little use of finished biface tools took place at these sites. Site 38CS92B also had a value of .00 which is somewhat disturbing since the value of this index for adjacent 38CS92A was quite high, .20. Higher values for this variable (.10 or greater) were present at 38FA102, 38FA103, 38FA116, 38FA118, 38CS64, 38CS75, 38CS92A, 38YK25A, and 38YK39.

The Indexes of Early Stage Reduction for 27 controlled collections are presented in Table 7. Quarry/workshops sites would be predicted to have high values for this variable. The data are not entirely consistent with this prediction. Relatively high values of the Index of Early Stage Reduction

(2.0 or greater) are present at the quarry/workshop sites 38RD104, 38CS82, and 38CS83 but a relatively low value is indicated for 38YK24C. Other high values for this index are exhibited by the controlled collections from 38FA103, 38FA115, 38CS76, 38CS92B, and 38YK24B. The value of this index at 38FA100 is particularly high.

TABLE 6.

INDEXES OF BIFACE DISCARD (BD) FOR 23 PREHISTORIC ARTIFACT SAMPLES FROM THE I-77 SURVEY

Site No.	BD	Site No.	BD
38RD104	.00	38CS82	.00
38FA100c	.02	38CS83A	.00
38FA100*	.06	38CS83B	.00
38FA102	.16	38CS84	.07
38FA103	.13	38CS92A	.20
38FA115	.09	38CS92B	.00
38FA116	.30	38YK24B	.08
38FA118	.20	38YK24C	.00
38CS64	.31	38YK25A	.20
38CS67	.00	38YK37	.06
38CS72	.06	38YK39	.12
38CS75	.10		

*This is the sum of all 5 test pits.

Notes: (1) $BD = \frac{\text{No. of bifaces, including points, and biface fragments}}{\text{No. of other flakes}}$

(2) This index calculated only for controlled samples in which the sum of all of these classes was 10 or more.

TABLE 7.

INDEXES OF EARLY STAGE REUDCTION (ER) FOR 26 PREHISTORIC ARTIFACT SAMPLES FROM THE I-77 SURVEY

Site No.	ER	Site No.	ER
38RD104	3.0	38CS76	6.5
38FA100c	29.0	38CS82	23.0
38FA100*	1.6	38CS83A	6.3
38FA102	1.4	38CS83B	8.8
38FA103	2.2	38CS84	1.6
38FA107A	1.1	38CS92A	1.4
38FA115	7.0	38CS92B	2.1
38FA118	0.8	38CS94	1.6
38CS64	1.9	38YK24B	2.9
38CS65	1.8	38YK24C	1.4
38CS71	0.6	38YK25A	1.1
38CS72	1.6	38YK37	1.2
38CS75	1.3	38YK39	1.8

*This is the sum of all 5 test pits.

Notes: (1) $ER = \frac{\text{No. of chunks and other flakes}}{\text{No. of thinning flakes}}$

(2) This index calculated only for controlled samples in which the sum of all three classes was 10 or more.

In evaluating these data it should be borne in mind that the collections cannot be assumed to be reliable samples of the archeological context at the sites they represent. They are subject to sampling error derived not only from low numbers but from subtle intrasite variations in artifact distribution. They seem, however, to generally correspond to our predictions for the content of quarry vs. nonquarry assemblages, even though there are conspicuous exceptions. The controlled collection from 38FA100 suggests a very high degree of early stage biface manufacture, which is not inconsistent with the hypothesis that it represents a location of intensive habitation. And it may be significant that these two indexes show a general pattern of negative correlation—which is perhaps not wholly attributable to the fact that one variable, the number of other flakes, is in the numerator of one index and the denominator of the other.

Metric attributes of biface thinning flakes in the controlled collections are described statistically in Appendix E. These descriptive statistics were calculated with the use of the Means Procedure of the Statistical Analysis System (SAS), a computer program on file at University of South Carolina Computer Services. These data are related to the predictions of the Biface Thinning Flake Model; that flakes produced by resharpening of bifaces would tend to be smaller and less variable than those produced by manufacture. If this model were

applicable, there should be two distinct modes in the data set. There should be consistently larger and more variable flakes from quarry/workshops and probable habitation sites and lower values for these parameters for the rest of the sites. The patterning is obviously not that clear-cut, calling for a reevaluation of either the model itself or its applicability to this particular data set.

It is emphasized that the Biface Thinning Flake Model has not yet been tested experimentally or archeologically. Both Goodyear and House feel that it is strong theoretically (though undoubtedly over-simplified) and, impressionistically, it seems to apply well to some regionally-extensive sets of data (see Price et al. 1975: 123-126). It seems probable, however, that it would apply only in the case of lithic raw materials that can be procured only in a few limited locations, "quarried" vs. "nonquarried" resources in Gould's (1974) terminology. We initially viewed vein quartz in the I-77 area as intermediate between a "quarried" and "nonquarried" resource but perhaps sufficiently circumscribed in occurrence that the Biface Thinning Flake Model would be applicable.

Returning to the data at hand, we now suggest that quartz may be behaving more like a "nonquarried" resource, one that was frequently extracted and worked on an ad hoc basis in close proximity to other kinds of extractive loci and not necessarily procured on special expeditions and brought to habitation sites for finishing of tools. The biface blank samples from quarry/workshops suggest that blanks were usually exported in very early stages of manufacture. Blanks from the numerous low-density lithic scatters in the corridor are often more finished looking than those at quarries, suggesting that they were rejected after some further reduction had taken place at the former sites. Given this pattern of procurement, early stage manufacturing debitage would be present at many extractive loci, and the Biface Thinning Flake Model would not be directly applicable.

From Appendix E it is apparent that the thinning flakes from the quarry/workshops are not much longer or wider than thinning flakes from many other sites, though they do seem to be usually thicker. Nor do the Coefficients of Variation show any readily interpretable patterns. A few fairly low values of the mean length are present. The sites with mean length values of less than 15mm are 38FA102, 38FA103, 38FA116 and 38FA118, all four of which have fairly high Indexes of Biface Discard. These sites are consistent with the predictions of the Thinning Flake Model for extractive sites, perhaps indicating relatively few inputs from biface manufacture in the samples. The collection from 38CS92B has a relatively high value of mean thinning flake length, agreeing with the other evidence of early stage biface manufacture at this site.

Another approach to considering the chipped stone materials in the corridor is estimation of the differential rates at which different classes of material entered the archeological record in the past. The initial stages of biface manufacture have high outputs of debitage; literally hundreds of flakes may be produced during a few minutes of knapping. The activities that resulted in deposition of broken or exhausted bifaces and small (resharpening?) flakes may, on the other hand, have had very low outputs per unit time.

Hypothesizing, for the moment, that Morrow Mountain points were hafted on short handles and used as knives, it may be that a Morrow Mountain knife could usually be used in butchering a deer without being broken or significantly dulled during the process. The probability of exhausting or breaking a point during the butchering process (whether in use or resharpening) may have been less than one per deer. Or the Morrow Mountain knife might have been used infrequently to trim a young tree to replace a broken spearshaft or repair a trap, and exhausted or broken during these activities even more infrequently.

In all these hypothetical instances, the outputs of small thinning flakes, biface fragments, and discarded points would have occurred at a low rate; rather intensive seasonal activities over centuries would have resulted in only a light scatter of specimens of these classes. In contrast, quarrying and manufacturing activities would be quite conspicuous in the archeological record even though they were relatively infrequent events in past systemic context.

Other Tool Systems

Evidence of heavy-duty woodworking is almost conspicuous by its absence in the I-77 collections. Not a single specialized woodworking tool (i.e. ground stone axe or celt or chipped stone adze) was found in the corridor even though they seem to be fairly frequent on riverine sites in the Piedmont. These tools were undoubtedly highly curated, however, and their absence may reflect only the relatively small size of the I-77 artifact sample. Perhaps even more significant is the scarcity of large core tools of a general kind that are common in lithic assemblages world-wide and probably represent ad hoc manufacture of a crude hand-held, chopping, adzing, or planing tool. Unlike well made axes and adzes, such tools were probably not curated but abandoned at the location of use.

A core tool from 38FA107A (Fig. 18) fits this description admirably. It has an evenly retouched, regular, convex, adze-like edge with some step fracturing and smoothing just above this edge on the dorsal face. A core tool from 38CS94 may represent a similar function but a very crude adze-like biface from 38FA118 (Fig. 17a) may only represent a biface blank with incidental battering and steep retouching on one end. These examples are enough to give us a hint as to what non-curated, heavy-duty woodworking tools in the inter-riverine Piedmont might look like, but they are so few in number as to suggest that heavy duty woodworking was of very minor importance in prehistoric times in the corridor area.

Another tool class which appears in the I-77 corridor, but in very small numbers, is flake tools. Flake tools, presumably used in a variety of cutting and scraping tasks, are readily dulled by use on hard materials and are probably seldom curated. In many Archaic assemblages in the Mississippi Valley in northeast Arkansas, half or more of the flakes over about 1 cm in length exhibit edge damage indicative of use (Schiffer and House 1975, Appendix E). Their relatively low frequencies in the I-77 corridor suggest that varied maintenance activities--whittling, sewing, and bone tool manufacture, to mention a few possibilities--were performed only infrequently, assuming that in this region flake tools rather than bifaces were commonly used for these purposes. Interestingly, the controlled collection from 38FA100 exhibits a high incidence of flake tools.

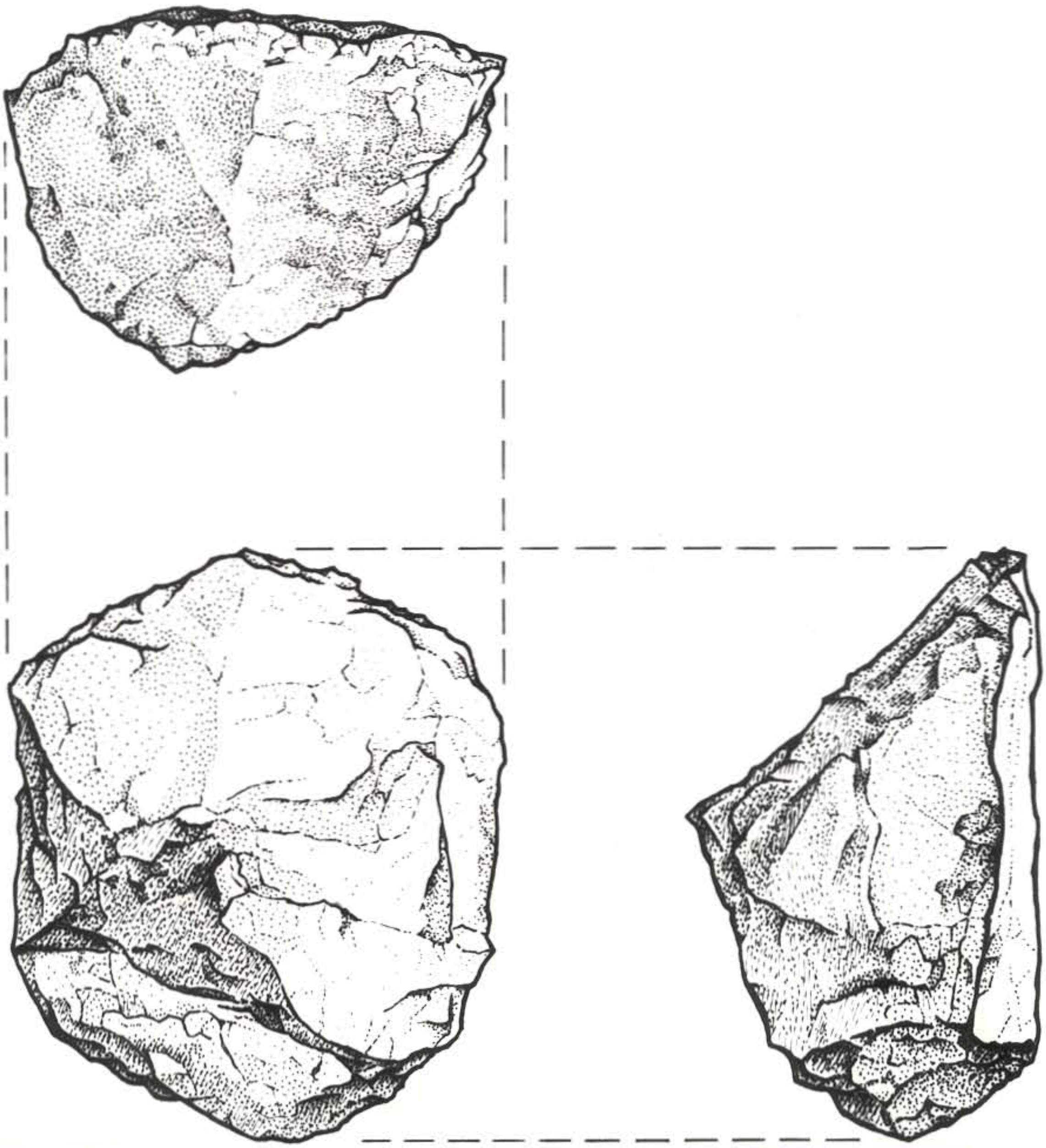

FIGURE 18: A core tool from site 38FA107A (illustration is approximately 1 1/2 times actual size).

Unifaces are similarly scarce. Most of the examples tabulated in Appendix C are rather crude; some may not actually be finished tools. Only the fragment from 38FA116 is of a well-made, steep angled end scraper.

Activity Analysis in Summary

The inferences presented above would be more credible if they were based on a larger and more controlled data set. The numbers of artifacts in most site samples are rather small, and comparison of different controlled samples within the same site indicates that intrasite differences in artifact distribution may be another important source of sampling error on this level of analysis. In addition, the quantitative implications of some of the hypothetical past behaviors remain unverified.

On the positive side, the inference that relatively intensive habitation is represented by only a few of the samples appears quite strong. Site 38FA100 is the only site which exhibits strong evidence of Archaic habitation. Some late prehistoric habitation at 38CS92 is suggested by the presence of a few Chicora Ware group sherds in the samples from that site. The sparseness of heavy-duty woodworking tools and even flake tools suggests that maintenance activities were similarly of only minor importance in the corridor area.

The data that are present, on the other hand, suggest that most of the archeological remains in the corridor area can be attributed to the manufacture, use, resharpening, breakage, and discard of light-duty bifacial cutting tools. The relative amount of early stage biface manufacture represented by samples seems particularly variable from site to site. As shall be seen, manufacturing of bifaces seems in many cases to have begun with extraction and preforming of quartz at loci in and near the corridor, though some probable resharpening of tools of nonlocal raw materials is also evident.

Though the analyses so far support the above inferences, there yet remain many unknowns and relevant variables which we do not control. Particularly, we need more complete information on each of the tool systems represented: Do Morrow Mountain points consistently exhibit heavy blade-edge damage? and; could many of the 10-15 mm long thinning flakes in the samples actually have been detached during resharpening of Kirk, Morrow Mountain or Savannah River points? We certainly do <u>not</u> know, for instance, that hafted Morrow Mountain points were actually used for butchering white-tailed deer. It remains to intensively compare biface and biface thinning flake morphologies, to conduct detailed wear and breakage pattern studies, and to carry out experimentation pertinent to hypothesized tool functions and manufacture processes.

Investigation of Prehistoric Site Variability

Strategy of Analysis

This section will attempt to articulate data on site content, and the behavioral inferences presented in the preceeding section, with the data on the attributes of sites in an attempt to derive a typology of the function of sites within a settlement system (cf. Binford 1964). It is in this section that the data on site attributes, presented in Appendix B will be analyzed most thoroughly.

It will be noted that the present data pertinent to site variability are not well controlled. The chronic sampling problems limit the reliability of our descriptions of site content and we are prevented from compiling, in every case, reliable descriptions of site attributes by the nature of the exposure of the archeological record in the corridor area, in logging roads, gullies, overgrown beanfields, and 1x1m test pits. The assignment of sites to functional types in this section will form the basis for the environmental analyses presented in the following section, and constitute hypotheses to be tested in future excavations at these and similar sites in the inter-riverine Piedmont.

Analysis of Site Attributes

Data on the topographic position of the prehistoric sites recorded by the I-77 survey are presented in Table 8. It should be emphasized that no evidence of midden staining was observed at any of the sites in the I-77 corridor. Prehistoric sites were most frequently encountered on ridge tops and on gently sloping hillsides though some were recorded on steeper hillsides and on elevated areas overlooking streams. Only one site, 38CS91, was found on a low terrace or natural levee within an active floodplain area. The lack of recorded sites in and near floodplains in the corridor, however, may be indicative of historic period alluviation in these valleys rather than the actual distribution of sites. As will be seen from the test pit data analysis, there is yet little reason to believe that prehistoric sites, taken on the whole, are located along streams. Comparison of topographic and site content data suggests the possibility that habitation sites may tend to be located on elevated areas overlooking streams.

TABLE 8.

SUMMARY OF PREHISTORIC SITE TOPOGRAPHIC POSITIONS

Topography	No. of sites
Ridge top	21
Steeper hillside	9
Gently sloping hillside	11
Elevated area by stream*	9
Low creek terrace	1

*Includes high terraces, low hilltops and hillsides by streams

The data on the slope direction of prehistoric sites, summarized in Table 9, suggest that sites may have a slight tendency to be located on south-facing slopes. Two factors possibly affecting these observations should be noted: (1) we may have tended to record slope direction in terms of cardinal directions --N, S, E, W--rather than the intermediate bearings; and (2) more xeric plant communities were present on some south-facing slopes, perhaps favoring site discovery. No intensive analyses of the slope magnitude data are undertaken but they suggest that most sites are on fairly level locations or gentle slopes. Again there is a possible bias factor in that logging roads, fields, etc. tended to be located on more level portions of the landscape.

TABLE 9.

SUMMARY OF PREHISTORIC SITE SLOPE DIRECTIONS

Direction	No. of sites	Direction	No. of sites
North	9	Southeast	3
Northwest	1	South	13
Northeast	1	Southwest	4
East	3	West	2
		Approx. level or slope direction was variable	15

Our measurements of the extent of sites were very imprecise. Most of the sites were exposed in only limited areas and the figures given for some sites in Appendix B indicate an only slightly better state of knowledge than the ones designated "no data." In addition to poor ground surface visibility, the nature of the site forming processes themselves may have contributed to the difficulty of measuring this variable. Some of the low density sites less than 100' in diameter, for instance 38FA116, 38CS81, and 38CS94, may represent single brief episodes of occupation. Most of the "sites" consisting of discontinuous, low density artifact scatters of artifacts over several acres or hundreds of feet of logging road probably represent juxtaposition or overlap of the outputs of many such brief episodes of occupation. One class of site is distinctive in this regard, single artifacts were designated "isolated finds" when it was clear that they were not closely associated with other artifacts or debitage.

Inference of Site Function: Site Content, Density, and Descriptive Attributes

Eight of the I-77 prehistoric sites were tentatively identified as quarry workshops, sites of extraction of vein quartz and early stage manufacture of tools of this material. These sites are 38RD104, 38CS66, 38CS67, 38CS79, 38CS82, 38CS83, 38CS87 and 38YK24C.

Attributes used to infer habitation vs. extractive activities are the presence of quantities of fire-cracked rock and a high density and diversity of artifacts. These attributes were very difficult to reliably measure in the context of the present survey. Density, especially, was measured only impressionistically. Site 38FA100 remains in a class by itself, exhibiting high artifact density (on at least part of the site), high artifact variability, and abundant fire-cracked rock. The concentrated part of this site is located on a relatively level area on a south-facing slope and about 200 feet from Cedar Creek, a rank 4 stream.

Three other sites are tentatively identified as possible Archaic habitation sites: (1) the test pit which discovered 38CS69 yielded a fairly large sample of debitage and probable fire-cracked rock, considering its small size, (2) 38YK25A yielded no fire-cracked rock, but exhibited a fairly high degree of tool diversity and overall density, (3) 38YK39 also exhibited a fairly high artifact density and yielded one piece of fire cracked rock. Sites 38CS69 and 38YK39 are located immediately north of fairly large streams in situations which would have been quite sunny in the wintertime. Site 38YK25A, however, is on a north-facing, gentle slope with the nearest water a few hundred feet away. These sites, indeed were distinguished from "extraction" sites chiefly in order to compare these two sets of sites in terms of the environmental variables relevant to the subsistence/settlement hypotheses outlined above.

Site 38CS92 is also in a class by itself in having a Mississippian component. The presence of ceramics at this site suggests that the Mississippian occupation may have involved habitation.

The four isolated finds, 38FA104, 38CS81, 38CS90, and 38CS93, may represent a distinct behavior pattern which resulted in deposition of isolated tools and blanks. Two of these are finished points, another is a preform or blank, and the fourth consists of a number of fragments of a single unidentified biface. Three of these isolated finds were on north-facing slopes and three were on relatively steep slopes, estimated at 10% or greater. The association of "isolated finds" with steep slopes raises the possibility that these artifacts may not have actually been deposited in isolation but rather represent larger artifacts left behind by erosion of a site removing the smaller flakes. This possibility however, is not considered likely in these particular cases.

The remaining sites (excluding those discovered in test pits, areas of extremely poor visibility, etc.) are lumped into the catch-all category of "extractive sites." These are low density artifact scatters which seem to represent mostly outputs of later stage biface tool manufacture and use of biface tools. Reviewing the data pertinent to these site in Tables 6 and 7 and Appendixes C and D will reveal that there is considerable variability among sites placed in this category.

Summary of Prehistoric Site Variability

The assignment of the I-77 prehistoric sites to these functional categories on the basis of artifact content and descriptive attributes is quite tentative and some parts of this typology are better than others. The identification of eight sites as quarry/workshops is the strongest inference but there is a good possibility that the isolated finds also represent a distinct set of behaviors.

With the exception of 38FA100, the habitation site/extraction site distinction is rather tenuous and little more than a heuristic device for subdividing the site sample in an attempt to discern techno-environmental patterns. The rationale of the classification has, however, been made explicit and, in the specific cases, this classification is subject to verification or refutation by future excavation.

The functional classification of the I-77 prehistoric sites is summarized below:

Quarry/workshop sites:

38RD104	38CS79	38CS87
38CS66	38CS82	38YK24C
38CS67	38CS83	

Archaic habitation sites:

38FA100	38YK25A
38CS69	38YK39

Mississippian habitation site:

38CS92

Isolated finds:

38FA104	38CS90
38CS88	38CS93

Extraction sites:

38FA101	38FA116	38CS74
38FA102	38FA117	38CS75
38FA103	38FA118	38CS76
38FA106	38FA119	38CS81
38FA107	38CS64	38CS85
38FA110	38CS71	38CS94
38FA112	38CS72	38YK37
38FA115	38CS73	38YK40

Correlation of Site Types and Environmental Variables

Measurement of Environmental Variables

The hypotheses concerning the relation between site location and environmental variables are outlined earlier. Measurements of these variables were made using USGS topographic maps of either 7.5' or 15' scale. As discussed above, a one-half mile radius catchment was used as the hypothetical extractive zone around a site. For comparative purposes this was also done with sampling units.

The amount of bottomland associated with a rank 3 or larger stream was measured within each catchment using a polar planimeter. Also, the number of rank 1 streams and rank 2 streams within each catchment was recorded. The distance to a permanent water source was measured only for sites. All measurements of environmental variables are presented in Appendix E. The means and standard deviations of these measurements for sampling units, sites in sampling units, total sites, and each site type are given in Table 10. These site types are habitation sites, isolated finds, quarry sites, and extraction sites.

Statistical Evaluation of Data

Once we had made all of our measurements we needed some way of statistically evaluating these data. The first test which comes to mind is a difference of means test utilizing the data in Table 10. However, a difference of means test cannot be used because the populations from which our samples were taken probably do not have normal distributions, and the samples are small. Instead, for the amount of bottomland within a catchment and the distance to a permanent water source, the Kolmogorov-Smirnov test (Siegel 1956) was used to compare the data from the different site types and between sites and sampling units. For the nominal scale data, i.e. number of rank 1 and rank 2 streams within catchments, the chi-square test was used for a pairwise comparison of each site type and for a comparison of sampling units with sites.

In evaluating the correlation of sites and environmental variables, we first wanted to determine if sites in general (i.e. not segregated by site type) show any locational patterning with regard to these variables. This was done by comparing the mean values of each variable for sites found in sampling units with the comparable data for all of the sampling units. Since the sampling units are randomly selected and dispersed throughout the corridor, the environmental data from them was assumed to be representative of the highway corridor as a whole. Only sites found in sampling units were used for this comparison in order to avoid sampling biases (for example, specifically examining all stream crossings). The results of these tests are in Tables 11 and 12.

We also wanted to see if the different functional site types would show any locational patterning with regard to the environmental variables. Variation between site types could occur even if the sites in general showed no significant differences from the sampling units because lumping the site types together might cancel out the variation. For each variable, each site type was compared to every other site type. The results of these tests are in Tables 13, 14, 15, and 16.

Interpretation

Tables 11 and 12 show the results of the statistical tests comparing the values of environmental variables from sites with those from sampling units. The results of the Kolmogorov-Smirnov test (Table 11) indicate that there are no significant differences between sites and sampling units with regard to the amount of bottomland within a one-half mile radius catchment. As indicated in Table 12, there are also no significant differences between sites and sampling units with regard to the number of rank 1 and rank 2 streams. These findings

TABLE 10.

MEANS AND STANDARD DEVIATIONS OF STREAM RELATED VARIABLES

		Bottomland Area (sq. mi.)		Number of Rank 1 Streams		Number of Rank 2 Streams		Distance to a Permanent Water Source (feet)	
	N	$\bar{x}$	s	$\bar{x}$	s	$\bar{x}$	s	$\bar{x}$	s
Sampling Units	43	0.046	0.090	3.209	1.627	0.837	0.754		
Sites in Sampling Units	19	0.037	0.083	3.368	1.499	0.632	0.684		
Total Sites	51	0.095	0.117	3.059	1.782	0.882	0.765	609.608	553.469
Habitation Sites	4	0.111	0.100	2.500	1.291	1.000	0.816	225.000	189.297
Isolated Finds	4	0.029	0.058	3.250	0.957	0.500	0.577	625.000	556.030
Quarry Sites	8	0.115	0.135	2.125	1.808	0.875	1.126	712.500	788.194
Extraction Sites	24	0.110	0.131	3.250	1.871	0.833	0.702	718.750	500.177

TABLE 11.

RESULTS OF THE KOLMOGOROV-SMIRNOV TEST COMPARING BOTTOMLAND AREA (SQ. MI.) WITHIN 1/2 MILE RADIUS CATCHMENTS, BETWEEN SAMPLING UNITS AND SITES IN SAMPLING UNITS

Sampling Units	Sites in Sampling Units	
n = 43	n = 19	$x^2 = 0.296$
x = 0.046	x = 0.037	df = 2
s = 0.090	s = 0.083	$.30 > p > .20$

TABLE 12.

RESULTS OF THE CHI-SQUARE TEST COMPARING THE NUMBER OF RANK 1 AND RANK 2 STREAMS BETWEEN SAMPLING UNITS AND SITES IN SAMPLING UNITS

	Sampling Units		Sites in Sampling Units		
Rank 1 Streams	138	(ob)	64	(ob)	$x^2 = 0.10$
	140.10	(ex)	61.90	(ex)	df = 1, $.80 > p > .70$
Rank 2 Streams	36	(ob)	12	(ob)	$x^2 = 0.72$
	33.29	(ex)	14.71	(ex)	df = 1, $.50 > p > .30$

can be summarized as follows: the measurements of those environmental variables within site catchments is not significantly different from measurements of these variables in catchments centered on a set of randomly selected points (sample units) in the highway corridor. Thus on the basis of these tests, we can assume that sites in general (i.e. not segregated by site type) show no strong locational patterning with regard to these environmental variables.

Tables 13, 14, 15, and 16 show the results of the pairwise comparison of sites by site type for each of the following variables: amount of bottomland distance to a permanent water source, and number of rank 1 and rank 2 streams. The Kolmogorov-Smirnov test for bottomland area (Table 13) shows no significant differences at the .05 level. However, all comparisons involving isolated finds tend to have lower values of alpha, which may indicate a pattern. When small sample sizes are used as is the case with isolated finds, the chi-square approximation is conservative, i.e. "the true probabilities are less than those computed" (Blalock 1972: 264). This gives us reason to suspect that, if our sample sizes were larger, the Kolmogorov-Smirnov test might show that the isolated finds had significantly less bottomland area than the other site types.

For the distance of sites from a permanent water source, the Kolmogorov-Smirnov test (Table 14) again shows no differences significant at the .05 level. Again there is a problem with small sample sizes. There is a stronger pattern with habitation sites having the shorter distance, although not significantly shorter according to our test. But again taking into account the conservative nature of this test with small samples, we may suspect that the distance of habitation sites from a permanent water source is significantly shorter. This may also possibly hold true for isolated finds, but the pattern is much stronger for habitation sites.

Chi-square tests were used to see if there were any significant differences in the number of rank 1 streams within the catchments of each site type (Table 15). None of the differences were significant at the .05 level. A similar chi-square test was not done for rank 2 streams because the expecteds would be too small in some cases. To avoid this problem, rank 1 and rank 2 streams were combined for the chi-square test (Table 16). Again, there were no significant differences between site types.

Conclusions

Although several faint patterns show up in the data, the various tests indicate that there are no significant differences between sites and sampling units and between site types with regard to these environmental variables. There are several possible conclusions that can be made at this time.

A. Our hypotheses are incorrect and we are focusing on the wrong variables.

B. The environment is fairly homogenous and we cannot tell much about variability within it with the methods we are using.

C. There is not enough variability in the site sample; there are especially not enough good, unambiguous habitation sites like 38FA100.

D. The sample sizes are not large enough. This is particularly true for isolated finds and habitation sites.

TABLE 13.

RESULTS OF THE KOLMOGOROV-SMIRNOV TEST FOR ALL POSSIBLE COMPARISONS OF BOTTOMLAND AREA (SQ. MI.) WITHIN 1/2 MILE RADIUS CATCHMENTS OF SITES BY SITE TYPES

	Habitation Sites	Isolated Finds	Quarry Sites	Extraction Sites
Habitation Sites n = 4 $\bar{x}$ = 0.111 s = 0.100	-	D = 2/4 K_D = 2 p > .05	D = 0.250 X^2 = 0.667 .80 > p > .70	D = 0.292 X^2 = 1.169 .70 > p > .50
Isolated Finds n = 4 $\bar{x}$ = 0.029 s = 0.058	-	-	D = 0.375 X^2 =1.490 .50 > p > .30	D = 0.417 X^2 = 2.386 .50 > p > .30
Quarry Sites n = 8 $\bar{x}$ = 0.115 s = 0.135	-	-	-	D = 0.125 X^2 = 0.375 .90 > p > .80
Extraction Sites n = 28 $\bar{x}$ = 0.110 s = 0.131	-	-	-	-

TABLE 14.

RESULTS OF THE KOLMOGOROV-SMIRNOV TESTS FOR ALL POSSIBLE COMPARISONS OF THE DISTANCE (IN FEET) OF SITES FROM A PERMANENT WATER SOURCE BY SITE TYPE

	Habitation Sites	Isolated Finds	Quarry Sites	Extraction Sites
Habitation Sites n = 4 $\bar{x}$ = 225.00 s = 189.30	-	D = 2/4 K_D = 2 $p > .05$	D = 0.625 X^2 = 4.167 $.20 > p > .10$	D = 0.583 X^2 = 4.661 $.10 > p > .05$
Isolated Finds n = 4 $\bar{x}$ = 625.00 s = 556.03	-	-	D = 0.375 X^2 = 1.499 $.50 > p > .30$	D = 0.333 X^2 = 1.522 $.50 > p > .30$
Quarry Sites n = 8 $\bar{x}$ = 712.50 s = 788.19	-	-	-	D = 0.208 X^2 = 1.038 $.70 > p > .50$
Extraction Sites n = 24 $\bar{x}$ = 718.75 s = 500.18	-	-	-	-

TABLE 15.

CHI-SQUARE EVALUATION OF THE NUMBER OF RANK 1 DRAINAGES WITHIN .5 MILE CATCHMENTS OF PREHISTORIC SITE TYPES

Site Type	(ob)	(ex)	Site Type	(ob)	(ex)	X^2	df	p
Habitation Sites	10	11.5	Isolated Finds	13	11.5	$X^2 = 0.39$	df = 1	$.70 > p > .50$
Habitation Sites	10	9	Quarry Sites	17	18	$X^2 = 0.035$	df = 1	$.90 > p > .80$
Habitation Sites	10	12.571	Extraction Sites	78	75.429	$X^2 = 0.613$	df = 1	$.50 > p > .30$
Isolated Finds	13	10	Quarry Sites	17	20	$X^2 = 1.35$	df = 1	$.30 > p > .20$
Isolated Finds	13	13	Extraction Sites	78	78	$X^2 = 0$	df = 1	$p > .99$
Quarry Sites	17	23.75	Extraction Sites	78	71.25	$X^2 = 2.558$	df = 1	$.20 > p > .10$

TABLE 16.

CHI-SQUARE EVALUATION OF THE NUMBER OF RANK 1 AND 2 DRAINAGES WITHIN .5 MILE CATCHMENTS OF PREHISTORIC SITE TYPES

Habitation Sites		Isolated Finds		$X^2 = 0.034$
(ob)	14	(ob)	15	df = 1
(ex)	14.5	(ex)	14.5	$.90 > p > .80$

Habitation Sites		Quarry Sites		$X^2 = 0.210$
(ob)	14	(ob)	24	df = 1
(ex)	12.667	(ex)	25.333	$.70 > p > .50$

Habitation Sites		Extraction Sites		$X^2 = 0.292$
(ob)	14	(ob)	98	df = 1
(ex)	16	(ex)	96	$.70 > p > .50$

Isolated Finds		Quarry Sites		$X^2 = 0.462$
(ob)	15	(ob)	24	df = 1
(ex)	13	(ex)	26	$.50 > p > .30$

Isolated Finds		Extraction Sites		$X^2 = 0.094$
(ob)	15	(ob)	98	df = 1
(ex)	16.143	(ex)	96.857	$.80 > p > .70$

Quarry Sites		Extraction Sites		$X^2 = 1.847$
(ob)	24	(ob)	98	df = 1
(ex)	30.5	(ex)	91.5	$.20 > p > .10$

Evaluation of Settlement/Subsistence Hypotheses

Patterns of Exploitation

Hypothesis 1, that there was no exploitation of the inter-riverine Piedmont is clearly disconfirmed in the case of the Archaic Period. The I-77 results are generally consistent with Kelly's (1972) data. Unlike Kelly we found no evidence of Woodland occupation, however. Though we found a single Mississippian component, the I-77 results, like Kelly's data, suggest that Mississippian activity in the corridor area was minimal.

Hypothesis 2, also seems disconfirmed in the case of the Archaic. Both the I-77 survey and Kelly's survey revealed abundant evidence of Archaic occupation in the heart of this inter-riverine zone between the Broad and the Catawba-Wateree river systems. This hypothesized pattern may nonetheless be an accurate description of the prehistoric Mississippian pattern of use of this zone since prolonged Mississippian occupation involving relatively high population densities seems to have existed in the adjacent riverine zones.

The presence of probable habitation sites in the corridor, the topographic diversity of site location, and other evidence of a broad range of subsistence activities argues convincingly for Hypothesis 4 rather than Hypothesis 3. A closer look at Hypothesis 4 will reveal that it is actually two hypotheses: (A) that exploitation of this zone involved permanent (year-round) occupation, and (B) that only seasonal base camps were present. This pair of hypotheses will be evaluated below.

Structural Poses and Site Variability

Midden staining was not observed at any of the prehistoric sites in the I-77 corridor but 38FA100 exhibited the other predicted attributes of Archaic habitation sites. Three other sites exhibited some of these attributes. The only artifact class "suggestive of habitation" encountered on any of these sites was fire-cracked rock; no steatite sherds or Stalling's or Thom's Creek ceramics were found. Maintenance activities seem to be represented by the occurrence of numbers of flake tools at some of these sites. In general, however, the artifact inventory at even the suspected habitation sites seems generally narrow and impoverished, in view of the paucity of evidence of heavy-duty woodworking and the absence of any evidence of plant processing.

Midden staining is usually considered a good indicator of intensive habitation involving one or more permanent houses. Its absence, however, may reflect erosion rather than the absence of such occupation. The present data, limited as they are, are more consistent with Hypothesis B, that these sites represent less intensive habitation, than with Hypothesis A, that these sites represent loci of more intensive habitation (involving for instances permanent houses). It is emphasized that "habitation sites" as defined here, appear to be quite infrequent in the corridor area and our present sample of sites is not sufficient for generalizing about regional parameters of their location, descriptive attributes, and artifact content.

Most of the prehistoric sites recorded by the present survey correspond fairly well to our expectations for sites for extraction of biotic resources as outlined in the implications of Hypothesis 3. Though no strong patterning in site/environment relationship is evident in the present data set, it will be

noted that most of the sites tentatively identified as extractive sites are located on ridge tops and not readily accessible to permanent water. Consistent with Implication 2, the artifact inventory at these sites seems to be oriented around the use of light-duty cutting tools. The conspicuous presence of outputs of early stage biface manufacture in most, though not all, of the "extraction site" samples is not consistent with the predictions of the "Biface Thinning Flake Model" for such sites. The present analyses, however, suggest that this model is not directly applicable when a given lithic resource is widely available in the environment and quarrying and preforming can be conveniently carried out during the course of other extractive activities. All of these suspected extractive sites, whether producing evidence of early stage biface manufacture or not, seem to have a low overall density of artifacts, consistent with Implication 3. Isolated finds may represent outputs of single brief episodes of extractive activity. If the present data are considered representative, these finds may tend to be particularly remote from water and floodplain zones and frequently located on steep, exposed locations.

Hypothesis 4, that extractive sites for lithic resources are present in the corridor area, is confirmed by the survey data. The vein quartz quarry/workshop sites recorded by the I-77 survey are discussed in the section on Lithic Resource Procurement.

Identification of Specific Biotic Resources Exploited by Prehistoric Societies

The correlation of site types and environmental variables, discussed above, was designed to help identify the specific biotic resources which were the major targets of prehistoric subsistence activities in the inter-riverine Piedmont. This avenue of investigation is particularly crucial to our long-term research goals since it seems unlikely that we will ever recover direct subsistence data, in the form of animal bones, charred plant remains, economic pollen, etc., from many sites in the inter-riverine zones.

The present analyses, however, have yielded no firm conclusions about the location of prehistoric sites with relation to the distribution of hypothetical target resources in the environment. Numerous low density sites characterized by outputs of the manufacture and use of light duty cutting tools are present in upland hardwood zones, probable areas of high white-tailed deer concentration in the fall. That hickory nut and acorn gathering also took place in these zones cannot be ruled out since gathering, if not processing, of nuts would probably have few if any outputs in archeological context. If processing activities were carried out at seasonal base camps, however, we might expect either stone mortars and pestles such as are frequently found on riverine Archaic sites throughout the Southeast; or, alternatively, some evidence of heavy-duty woodworking reflecting manufacture of wooden mortars. Our knowledge of the content of "habitation" sites in this inter-riverine zone is yet very limited.

Correlation of site occurrence and stream rank data suggest a tendency for all types of sites to be associated with larger streams. There is a possibility of sampling bias introduced by slightly better visibility along higher rank streams. Two alternative hypotheses to explain this pattern are: (1) a concentration on stream bottom resources, consistent with Hypothesis 3, and (2) a broad spectrum seasonal subsistence strategy involving resources from diverse micro-environments. As noted above, the major creek valleys are indeed centrally located with respect to all of the biotic resources in the inter-riverine Piedmont. A related possibility is that extractive loci for creek bottom resources are now buried beneath several feet of historic period alluvium in the floodplain.

Discussion of Hypothesis Testing

Archeological confirmation of most hypotheses about the past is a cumulative process taking years and involving articulation of diverse categories of data and progressive identification and control of unknowns in the relationship between the archeological record and past human behavior. The present discussion has attempted to at least explicate some hypotheses and begin the process of testing them. The field methods used by the I-77 survey were designed to fulfill the data requirements of these hypotheses and every practical attempt was made to eliminate sampling bias on both the intersite and intrasite levels. The limitations of the present data set, however, need to be reiterated:

1. These data are all from the surface and represent temporally diverse (though primarily Archaic) occupations. The possibility of significant intrasite variability in artifact content exists at most sites and has not been controlled in the present survey. Nor do we yet know anything about the subsurface and the possible existence of features at any of these sites.

2. The sample of artifacts from most sites is quite small and subject to bias from sampling error.

3. The number of sites recorded by the I-77 survey is quite small. The population of the more frequent types of sites, especially "extraction" sites, may be adequately represented but the proportion of the more infrequent types of sites, such as Archaic "habitation" sites, in the underlying population cannot be reliably estimated at this time.

4. Specific technological and functional studies of specific artifact classes are needed to determine whether many of the tool-debitage and morphology-function correlates assumed in the above discussion are even possible.

New and Revised Hypotheses

While the data generated by the I-77 survey offer no clearcut choices among the alternative hypotheses presented earlier, they do favor the model of a Middle (and perhaps Late) Archaic settlement/subsistence pattern involving prolonged occupation of seasonal base camps along larger creeks in the interriverine Piedmont. Sites interpreted as representing extractive loci are quite common on ridge tops in what would have been areas of high white-tailed deer concentration in the fall. The apparent association of prehistoric sites with major creek valleys, however, argues for a broad spectrum, rather than a single resource focus for subsistence activities in this zone. The probable habitation sites that we know of in the corridor area seem to more closely fit our expectations for sites of temporary base camps than sites of winter settlements with construction of permanent houses.

Based on the present data we propose a settlement pattern model for the Middle and Late Archaic involving spring and summer residence along major rivers; a move to seasonal base camps in upland creek valleys in September to take advantage of deer concentration in upland hardwood zones, with some exploitation of other resources as well; and then a return to riverine-located winter quarters with permanent houses in about December when the coldest weather arrived, the deer rutting season came to an end, and the acorn mast in the hardwood forests began to be exhausted.

The main features of this model are encompassed by the subsistence/settlement hypotheses already presented and the archeological implications of the pertinent hypotheses probably remain useful for testing the present model. The main requirement for testing this model, then, would be a more reliable description of the archeological context of Middle and Late Archaic occupations in the inter-riverine Piedmont. This description can only be based on larger and better controlled sets of survey data than could be generated within the context of the present survey, plus some intensive excavation of specific prehistoric sites in this environmental zone.

The major prehistoric occupation of the I-77 corridor area seems to have been during the Middle and Late Archaic, but both Kelly's (1972) data and the I-77 data indicate significant Early Archaic occupation, as well, in this inter-riverine zone. Kelly's data and preliminary analysis of the results of the Laurens-Anderson survey (Goodyear and Ackerly, personal communication) indicate that very early Archaic components (recognizable by the presence of Palmer and other roughly contemporary points and certain forms of end scrapers) seem to be quite common on ridge tops in some areas of the South Carolina Piedmont. Goodyear and Ackerly suggest, on the basis of preliminary results of the Laurens-Anderson survey, on the basis of preliminary results of the Laurens-Anderson survey, that these components may be especially concentrated on the watershed divides between major river systems. Kelly (1972: 46-48) reports that Palmer points seem to be concentrated on ridge tops rather than adjacent bottomland areas and that the distribution of "convex" uniface scrapers (probably Early Archaic forms, for the most part) (Kelly 1972: 85-88) is similar. Though the distribution of these two tool forms by topography appeared to be similar, Kelly (1972: 89) found no evidence confirming that they are strongly associated on a site-by-site basis. The data from the I-77 corridor area pertaining to occupation on this time level are very sparse and inconclusive, beyond verifying the occurrence of very early Archaic occupation. Two Palmer point fragments were found, at 38FA100 and 38CS72 and one fragment of an endscraper was found at 38FA100. Two of these finds were on ridge tops; the third was on a rise overlooking a rank 4 stream.

The interesting thing about this pattern assuming that it accurately reflects the actual distribution of Palmer points and endscrapers in the inter-riverine Piedmont, is the association of tools indicating maintenance activity (endscrapers) with Early Archaic occupations on ridge tops. This suggests a difference between Early Archaic and later Archaic utilization of this zone since little evidence of maintenance activities (excluding quartz biface manufacture) seems to be associated with most Middle or Late Archaic components in the corridor area. It is emphasized that the reality of this extrapolated pattern, too, remains to be verified by analysis of larger, more rigorously collected data sets.

If such a difference in settlement pattern between very early Holocene (ca. 7000 B.C.) and later Archaic occupations in the Piedmont can be verified, this shift in settlement pattern might be of relevance to our understanding of human ecology and the dynamics of adaptational change during the 7000 year-long Archaic period in the Southeast. Cleland (1976) recently reviewed our knowledge of changing aboriginal adaptive strategies in prehistoric eastern North America in terms of a "focal-diffuse" model of variation in economic adaptation. In Cleland's model, focal adaptations are those which are centered

economically on a single species or a few species which are exploited by a similar set of tools and techniques. Diffuse adaptations, on the other hand, are present when no single resource or related set of resources are abundant, concentrated, and/or reliable enough to promote economic security and, instead, a diversity of resources is regularly exploited. Archeologically, focal adaptations are characterized by numbers of sites which are quite similar in artifact content and located in similar environmental zones while a great deal of diversity in site content and location tends to be associated with diffuse adaptations. In focal adaptations, tool form variability is limited and parallels a few functional categories--though individual specimens representing each functional type may have been produced and broken, lost, discarded, or abandoned in great numbers. In diffuse adaptations, there may either be an expanded inventory of tools and diverse tool kits or tools which performed diverse functions.

Cleland (1976: 69) notes that the archeological record of Paleo-Indian and Early Archaic occupations in eastern North America conforms well to our expectations for focal adaptations. He observes that the toolkit of Paleo-Indian and Early Archaic occupations throughout much of North America seems largely limited to tools involved in the processing of meat, bones, and hides and exhibits little change in form over three or four thousand years.

The most intensive investigation of Early Archaic site variability to date has been research on the Dalton Culture of the Central Mississippi Valley by Morse (1971, 1973), Goodyear (1974), and others. Though the cause of observed variability among Dalton components in the region remains the subject of lively debate (Schiffer 1975a, 1975b; Morse 1975b; Price and Krakker 1975), it seems that a portion of the known Dalton tool kit, characterized by Dalton points and steep-angled endscrapers, and occasional occurrence of other probable bone processing tools (Goodyear 1974) is extremely widespread, occurring at a large number of sites in a wide variety of environmental situations. Whether or not distinct long-termed base camps formed a part of the prehistoric Dalton settlement pattern, the repetitious occurrence of Dalton points and steep-angled endscrapers at sites throughout this environment suggests the repetitious occurrence of a certain set of extraction-related tasks at these loci in the past.

The Palmer phase in this portion of the Southeast is roughly contemporary with Dalton (7000-8000 B.C.) and the most common recognized Palmer tools, serrated, beveled Palmer points and steep-angled endscrapers (Coe 1964; Broyles 1971), seem to be functional equivalents of Dalton points and associated steep-angled endscraper forms. We hypothesize, then, that the Palmer components on ridge tops in the Piedmont represent a set of activities similar to that represented by the occupation floors at the Brand site in Arkansas (Goodyear 1974). In the Piedmont, fortunately, we probably control paleo-environmental variables better than we do in the Mississippi Valley and, if future surveys indicate that these Palmer sites are indeed concentrated on ridge tops and along the divides between major river systems, it would support the hypothesis that these sites were loci of intensive hunting and processing of white-tailed deer in the fall in the context of a focal adaptive strategy. The key archeological variables in testing this hypothesis will be reiterated: (1) occurrence of steep-angled endscrapers and perhaps other probable bone working tools (i.e., gravers, pièces esquillées) at Palmer point-producing sites, (2) a low frequency of other than probable butchering and bone processing tools at these sites, and

(3) a concentration of such sites themselves on ridge tops vs. major stream valleys and on the watershed divides which would have been centrally-located within the hardwood forest of the inter-riverine zones.

Cleland (1976: 69) attributes the apparent shift from a focal to a diffuse adaptive strategy throughout much of the east at the end of Early Archaic times to environmental shifts and the disappearance of big game animals. While recognizing the occurrence of a climatic shift around the end of Palmer times, we offer as an alternative hypothesis that significant population increase required the development of a broader spectrum, more labor-intensive subsistence strategy (cf. Boserup 1965; Asch, Ford and Asch 1972: 27-30) by Middle Archaic times.

We emphasize that both of the above models are in no way research results of the I-77 survey. They are built on those results, however, and are intended as hypotheses to guide future research, select archeological data categories, and identify variables in a manner similar to the hypotheses at the beginning of this chapter.

TESTING THE HYPOTHESIS THAT PREHISTORIC SITES TEND TO BE LOCATED ALONG STREAMS

As noted in the agreement between the South Carolina State Highway Department and the Institute of Archeology and Anthropology, which forms the basis of the I-77 survey, prior survey experience suggests that at least some kinds of prehistoric sites are concentrated along permanent streams. An attempt to test this hypothesis was one of the major research designs operationalized by the I-77 survey. This research design was one of the major determinants of the particular sampling strategy employed in the survey.

Methods

This hypothesis was tested by comparing data from the sampling quadrats--a random sample of the corridor as a whole--with data from the survey of the stream crossings. We could not however, simply use the total number of prehistoric sites found in each type of survey unit since these numbers would reflect not only the actual presence of sites but also vegetational differences and differences in the area actually surveyed at stream crossings. As indicated in Table 4, the ground surface visibility in the two kinds of survey units was roughly comparable. Nonetheless, bias introduced by differential vegetation cover cannot be ruled out and an alternative to reliance on simply the number of sites recorded in each kind of sampling unit is desirable.

To eliminate this possible source of bias, and to meet the assumptions of the chi-square test, only sites discovered by digging the 1x1m test pits were used. The only influence that variation in vegetational cover would have had upon these results would be to decrease the number of test pits dug, since we felt that it would be redundant to put in a test pit where soil was already exposed. Differential vegetation cover then, would decrease the sample size but would not affect the independence of the cells of the contingency table.

Test Results

The data used in the chi-square test and the results of the test are presented in Table 17. As shown, both types of survey units yielded the same number of positive results. There were proportionately slightly more positive test pits at creek crossings than in the sampling units. The chi-square test, however, indicates that this difference cannot be considered significant, suggesting that we should not at this time accept the hypothesis that prehistoric sites in the I-77 corridor are concentrated along streams.

Discussion

In evaluating these results, two things should be borne in mind. First our test pits at stream crossings were usually placed on the first rise or terrace above the floodplain. Only one site, 38CS91, was found on any of the floodplains in the I-77 corridor. Increased flooding and erosion during the historic period has covered these valley floors with modern sediment to a depth

averaging 4 feet (Trimble 1972). As pointed out earlier, it is possible that this alluvium may be obscuring many stream-associated prehistoric sites.

Second, the apparent lack of any strong association of prehistoric sites with streams does not necessarily indicate that streams were not of key importance to prehistoric occupations in the inter-riverine Piedmont. It may be that sites of intensive habitation in this environmental zone are in fact concentrated along streams but are so infrequent that they cannot be adequately represented in a comparatively small impact zone sample such as that generated by the I-77 survey.

TABLE 17.

CHI-SQUARE TEST FOR SIGNIFICANCE OF RELATIVE SUCCESS IN THE USE OF SAMPLE UNITS AND STREAM CROSSINGS FOR LOCATING SITES, BASED ON TEST PIT RESULTS

	Positive Results	Negative Results	
Sample Units:	5 (5.847)	64 (63.153)	69
Stream Crossings:	5 (4.153)	44 (44.847)	49
	10	108	N 118

$X^2 = 0.323$
df = 1
$p > 0.20$

Prehistoric Site Location and Stream Rank

Although the chi-square test in Table 17 gives no indication that sites in general tend to be located along streams, it may be that those sites that are located along streams tend to be located on larger rather than smaller streams. In order to test for such a correlation, streams were ranked according to the system proposed by Strahler (1964) and others, and the sites located at stream crossings were grouped according to the rank of the streams on which they were located. Table 18 shows the distribution of these sites by stream rank and the distribution of streams by stream rank.

In order to test for the significance of stream rank for site location, a chi-square test was used to compare the distribution of sites with the distribution of streams. Although there were five stream ranks, these ranks had to be combined into two groups in the chi-square contingency table so that all expected frequencies would be 5.0 or greater (Table 19). As can be seen in the

contingency table, the site/stream ratio was greater for higher rank streams (3, 4 and 5) than for lower rank streams (1 and 2). The calculation of chi-square resulted in a value of $p < .02$. Thus, if we can assume that no significant differences in vegetational cover between higher and lower rank streams, then stream rank was a significant factor in the location of prehistoric sites, and these sites tend to be located on the higher rank streams rather than lower rank streams.

TABLE 18.

DISTRIBUTION OF SITES LOCATED AT STREAM CROSSINGS AND DISTRIBUTION OF STREAMS, GROUPED BY STREAM RANK

Stream Rank	1	2	3	4	5	Totals
Number of Sites	4	3	2	2	6	17
Number of Streams	19	10	2	3	4	38

TABLE 19.

CHI-SQUARE TEST FOR SIGNIFICANCE OF STREAM RANK TO SITE LOCATION

	Ranks 1 and 2	Ranks 3, 4, and 5	
Sites	7 (11.127)	10 (5.873)	17
Streams	29 (24.873)	9 (13.127)	38
	37	19	N 56

$x^2 = 6.413$
df = 1
$p < .02$

Conclusions

The results of these tests are tentative and point to the need for further research dealing with prehistoric site location in the inter-riverine Piedmont. The first question that needs to be answered deals with the extent to which increased flooding and sedimentation during the historic period might be obscuring prehistoric sites associated with streams. Second, the stream location hypothesis does not distinguish between functional site types. It may be, as was suggested earlier, that habitation sites in this area are concentrated along streams. Unfortunately the small size of our data set prevented us from testing each site type separately. Third, the fact that we found a correlation between stream rank and site location, for those sites which were found at stream crossings, lends support to the hypothesis that streams are an important locational factor for certain types of prehistoric sites. Further research in this area should attempt to discover if certain types of sites are in fact concentrated along streams, and if so, what is the nature of these sites, and what environmental variables associated with drainage rank would influence site selection in favor of higher ranked streams.

INVESTIGATION OF PREHISTORIC LITHIC RESOURCE PROCUREMENT IN THE I-77 CORRIDOR AREA

The Uses of Lithic Resource Procurement Studies

In almost all nonmetal-using societies, stone is the raw material for many tools used directly in exploiting the environment; it is also the raw material of tools used in the fabrication of most other tools. Lithic technology can be considered the technological cornerstone of such societies. Cultural systems with such a technology tend to produce large quantities of broken, exhausted, or lost stone tools and manufacturing debitage which enters the archeological record and are uniformly well preserved.

Since the lithic technology of a past society is articulated, directly or indirectly, with all other aspects of the past cultural system, lithic analysis need not be an end in itself but a means toward reconstruction of these other aspects. In this regard, knowledge of lithic resources and lithic resource procurement strategies becomes basic to a variety of research problems. Gould (1974) suggests, based on ethnographic data from the Western Desert of Australia, that manufacture of tools of nonlocal, "expensive" vs. locally-available raw materials usually takes place at base camps rather than at extractive loci. Analysis of raw materials in debitage samples then, may be a source of information on site function in a settlement system. The mechanism of the movement of materials over long distances--whether by special expeditions for procurement, quarrying and preforming by local groups and exchange with other groups, or a market system--is presumably related to the overall economic and social organization of a society. And the development of new technologies in the course of major economic shifts often entails new tools with new requirements for raw materials.

The observations on prehistoric lithic resource utilization in the I-77 corridor area presented here are only preliminary. It is hoped that this discussion will reveal some of the more general patterns in prehistoric lithic resource procurement in the region and help to identify problem areas for investigation during the mitigation stage on I-77 and any other future research on prehistoric lithic technology in the South Carolina Piedmont.

Identification of Raw Materials in the I-77 Collections

Our identification of the raw materials used for manufacture of stone tools in the I-77 corridor is based primarily on discussions with Mr. Richard Dayvault of the Geology Museum of the University of South Carolina and Mr. David Howell of the Geology Division of the South Carolina State Planning Board. Mr. Dayvault and Mr. Howell examined some of our collections and discussed at length with us the nature and possible origins of some of the raw materials represented. These discussions have been quite helpful and, though we did not receive the easy answers we were looking for, we did gain some hypotheses which can form the basis for more intensive investigation in the future.

The geologic history and petrology of the Carolina Piedmont are exceedingly complex. A variety of igneous rocks occurs in dikes and plutons. Many of the sediments present are of volcanic origin and were sorted horizontally prior to deposition. Many post-depositional processes have also affected sediments; many of the rocks in the Piedmont have been subjected to intense heat and pressure, and partial replacement by silica.

In addition to the complexity of the rocks in their geological context, archeological specimens are usually quite out of context, geologically speaking. They may not reflect modal tendencies in their parent outcrop but rather meticulous selection for certain qualities. After this initial selection, raw materials may be further altered in appearance by heat treatment to improve their chipping properties (cf. Crabtree and Butler 1964).

The raw material identifications presented here are, for the above reasons, quite tentative and the categories used are in some cases only ball park estimates of origin and hypotheses for future investigation. Detailed petrological analyses of raw materials should be a priority in future research in the region.

The major categories of raw materials represented in the I-77 collections are:

Quartz: Crystalline vein or "bull" quartz, usually translucent or white but occasionally reddish, greyish, yellowish-brown, or clear. This material is formed in veins ranging from a few inches to several feet in thickness in rocks throughout the Piedmont. It is much harder and more resistant to weathering than any surrounding rock and, hence, is usually left behind as residual chunks in the soil mantle. Occurrences of solid, uniform, relatively unweathered quartz are frequently encountered throughout the South Carolina Piedmont but do not seem to be present on quite every ridge. The crystalline structure of this material interferes greatly with conchoidal fracturing and makes it a relatively difficult material to use for chipped stone tools.

Carolina Slate: A very fine-grained, isotropic, hard, silicious-appearing material with a good conchoidal fracture. Unweathered specimens are very dark grey to black. Archeological specimens dating to the Archaic, however, usually exhibit surfaces weathered to a grey, light grey, blue grey, or light greyish brown color; frequently showing a fine banding. This is apparently the "argillite" described by John Kelly (1972: 31-32).

David Howell (personal communication) considers this to be an ignimbrite or welded tuff and notes its similarity to specimens from the Uwharrie Formation in the Carolina slate belt. This formation lies primarily in North Carolina but extends into Chesterfield County, South Carolina, some 50 miles east of the I-77 corridor. Specimens from the I-77 corridor have been compared with prehistoric quarry and workshop debris from the Hardaway site and Morrow Mountain in North Carolina (cf. Coe 1964) and found to be virtually identical in appearance.

Tuffaceous: This is our catch-all for various highly indurated, coarse-grained rocks which seem to be composed of tiny but megascopically observable particles of diverse materials. The archeological specimens in the I-77

collections seem to be quite isotropic, exhibiting conchoidal fracture with rough surfaces. They are usually weathered to a mottled light grey, though frequently stained reddish or yellowish by clay soils. Fresh breaks reveal a dark grey unweathered core in some of these specimens. The large size of some of these flakes argues for a local origin but we observed no quarries or workshops for this material. David Howell (personal communication) states that such rocks are common in the Carolina slate belt. The "tuffaceous" from I-77 corresponds fairly well to the description of "andesite" by Kelly (1972: 32).

Chert: Chert is defined as a "compact silicious rock formed of chalcedonic or opaline silica, one or both, and of organic or precipitated origin." It is distinguished by being cryptocrystalline (American Geological Institute 1962: 82). Only very small quantities of chert were found by the I-77 survey but these specimens exhibited great diversity. In the opinion of David Howell and Dick Dayvault (personal communications) a single flake of black translucent chert and some pieces of uniform grey to translucent grey chert resemble Fort Payne and related cherts from the Ridge and Valley Province beyond the Blue Ridge Mountains. These cherts are much more common in archeological contexts further north and west in the South Carolina Piedmont. Some carbonate-rich sediments containing chert are present in the Piedmont and David Howell suggests that some of the opaque light and dark grey chert flakes from 38FA118 exhibiting tiny crystal-filled seams originated in these deposits. A variety of high quality cherts is available on the Coastal Plain of South Carolina. None of the I-77 chert specimens, however, exhibit the weathering characteristics of Coastal Plain cherts dating to the Archaic or earlier.

Argillite: Argillite is defined as a "rock derived from siltstone, claystone, or shale, that has undergone a somewhat higher degree of induration than is present in those rocks. Argillite holds an intermediate position between the rocks named and slate" (American Geological Institute 1962: 23). Specimens found on the I-77 survey are light greyish green, rather soft, and exhibit marked bedding planes which interfere with conchoidal fracture. Most of these specimens came from one site, 38CS75, and probably represent reduction of one piece of raw material. The argillite described here is probably the "slate" described by Kelly (1972: 32). Argillite is one of the major constituents of the Carolina slate belt in South Carolina (Overstreet and Bell 1965).

Other: A few specimens did not readily fit into the above categories. These include a few flakes of probable basalt, a few flakes tentatively identified as amphibolite, and several pieces of yet wholly unidentified material.

Identification of the raw material of points and biface thinning flakes in controlled samples are given in Appendixes D and E.

Quartz Quarry/Workshops in the I-77 Corridor

As noted earlier, prehistoric sites have been tentatively identified as sites of quarry/workshops for extraction and reduction of vein quartz preparatory to the manufacture of chipped stone tools. These sites are: 38RD104, 38CS66 (Fig. 19), 38CS69, 38CS79, 38CS82, 38CS83, 38CS87 and 38YK24C.

These sites can be characterized in most cases by:

1. close proximity to a surface exposure of solid, uniform, relatively unweathered vein quartz;

2. an extremely high density of quartz debitage relative to other sites (though we haven't yet attempted to quantify this variable);

3. a high ratio, in most cases, of chunks and other flakes to biface thinning flakes (see Table 7);

4. relatively large and thick flakes in both flake categories (see Appendix E);

5. very low frequencies of flake tools and whole or fragmentary finished bifaces.

These sites are very difficult to sample in the context of a preliminary field survey. There are not only large quantities of debitage present but it is also difficult to reliably distinguish some chunks and flakes from the unmodified residual quartz which is also present in quantity on these sites. The lack of chunks in the sample from 38YK24C probably reflects our failure to distinguish this class in the field. Therefore, only a few preliminary observations and hypotheses about aboriginal quartz procurement will be offered at this time.

These sites are in general consistent with our expectations for specialized quarry/workshop sites based on Holmes' (1919) classic descriptions of such sites. However, most of these are fairly small and probably represent a relatively limited number of visits. No evidence of digging of pits into the soil to obtain quartz was observed but such evidence would be readily obscured by millenia of erosion and humus accumulation or by historic cultivation. One of these sites, 38CS82, probably represents a single episode involving the reduction of a few pieces of quartz. The rejected biface blanks that are present are usually much cruder than many of the blanks illustrated by Holmes and in other reports on quarry/workshops. This may reflect consistent exportation of blanks in very early stages of manufacture. This also suggests that excess weight at time of export was not considered undesirable and that the blanks were being exported only a few at a time and for only short distances.

Judging from the I-77 site sample and other evidence in the corridor area, quarry/workshop sites such as these are extremely numerous in this interriverine zone. Quartz in the Piedmont then, would probably approach Gould's (1974) definition of a "non-quarried" lithic raw material; that is, one that is extremely widespread in the environment and which was extracted and used on an <u>ad hoc</u> basis whenever stone was required for manufacture of a tool element in the context of either extractive or maintenance tasks.

FIGURE 19: A view of quartz and quartz debitage in a logging road at 38CS66.

No intensive debitage analysis has yet been attempted but the major reduction strategy seems to have been selection of tabular chunks of quartz of the appropriate size and shape for the desired tool and reducing it bifacially. Some large quartz flakes are found but we have yet observed no evidence at these sites of intentional production of large flakes and their subsequent use as tool blanks. That no such evidence has been observed is somewhat curious. When viewed from the side, many quartz Morrow Mountain and Guilford points from the South Carolina Piedmont exhibit a curve toward one face, strongly suggesting that they were made on flakes.

There is no firm association of temporally-diagnostic tools with these quarries. The kinds of points found in the general localities of these sites, however, suggest that they date to the Archaic, perhaps predominantly to the Middle and Late Archaic.

Lithic Raw Material Use Through Time

The major source of information on patterns of lithic resource utilization through time in the corridor area is the raw material of temporally-diagnostic points in our samples. These data are presented in Appendix D. They indicate that both quartz and Carolina slate were used throughout the Archaic. An end-scraper fragment of light grey chert from 38FA116 suggests Early Archaic utilization of Ridge and Valley Province chert. The single biface of argillite from the survey was a Savannah River point base from 38CS75.

Site 38CS92 appears to have an Archaic as well as a Mississippian component. Unweathered Carolina slate debitage at this site is probably attributable to the Mississippian occupation. The single flake of translucent black (Ridge and Valley Province?) chert from 38CS92 is consistent with the association of this material with late prehistoric and protohistoric occupations further west in the South Carolina Piedmont.

No temporally-diagnostic artifacts were made of the material we are calling "tuffaceous." The time of the use of this material remains obscure.

A cross-tabulation of raw materials with point types from this same inter-riverine zone is presented by Kelly (1972, Table 43). The I-77 data are basically consistent with this much larger data set, given the tentative correlation of Kelly's and our raw material categories earlier in this section.

Analysis of Raw Materials and Biface Thinning Flake Attributes

Understanding the technological properties and differential use patterns of various lithic raw materials is crucial to understanding the functioning of different raw materials in past cultural systems. Importation of a certain raw material from source areas 50 or 100 miles away might reflect demand for a technologically superior raw material. On the other hand, exchange can sometimes function primarily as a mechanism for promoting intergroup solidarity and cooperation. And, as Gould (1974) points out, there may be at times ideological reasons for selecting raw materials which are not the most appropriate from a technological perspective.

As noted in the preceeding section, there is evidence of at least some use of Carolina slate throughout the Archaic. It was noted during the survey that specimens of Carolina slate we were collecting consisted almost entirely of biface thinning flakes and a very few biface fragments. The lack of any apparent manufacturing debris in our site samples suggested that primarily use and resharpening of bifaces of Carolina slate, rather than their manufacture, took place in the corridor area. And the seeming paucity of biface fragments of this material suggests that upon breakage of a tool, the fragments tended to be not discarded but curated (cf. Binford 1973: 242) with the intention of recycling them.

It remained for us to construct a model which would allow us to test the hypothesis that an effort was made to minimize the waste of an "expensive" raw material, one which had to be imported from a considerable distance. As Goodyear (personal communication) has suggested, the technique of resharpening Dalton Points in northeast Arkansas minimized the reduction of flake width per episode of resharpening, thereby extending the uselife of the tool. Most of the bifaces from the I-77 survey seem to have been, unlike most southeastern Dalton points, resharpened bifacially. One way to minimize the reduction of mass during bifacial resharpening while maintaining a given blade edge morphology and effective tool function, would be to detach long, thin flakes which would extend to the center of the biface. Detachment of shorter flakes would result in a higher blade edge angle; detachment of thicker flakes would more rapidly waste the mass of the piece. This principle should also be applicable to some degree in later stages of biface manufacture as well as resharpening. If a greater effort was made in this way to minimize the waste of some kinds of non-local vs. locally-available stone in biface manufacture and resharpening, this should be reflected archeologically by a significantly greater mean length/width ratio in the samples of non-local stone.

Accordingly, the length/thickness ratio was calculated for each flake for which the relevant attributes could be measured. The mean and standard deviation of this variable were then calculated for the biface thinning flakes in each raw material category. It seemed probable that the length/thickness ratio would be the best measure of intentional minimization of mass reduction in biface manufacture and resharpening since it, unlike weight, would not be a function of manufacturing stage. Nonetheless, estimates of the parameters of the latter variable, thinning flake weight, were also calculated. These calculations were accomplished with the use of the Means Procedure of the Statistical Analysis System (SAS), a computer program on file at University of South Carolina Computer Services. These statistics for both variables are presented in Table 20.

It will be noted from Table 20 that the biface thinning flakes of Carolina slate averaged proportionally almost twice as long as the thinning flakes of quartz. Given the associated sample standard deviations, this difference was found to be significant at the ($t = 7.074$, $df = 230$) .005 level using a small sample method for testing the difference of two means (Hoel 1966: 177). The mean of the length/thickness ratios of the other raw materials were also basically consistent with the above model; chert as an exotic, and tuffaceous as a local, raw material. The small sample sizes, however, preclude any reliable evaluation of the significance of these differences.

TABLE 20.

ANALYSIS OF THE LENGTH/THICKNESS RATIOS AND WEIGHTS FOR BIFACE THINNING FLAKES IN DIFFERENT RAW MATERIAL CATEGORIES IN THE I-77 COLLECTIONS

Raw Material	length/thickness ratio			weight (g)		
	n[1]	$\bar{x}$	s.d.	n	$\bar{x}$	s.d.
Quartz	216	3.849	1.184	417	1.973	3.117
Carolina slate	16	6.256	2.518	54	1.154	1.441
Tuffaceous	8	3.833	1.120	18	4.744	3.796
Chert	10	4.492	1.502	15	0.873	0.789
Argillite	1	4.167	0.0	5	1.660	1.911

[1]This refers to the number of observations; many flakes were broken and not all attributes could be measured.

The means of the weights of thinning flakes of different raw material categories are also basically consistent with the model. The patterns are, however, less clear-cut. This probably not only reflects the partial dependency of raw weight upon manufacturing stage and size of the tool, but also the use of broken as well as whole flakes in these calculations; hence, the extremely large standard deviations for this variable.

Though these data are consistent with the model outlined above, it should be noted that at least two alternative explanations of this pattern come readily to mind. First, it might be argued that the greater length of the Carolina slate thinning flakes reflects not more care in manufacture but the more isotropic nature of the material, its technological advantages as a raw material. This is quite likely. These two cultural variables, (1) minimization of the waste of a nonlocal raw material, and (2) importation of a technologically superior raw material are, however, almost certainly interdependent. The advantages of a raw material which was more easily controlled, had a lower failure rate during knapping, and a longer uselife per tool might create the demand for the importation of such a material from a considerable distance.

The other alternative is that the two sets of flakes, of quartz and Carolina slate, do not represent wholly comparable sets of past behaviors. If the Carolina slate thinning flakes in the samples are predominately a by-product of the

modification of large, broad-bladed bifaces such as Savannah River points, then this might account for their larger mean length/thickness ratio.

Evaluating these alternatives, however, will require larger and more controlled sets of data than could be collected by this preliminary field study.

HISTORICAL ARCHEOLOGICAL RESOURCES IN THE I-77 CORRIDOR

Two of the research designs operationalized by the I-77 survey entailed investigation of historical archeological resources. We were interested in investigating early historic settlement patterns in the inter-riverine Piedmont of South Carolina and in exploring the archeological potential of evidence of historical agricultural land use in the region. An arbitrary cutoff date of 1900 was chosen for the upper limit of the early historic period. Archeological investigation was, accordingly, confined to remains which appeared to date to 1900 or earlier.

We were somewhat at a loss to establish a framework for evaluating the significance of individual historic sites in a region occupied by persons of European and African descent for over 200 years. For this reason, we have adopted a rather descriptive approach to these data in the hope that a minimal description of temporal and functional varability in the archeological residue of this 200 year occupation will form some basis for establishing the research potential of these resources.

It should be emphasized that the same vegetational and site visibility constraints operating on prehistoric remains also operated on the observability of historic archeological resources. Therefore, our sample of historic sites and evidence of some kinds of agricultural modifications of the landscape probably represent only a fraction of the resources actually present in the areas intensively surveyed.

Early Historic Archeological Sites in the I-77 Corridor

A total of 15 early historic components was recorded in the I-77 corridor. These components are summarized in Table 21 and their relationship to the I-77 corridor and our sampling design is summarized in Table 2.

Estimating the Temporal Range of Historical Components

Time did not permit an exhaustive search of archival sources which might have served to identify specific historical archeological sites in the corridor area and indicate their temporal range. Robert Mills' 1826 *Atlas of South Carolina* (1965) was, however, consulted and one site, 38FA113, seems to be indicated in this source.

Temporal placement of most sites was based upon artifact analysis. The historic artifact samples were chiefly grab vs. controlled samples and the numbers of artifacts were, in most cases, quite small. Therefore, no attempt was made to quantitatively analyze these samples or use South's (1972) mean ceramic date formula. Instead, the presence or absence of the more well-known temporally-diagnostic marker types was used to roughly bracket the occupation span of sites. Samples containing sherds of pearlware (Noël Hume 1970: 129-133) were attributable to early nineteenth century occupations, while samples containing only white earthenware or ironstone sherds (South 1974: 247-248) were attributable to later nineteenth century occupations. Samples containing sherds of glass with a characteristic purple tint resulting from photochemical

TABLE 21.

DEFINITION AND TEMPORAL PLACEMENT OF HISTORIC COMPONENTS RECORDED BY THE I-77 SURVEY

Site No.	Definition	Estimated dates
38FA99	House place	Late 19th c.-early 20th c.
38FA106	Scatter of historic artifacts	Late 19th c.
38FA107B	Scatter of historic artifacts	Early 19th c.
38FA108	House place and dump area	Early-mid 19th c.
38FA109	Scatter of historic artifacts	Early-mid 19th c.
38FA113	House place	Early 19th (?)-early 20th c.
38FA115	Scatter of historic artifacts	Early 19th c.
38CS70	Historic cemetery	Late 19th c.
38CS78	Rock ford on an early road	19th c.
38CS84	Scatter of historic artifacts	Early 19th c.
38CS89	House place	Late 18th c., early 19th c.(?)
38CS92	Scatter of historic artifacts	Early 19th c.
38CS94	Scatter of historic artifacts	Early-mid 19th c.
38YK25	Scatter of historic artifacts	Late 19th c.-early 20th c.
38YK38	House place with standing structures	Late 19th c.-Mid 20th c.

changes in manganese oxide impurities exposed to sunlight (Hunt 1959) were attributed to late nineteenth early twentieth century occupations.

Kinds of Historic Archeological Site in the I-77 Corridor

Historic artifact scatters. Most of the historic sites recorded in the I-77 corridor consisted of scatters of early historic artifacts, chiefly ceramics and glass. These scatters were, in most cases, found in logging roads and presumably represent dump areas associated with unrecognized house places. As will be noted from Table 21, these scatters were mostly attributable to early nineteenth century occupations.

House places. Five of the sites mapped by the survey were house places. One of these, 38YK38, was still standing and had been occupied in the last few years but ceramics and glass exposed in the yard included materials dating prior to 1900.

No temporally-diagnostic artifacts were recovered from site 38CS89 but the large fieldstone and clay fireplace (Fig. 20) suggest that the construction of the house occurred before the widespread use of cast-iron stoves in this region. This site is about a mile from the site of a mid-eighteenth century Scotch-Irish settlement and could conceivably date to that century. The presence of cast-iron stove parts, observed by the writers, suggests that the occupation span of the structure extends past the mid-nineteenth century.

The occupation span of a third ruined house place, 38FA113, seems to extend into the twentieth century but the location of this site appears to correspond to that of the "W. Lewis" place indicated on the map of Fairfield District in Mills' *Atlas* (1965).

A fourth house place, 38FA108, was discovered in sampling unit 12-V when scattered early to mid-nineteenth century artifacts were found in a newly cut logging road at the foot of a low rise in the bottom of a ravine. Subsequent investigation of the top of this rise revealed an overgrown, almost completely obscured pile of bricks representing a collapsed chimney.

The fifth house place, 38FA99, is a group of foundation stones and a brick chimney pile in a heavily wooded portion of Unit 6-II. Artifacts recovered by scraping back the leaves and pine straw suggest that this site was occupied around 1900.

An early rock ford. Site 38CS78 is a rock ford built across the South Fork of Fishing Creek. Mr. Fred Hambright of Lando, who is knowledgeable about local history, informed us that the old "sunken road" associated with this ford is part of the "Old Columbia to Charlotte Road." This route is not indicated in Mills' *Atlas* (1965) or any other nineteenth century map examined by the writers (J. H. Colton and Co. 1855; Stoeber, et al. 1873; Wilson 1822) but is nonetheless real and was observed by us to approximate the I-77 route in many places in both Chester and Fairfield Counties. This route can indeed be considered a nineteenth century predecessor of projected Interstate 77.

FIGURE 20: An early nineteenth century houseplace in the southwest corner of Unit 27-II (38CS89).

38CS70, a late nineteenth century cemetery. A reputed "old Indian cemetery" in the I-77 right-of-way near Stover was brought to the attention of the South Carolina Highway Department by a local resident. The writers were notified and visited the site in October 1975. In a heavily-wooded area we observed an undetermined number of small sunken depressions, some of which were marked by large, unmodified field stones.

In May 1976, as this report was being completed, the writers; Jacqueline Carter of the Institute; and Dr. Ted Rathbun, a physical anthropologist in the Anthropology Department at the University of South Carolina were on hand as observers when this cemetery was removed by the Dantzler-Baker Funeral Home of Great Falls under contract with the Highway Department. Bone preservation in the acidic red clay subsoil was practically nil; human bones were found in only one grave. In another grave, careful outlining and excavation of the grave pit resulted in the recovery of two wire nails from the floor of the pit. These were the sole artifactual materials recovered from the site and indicated that this particular grave, at least, dated no earlier than the late nineteenth century. On the basis of the extremely limited available data, we are confident that this site does not represent an Indian cemetery, but rather a late nineteenth century cemetery, perhaps used by poor blacks or whites of the area. Cursory examination of the records in the Chester County Courthouse by Carter, however, revealed no information on this cemetery.

Discussion of Historic Site Data

Most of the historic sites recorded by the I-77 survey appeared to date to the early nineteenth century, suggesting that the most intensive occupation of the corridor area was during this time. We may not, however, have recognized and recorded all late nineteenth century components encountered by the survey. We were somewhat disappointed to find no recognizable evidence of eighteenth century occupation since historical sources document English and Scotch-Irish settlement in the region beginning in the mid-eighteenth century. The frequency with which sherds of pearlware and other early nineteenth century types were found is presumably an archeological manifestation of the influx of population associated with the boom of labor-intensive cotton monoculture in the Piedmont in the first few decades after the invention of the cotton gin in 1793. These data and the data on agricultural modifications of the landscape, discussed in the following section, reflect the extremely intensive agricultural use of the region. That this use was ecologically and, in the long run economically, disastrous is attested to by the widespread evidence of severe gullying and sheet erosion--and by the fact that this once populous and productive region is now predominantly wooded and sparsely inhabited.

Agricultural Modifications

As a result of farming, the landscape is sometimes modified in ways that are detectable even after the land is again covered by forests. Occurrences of several types of modifications were recorded during the survey to see if this type of data might add to our knowledge of agricultural practices in the South Carolina Piedmont during the historic period.

Lack of adequate erosion controls and the continued use of clean tillage throughout most of the historic period were largely responsible for ecologically wasteful patterns of land use in the South Carolina Piedmont (Hall 1940; Trimble 1972). Fields were cultivated for relatively short periods before becoming depleted or eroded, at which time they were abandoned for new fields. The result is that virtually all of the original Piedmont forests were cut and cleared for farming at some time during the historic period (Rowalt 1937).

During this survey only one area (Sampling Unit 41-IV) was encountered in which the forest was in an oak-hickory climax stage, similar to descriptions of Piedmont forests at the time of the first explorers and surveyors. The rest of the highway corridor was in various stages of forest succession after having once been cleared. Even this oak-hickory forest on the north side of Fishing Creek is probably not part of the original Piedmont forest. Mills' (1965) *Atlas of South Carolina* shows a house in that area during the early 1800's; so that the forest there may have been cleared during or before that time, in which case there has been time for another oak-hickory climax stage to develop. Although over 80% of the land examined during the survey is now wooded, probably all of this land has been cleared at some time during the historic period. Most of this land was probably cleared for cultivation in order to replace depleted and eroded fields.

Categories of Observable Agricultural Modifications

Various agricultural practices in the South Carolina Piedmont have left modifications which are noticeable even after reforestation. The following categories of agricultural modification were recorded during the survey:

Rock piles are often found on the edge of old fields and consist of rocks removed from the field during clearing and plowing. Presumably this was done throughout the period of historical agricultural activity in the Piedmont.

Hillside ditches were used to control erosion in fields on hillsides by carrying off excess rainwater to prevent it from creating gullies. Specifications as to size, length, grade, and spacing varied widely (Hall 1949). Some ditches were dug so that they ran perpendicularly to the slope, carrying water off to the sides of the field where it might empty into ditches running parallel to the slope. In other cases ditches were dug to receive excess water from the furrows in a field with contour plowing, in which case the ditch might run parallel or diagonally according to the degree of the slope. The earliest hillside ditches in South Carolina date from the 1830's. These ditches can sometimes still be seen even on wooded hillsides.

Terraces were built on Piedmont hillsides for erosion control and the development of a level surface for cultivation (Hall 1949). Their use in South Carolina dates from the late 1860's to the present. Unfortunately some occurrences of these were not recorded. During the survey we attempted to distinguish what we considered earlier terrace systems characterized by high, closely spaced terraces on steep slopes from widely-spaced, low terraces of gentle slopes. We attributed the latter to the twentieth century and recorded only the former. We are now, however, uncertain as to the validity of this distinction as it does not seem to be made in any of the literature on early agriculture in the Piedmont.

Extensive gullying in the Piedmont is the result of poor erosion control during cultivation. Gullying was not prevalent in the Piedmont prior to the period of historic settlement and cultivation (Rowalt 1937); thus, the presence of extensive gullying would indicate that an area had been under cultivation. Large gullies up to about 30 feet deep were recorded during the survey.

Predominantly pine woods are the successional stage which is reached when a field or cleared area has been abandoned for approximately 30-40 years. The woods remain predominantly pine for another 50 years or so (Odum 1971: 261). Areas of recently planted pines in rows were distinguished from areas that seemed to represent old field succession.

Discussion

The presence or absence of each of these agricultural modifications was recorded for each sampling unit and stream crossing. These data are presented in Appendix H. While the presence of these modifications in a survey unit would be indicative of past agricultural activity in the unit, there are several problems with these data that prevent us from making precise statements about the amount of past agricultural activity in the area of the highway corridor as a whole.

1. While the presence of any of the first four agricultural modifications would indicate historic agricultural activity, areas of predominantly pine alone do not necessarily indicate such activity. These woods could be the result of reforestation after the land was cleared for lumber.

2. On the other hand, the absence of all of these modifications does not mean that the land has not been cultivated at some time in the historic past. The absence of rock piles could be due to few rocks in a field, or the rocks could have been scattered around rather than put in a pile. Erosion control practices, such as contour plowing, which would not be noticeable after reforestation, could have been used instead of hillside ditches or terraces, in which case extensive gullying may not have occurred. Sheet erosion also could deplete the soil so that the field was abandoned and allowed to reforest itself before extensive gullying took place. The occurrence of sheet erosion would not be noticeable after reforestation.

3. Logging activity may have destroyed some of these modifications.

4. As with prehistoric sites, the increased flooding, alluviation, and swamping of stream valleys during the historic period could be covering evidence of earlier historic agricultural activity in the bottomlands (Hall 1940; Rowalt 1937; Trimble 1972).

Summary

To our knowledge, these data categories of agricultural modification had not been systematically observed and recorded on any previous archeological survey. As with other types of archeological evidence, the collection of these data is subject to limitations such as observer biases, vegetational biases (i.e. poor visibility) and, destruction of evidence by either natural or cultural causes. This is particularly true of rock piles, hillside ditches, and even terraces, which could have been overlooked in some instances due to the poor visibility over much of the survey area. Due to their size we doubt that any areas of extensive gullying or predominantly pine woods were not observ-recorded.

Although we were able to collect these data categories, at present we feel that their usefulness to a survey of this type is limited. Various local agricultural journals and other types of local records which were prevalent throughout much of the historic period would probably provide better information about the agricultural practices of an area. These data categories would probably be most useful in studying specific historic sites and providing us with information about the behavior of the former inhabitants. The present survey has established that these categories of historical archeological data are present on the landscape in the corridor area and readily observable during archeological survey.

PROJECT IMPACTS AND SIGNIFICANCE OF RESOURCES

Estimating Project Impacts

Direct Impacts

The 41 prehistoric components and 15 historic components recorded in the I-77 corridor are assuredly only a fraction of the total resource base in the direct impact zone of the I-77 route. Extrapolating from the sampling unit data, 19 prehistoric and 5 historic components, we arrive at a minimum estimate of 95 prehistoric sites and 25 historic sites in the I-77 corridor. Because of the visibility problems, these figures could be conservatively doubled for an estimate that roughly 200 prehistoric components and 50 historic components would be destroyed by the planned construction on Interstate 77.

Indirect Impacts

The indirect impacts of the construction of Interstate 77, while not our primary concern in this report, should be taken into account in our consideration of the significance of the archeological resources in the direct impact zone. Indirect impacts of the construction of I-77 which may be anticipated would include establishment of subdivisions, gas stations, stores, and factories in a portion of the South Carolina Piedmont which is now, for the most part, remote from major highways and isolated. This inevitable development along the corridor will have much greater impacts on the archeological resource base than will the construction of I-77 itself. The net effect will be severe damage to the heart of the archeological resource base in this inter-riverine zone between the Broad and Catawba-Wateree rivers. It is also important to bear in mind that most of this land modification activity will be privately financed and not under the jurisdiction of NEPA, Moss-Bennett, or other federal legislation intended to conserve cultural resources.

Some Resources in the I-77 Corridor Already Destroyed by Construction

By the time the present archeological survey was authorized by the South Carolina Highway Department in August 1975, portions of the Blythewood to Rock Hill route were already under construction. These portions are located between the Blythewood interchange and South Carolina 34 in Richland and Fairfield Counties, a distance of about 7 miles, and between the York-Chester County line and Rock Hill, also a distance of about 7 miles. In early spring 1976, shortly after the completion of the fieldwork, another 5 miles of the projected route, from the York-Chester County line to South Carolina 9, was let for bids. The archeological resources in these 19 miles of corridor, included in the area recommended for further archeological study by Ryan in 1971, have already been destroyed by the construction of Interstate 77.

Defining Significance

Under relevant Federal legislation and guidelines (Scovill, Gordon and Anderson 1972) the significance of cultural resources in project impact areas is to be evaluated from several different standpoints including historical, educational, psychological, and scientific. Often, only the scientific significance is relevant to the evaluation of specific archeological resources, especially in the case of prehistoric remains.

In recent years, a framework for assessing scientific significance of archeological resources has evolved in which resources acquire significance only as they relate to specific research questions in substantive, technical, methodological, and theoretical contexts (cf. Scovill, Gordon and Anderson 1972; House and Schiffer 1975; Price, et al. 1975: 267-272). This discussion of the significance of the archeological resources in the I-77 corridor will, accordingly be based on general problem domains (cf. Canouts n.d.) which have been laid out generally in the Highway Research Design (Goodyear 1975a) and developed more specifically in this report. In this framework, the resources acquire significance not in terms of hypotheses which could be conclusively tested by investigation of one or a few sites but rather in terms of standing regional research designs in which confirmation of hypotheses would be accomplished in the context of the investigation of many sites in many diverse contract projects over many years. As Goodyear (1975a: 13) has pointed out, the use of regional research designs allows contract research to take place within a de facto multistage framework (cf. Redman 1973) in which data from an EIS stage investigation is used to guide research for mitigation stage work on that project, and data from earlier contract projects in a region are used to refine hypotheses and identify variables for later contract projects. The crucial thing here is the formulation of a standing research design into which specific contract projects, as they arise, can be integrated. Such research designs are not static but change as old questions are answered, new questions arise, and new methods and techniques become available to archeology. Only this approach holds the potential for meaningful research results over the long haul and, correspondingly, an adequate return on the taxpayers' money committed to contract research. At this time in the South Carolina Piedmont, such standing research designs are but in their embryonic stage, consisting of only problem domains being explored in this report, the ongoing analysis of the data from the Laurens-Anderson survey and other current research in the region.

Within the framework outlined above, the archeological resources in the I-77 corridor will be viewed from two standpoints: (1) the potential of these resources to yield information about past human lifeways and culture change, and (2) the research potential of these particular resources relative to those outside the impact zones of Interstate 77. The relevance of these resources and problem domains to technical and methodological issues, present concerns in eastern North American prehistory and early history, and general questions in the social sciences as a whole, will be developed in a preliminary way here. This discussion of significance then will form the basis for the specific recommendations for mitigation presented later.

Significance in Terms of Substantive Questions of Regional and North American Prehistory

Culture-history. The I-77 survey yielded no evidence of deep, stratified sites which would be useful for refining the prehistoric cultural sequence established by Coe (1964) and others. More precise control over artifact variability through time in this region will probably be derived primarily from future excavations at alluvially stratified sites in riverine zones. Data from inter-riverine zones could, however, be useful in cultural-historical studies by better defining functional and technological variability within the assemblages of a particular time period, thus allowing for more ready recognition and interpretation of "stylistic" changes in artifact morphology through time.

Activity analysis. The present research has demonstrated the existence of patterned regularities in the artifact content of prehistoric sites in the corridor area. This analysis also indicated the probability that these regularities in some cases can be correlated with inferred sets of past cultural behaviors, i.e., cooking with heated rocks, biface tool manufacture, etc. There is reason to believe that analysis of larger and more controlled samples of artifactual materials from these sites would yield information on many aspects of the function of these sites within prehistoric settlement systems.

Lithic resource procurement. A preliminary reconstruction of prehistoric strategies of procurement and utilization of vein quartz seems an especially feasible goal for additional research in the I-77 corridor. As lithic technology is articulated with almost all other aspects of human behavior in non-metal using societies, this preliminary lithic analysis would form a foundation for exploring many other questions. Gould (1974) has proposed a series of tentative "cross-cultural principles" for describing the differential utilization of different raw materials in low energy cultural systems. These principles could probably be used in future investigation of prehistoric human behavior in the corridor area.

Archaic hunting strategies. The hypothesis has been advanced that Archaic hunting and butchering loci associated with white-tailed deer procurement are represented by the numerous low-density artifact scatters in what we assume to have been upland hardwood zones. This hypothesis would be further tested by excavation of some of these sites, potentially yielding information on both technology and organization of white-tailed deer procurement systems during the Archaic.

Archaic settlement patterns. The tentative distinction made in this report between Archaic habitation sites and other functional types of sites in the I-77 corridor is probably testable by excavation at some of these sites. Confirmation that Archaic habitation sites actually exist in the inter-riverine zone would be of great importance in defining the total seasonal round of Archaic societies and revealing the overall strategies of adaptation of Archaic peoples to their Piedmont environment. More precise temporal control over components would, in this context, yield a sequence of perhaps diverse settlement patterns, a prerequisite for formulating evolutionary models of culture change during the Archaic in the region.

Mississippian settlement patterns. A single Mississippian component, 38CS92, was located in the I-77 corridor. A high human population density seems to have existed in nearby portions of the Catawba-Wateree and Broad River valleys but the present survey and Kelly's (1972) survey indicate relatively little utilization of this inter-riverine zone. Further information on the nature of rare Mississippian occupations in the inter-riverine zone, such as that at 38CS92, would contribute to an understanding of settlement variability and overall culture ecology of South Appalachian Mississippian in South Carolina. Alternative hypotheses to be tested at 38CS92 might be, (1) this is the location of a year round, whole-kin, habitation with permanent structures, burials, and fields adjacent; or (2) this is the location of a fall/winter hunting camp such as those documented for the protohistoric Creek.

Reconstruction of prehistoric subsistence and culture ecology. Two general categories of data are directly pertinent to reconstruction of prehistoric subsistence and culture ecology: (1) direct subsistence remains such as animal bones, charred plant remains and economic pollen, and (2) the location of sites with respect to the location of hypothetical target resources in the environment. Though we have not yet actually attempted to recover any of the first category of data from sites in the corridor, the apparent shallowness of the sites, the effects of erosion, and prevailing acidic soil conditions make it unlikely that significant quantities of direct subsistence data are preserved. The most likely direct subsistence data category to be recovered would be charred plant remains which might be present if undisturbed features are located at any of the sites.

Reconstruction of subsistence activities in the inter-riverine zone will probably have to rely on analysis of the location of functionally-distinct types of sites in the environment. This strategy has been attempted in this report. As noted above, the correlation of the artifactual, site attribute, and environmental variables in the I-77 data set yielded no firm conclusions about prehistoric settlement/subsistence patterns though few tentative techno-environmental patterns did emerge. We feel that this approach to inference of subsistence strategies is, nonetheless, promising and should be attempted in the future with a larger number of sites and a more diverse environment.

Adaptational change during the Archaic in the Southeast. The 7000 year-long Archaic period encompasses significant environmental change and, apparently, adaptational change. As suggested earlier in this discussion of substantive significance, it may be ultimately possible to define a sequence of subsistence/settlement systems for the Archaic and begin to model the evolutionary mechanisms for the changes from one system to the next. The possible relevance of I-77 corridor Archaic sites to a pan-Southeastern consideration of the shift from Early to Middle Archaic has been discussed.

A particularly interesting Southeast-wide question which might be explored by further work in the Piedmont is the apparent divergence in Middle Archaic adaptations from region to region within the Southeast. A divergence in hafted biface morphology has been noted by Caldwell (1958: 7) and others, and increasing evidence is suggesting divergence in adaptation (or in some cases nonadaptation)

from region to region in the Southeast. In the Arkansas Ozarks, the earliest intensive utilization of bluff shelters seems to have been in the Middle Archaic while in the nearby Mississippi Valley, the lack of expected forms of hafted bifaces suggests a depopulation of the area lasting for thousands of years (Morse 1969). In the Piedmont of Georgia and South Carolina, on the other hand, the inter-riverine zones seem to have seen their heaviest utilization of prehistoric times during the Middle Archaic. Explanation of these interregional differences in Middle Archaic adaptations would be of major importance to Southeastern U.S. prehistory.

Significance in Terms of Anthropological Theory

Plog (1974: 11) has argued that the major importance of archeological research to social science as a whole is that the archeological record is a unique laboratory in which to study long-term change. Testing the hypothesis, that the shift from, in Cleland's (1976) terminology, a more "focal" Early Archaic economic pattern to a more "diffuse" Middle and Late Archaic pattern was a development of a more labor-intensive economic strategy in response to increasing population density in the region would be relevant not only to Southeastern prehistory but also to prehistoric archeology world-wide and human ecology in general. This would be true of any regionally-oriented substantive problem domain in which evolutionary hypotheses were operationalized (cf. Plog 1974; Raab 1976). Investigation of prehistoric sites in the I-77 corridor could begin to lay the basis for identifying archeological variables for studying the interaction of environment, technology, organization, and population over thousands of years in the Piedmont. Such a long term study would be relevant to highly significant models in economics and population dynamics formulated by Boserup (1965), Birdsell (1968), Binford (1968), and Hayden (1975).

One of the more exciting current problem domains in ethnology and archeology worldwide is the study of the culture ecology of hunting and gathering adaptations, an "evolutionary stage" (cf. Service 1962: 8-10) which represents most of the ca. 2,000,000 years of human existence on earth. It has been observed that studies of hunting and gathering groups in the ethnographic present may be of limited use in identifying modalities in hunting-gathering adaptations in the prehistoric past since the ethnographically-known groups are in "marginal" environments (i.e., Eskimo, Bushman, Australian aborigine), hunter-gatherers having long since been replaced by more complex, higher energy adaptations in productive temperate zone environments (cf. Schiffer 1975a: 103-104; Morse 1975c). The Piedmont province, in contrast to the Arctic Ocean Coastal Plain or Kalahari or Western Australian deserts, can probably be considered a productive environment. In the Piedmont province, the major ecological zones; i.e., riverine/inter-riverine, bottomland forest/upland forest; are relatively clear cut and represent environment types found from Virginia to Alabama. Increasing control of paleo-environmental variables and techno-environmental patterns in the archeological record of Archaic occupations in the Piedmont could, in the context of regionally-oriented studies such as those outlined in the preceeding section, eventually produce research results of importance to our understanding of hunting-gathering adaptations worldwide.

Refinement of survey methodology

As has been noted by Lipe (1974) and others, one of the more important needs in cultural resource management studies in general is the development of survey methodologies which will not simply locate sites for later excavation but will themselves yield useful information about the archeological record of past cultural systems. Survey data are not only much less expensive to gather than excavated data, but are basic to a regional framework for research. Investigation of the problem domains outlined in the preceeding sections must entail considerable refinement of our repertoire of survey techniques and integration of new and old techniques into a methodology that is capable of generating the data required by the questions we are beginning to ask.

A preliminary attempt to evaluate the I-77 survey methods has been made in this report. A more comprehensive evaluation of these methods, however, will require excavated data from some of these sites. A number of descriptions of aspects of the archeological context of prehistoric occupations at specific sites has been made in this report, based on surface data gathered and observed in the survey. The reliability of these descriptions would be best evaluated by gathering larger, more controlled sets of data from these or functionally-similar sites, and comparing them with the surface data in terms of components represented, proportional frequencies of various artifact classes present, and parameters of metric variables such as dimensions of thinning flakes. This kind of approach would result in not only additional substantive information on prehistoric occupations, but might eventually yield a set of correlates between the surface and subsurface of sites. For instance, we might find that pits, postholes, and other subsurface features are present almost exclusively at sites with quantities of fire-cracked rock. The survey data from EIS stage investigations in the I-77 corridor have been rather intensively analyzed here and excavation at some of these sites in the corridor would provide an excellent opportunity to begin learning how to better collect and evaluate archeological survey data in the South Carolina Piedmont.

Significance of Historic Sites in the I-77 Corridor

The review of regional history undertaken by the writers revealed no evidence that any of the historic sites in the corridor were connected with especially significant historical events. It is apparent then, that the historic sites in the corridor, like the prehistoric sites, must be evaluated chiefly from a scientific viewpoint. The potential of historic archeological remains for reconstruction of past lifeways and investigation of cultural processes in the historic past is only now becoming widely appreciated (cf. South 1976) and there is yet relatively little precedent for evaluating the scientific significance of historic sites.

The only regional model yet formulated for use in investigation of historical archeological remains in South Carolina is Lewis' (1976) "frontier model" of Colonial society in the South Carolina backcountry in relation to the town of Camden. Testing all of the archeological implications of this model would require data from Colonial period sites in the region surrounding Camden, including the I-77 corridor area. No archeological phenomena encountered in the I-77 corridor, however, could be attributed to eighteenth century occupation.

Archeological investigation of nineteenth century occupation has been shown to be a fruitful avenue for investigation of human behavior in the even more recent past. In the South Carolina Piedmont, Carrillo (Wilkins, Hunter, and Carrillo 1975; Carrillo 1976) has recently undertaken the archeological study of refuse deposits associated with a late eighteenth century Scotch-Irish house place and an early nineteenth century German house place. In these studies, Carrillo demonstrates that refuse disposal practices over prolonged periods of time can be in part reconstructed by spatial analysis of the archeological record in areas surrounding houses. Carrillo (n.d.) has suggested, based on these single site studies, that ethnic or socio-cultural variability in refuse disposal practices may thereby be discernable archeologically. This ambitious problem domain is of far-reaching significance to social science research because of its implications for the role of "culture" (in this sense, shared systems of information with temporal continuity) vs. adaptation to specific environments with specific technologies in determining various aspects of human behavior.

Investigation of early nineteenth century sites in the I-77 corridor might be useful in expanding the data base for this problem domain, especially if the identity of the past inhabitants could be established from documentary sources. An additional dimension to such a study of socio-cultural variability in behavior might be the study of agricultural modifications associated with house places. The present survey has demonstrated that modifications of the landscape associated with early historic farming practices are in many cases readily observable in the present. Much information on traditional agricultural technologies and the spatial structure of farmsteads in England has already been assembled in the literature of historical geography (cf. Hoskins 1970), forming a comparative data base for analysis of continuity and change in these phenomena.

Archeological Resources in the I-77 Corridor and the Regional Resource Base

A factor in assessing the significance of archeological resources in the I-77 corridor is comparison of the resources in the corridor with those in adjacent, nonimpacted areas. If it would be demonstrated that the research potential of sites in the corrridor was duplicated by that of quite comparable sites outside the corridor, then the significance of the resources in the corridor would be correspondingly less. It might be observed, for instance, that the environment of the I-77 corridor, the inter-riverine Piedmont, is represented by thousands of square miles in South Carolina. This is in contrast to such environments as Fall Line floodplains which are very limited in area but nonetheless of key importance to human adaptation, prehistoric and historic, in the whole region.

While it probably is true that the prehistoric and historic sites in the I-77 corridor are quite similar to thousands of other sites in the region, two considerations should be borne in mind. First, though the direct impacts of the construction of I-77 upon the regional data base may be relatively minor, the indirect impacts, i.e. accelerated development in adjoining areas, certainly will constitute major damage to the regional base. Second, the I-77 survey is the first survey of its kind in the South Carolina Piedmont and, at this time, we simply do not know very much about archeological resources outside the corridor. It will be argued that since a significant research potential for the archeological resources in the I-77 corridor is indicated, the

impact of the proposed construction on these resources should be mitigated by investigation of a portion of these resources.

MITIGATION: RECOMMENDATIONS AND BUDGET PROPOSALS

Recommended Goals for Management of the I-77 Archeological Resources

Eligibility of Sites for Placement on the National Register

By virtue of their apparent scientific research potential, certain of the archeological sites located during the present survey--those recommended below for excavation--are considered eligible for placement on the National Register of Historic Places. We are not at this time, however, nominating any of these sites for placement on the Register. This decision is based on the following considerations. First, the sites have primarily a scientific value; none are known to have major historical, national, social, or psychological importance. Second, though the sites are considered to have significant scientific and anthropological value, such resources would be best used in the course of scientific study which elucidates their value to social science. Third, it is probable that any major rerouting of the proposed corridor would threaten a comparable number of similar sites.

A Minor Alteration of the Interstate 77--S.C. 200 Interchange

From observations we made in the field, it appears that site 38FA113, suspected to be the "W. H. Lewis" place indicated in Mills' *Atlas* (1965), is located in the path of one of the ramps of the projected State Highway 200 interchange. We recommend that, if possible, a minor change be made in the plans for this interchange in order to preserve this potentially significant site. If such a structural change is not feasible, we recommend that the budget for historic site mitigation, presented below, be expanded to accommodate documentary research and intensive field investigation of this site.

Intensive Field Study of a Portion of the Archeological Sites in the Corridor

Our major recommendation for mitigation of the impact of construction of I-77 is a research program involving intensive excavation and mapping of surface features at some sites in the corridor and test excavation at others. The I-77 survey and data analyses presented in this report indicate that the archeological resources in the corridor do have a significant research potential and, accordingly, an intensive field study of at least a portion of the resources is called for. This is particularly the case since 19 miles of the Blythewood to Rock Hill route are already under construction without any mitigation research having taken place. Our recommendations here are in line with the recommendation made five years ago by Thomas M. Ryan (1971) that salvage excavations be carried out in the right-of-way. These recommendations are also consistent with the cooperative agreement made in June 1975 between the Highway Department and the Institute in which it is specified that recommendations for mitigation research are an expected outcome of the present survey of the Interstate 77 corridor.

The overall goals of this program of mitigation will be outlined here. In the following sections, specific sites will be recommended for excavation; sampling strategies, and categories of relevant data will be outlined; and a budget for the proposed research will be presented.

The goals for the recommended program of mitigation for the prehistoric sites are twofold. The first goal would be to obtain more information on prehistoric utilization of the inter-riverine Piedmont. This would permit an evaluation, on the single site level (Goodyear 1975a: 19-27), of the inferences presented in the section on aboriginal utilization of the I-77 corridor. The emphasis in these excavations would be on collection of extensive data which would define sites spatially and reveal any intrasite patterning in the density and distribution of various classes of material and features. The emphasis then, would be on the horizontal structure of the site rather than on vertical stratigraphy and chronology. Information on the horizontal spatial structure of sites is directly relevant to reconstruction of the spatial structure of past behaviors at the site and defining any possible functionally-specialized areas within the site (cf. Binford, et al. 1970: 1). Second, data from such a program of excavation would be useful in evaluating the survey strategy used in the present study and in better identifying archeological variables to be observed and measured in future surveys and excavations in the Piedmont. The benefits of the achievement of both aims--in terms of our long-range efforts to understand Piedmont prehistory--would be realized as part of the cumulative results of research undertaken in conjunction with standing research designs.

Relevant to historical archeological resources, the goal of the proposed program of research would be an exploration of the archeological record of early nineteenth century occupation in the South Carolina Piedmont. Excavation at early historic house places in the corridor could yield information on various aspects of human lifeways in the region during the cotton boom ca. 150 years ago. This would allow us to better evaluate the research potential of such sites relative to regional economic anthropological studies such as Lewis' (1976) archeological study of the development of the Colonial frontier or Carrillo's (n.d.) proposed archeological study of socio-cultural variability in the early historic period. In addition to excavation and recovery of data on the distribution of artifactual materials, the proposed study would involve mapping of aboveground features at house places and agricultural modifications of the landscape.

In both cases, the level of recommended mitigation is rather minimal in proportion to the assessments of the research potential of sites made earlier. A much more intensive program of mitigation would be called for if the corridor were crossing, for instance, a Fall Line floodplain or the vicinity of a Colonial town.

Investigation of Stream Valley Sediments

One of the major requirements for constructing explanatory models for prehistoric technological, organizational, and demographic change in the Piedmont would be information on Holocene environmental change in the region. One potential source of the relevant data would be the alluvium in floodplains of major streams in the inter-riverine zones. At present, we do not know whether such data actually exist, or if they exist, the relative significance of data in one kind of floodplain versus another. It is known that deposits of late Pleistocene alluvium are present in some Piedmont stream valleys (Overstreet and Bell 1965) and that deep accumulations of historic period alluvium are widespread along Piedmont creeks and rivers. Since paleoenvironmental data are basic to our understanding Piedmont prehistory and since creek floodplains are present in the I-77 impact zone, we recommend a study of the feasibility of recovering such data from stream valley sediments in the corridor. Information of depositional processes during the eighteenth and nineteenth centuries also would be relevant to evaluating the completeness of the I-77 survey data. A recommended program of interdisciplinary investigation of stream floodplain sediments is outlined in a succeeding section and appropriate budgets are presented.

Recommendations for Investigation of Prehistoric Sites

Sites and Research Problems

In the previous discussion of prehistoric site variability, a number of tentative functional site types were distinguished. These types are: lithic quarry/workshop sites, Archaic habitation sites, a Mississippian habitation site, extraction sites, and isolated finds. We recommend that excavation take place at examples of each tentative site type (with, of course, the exception of "isolated finds") in order to test their hypothetical functions and obtain more data relevant to the nature and spatial extent of past activities at the sites.

Ideally, such excavations should take place at those sites which are most unambiguously assignable to a given type and for which we already have the most data as a basis for comparing our inferences based on survey data with those based on excavated data. This is not practical in every case since the sites that were easiest to sample from the surface were usually the most severely damaged. Site 38FA100, the most unambiguous Archaic habitation site, for instance, is now virtually destroyed by construction of the highway. If, however, our functional site typology is valid, the parameter estimates for a set of excavated samples should be more consistent and reliable than those based on surface samples; for example, excavated samples from a set of quarry/workshop sites should be more similar than surface samples from the same sites. The former estimates would be based on larger numbers and less subject to sampling error from intra-site variation in artifact distribution.

Quarry/workshop sites. We recommend intensive sampling of site 38CS66, which appears to be particularly well preserved. Relevant data categories for this site would be all chipped stone debitage, hammerstones, or finished

chipped stone tools and any evidence of features such as hearths or pits excavated into subsoil to obtain suitable pieces of quartz. Questions to be asked during excavation of this site would include:

1. At what time(s) in prehistory was this locus utilized?

2. Is this, in fact a quarry/workshop site? Are any other kinds of activities represented?

3. Were pits dug into subsoil to obtain quartz? Was the quarrying process labor-intensive or not?

4. What reduction strategy(ies) is represented? Were tabular chunks reduced bifacially? Were large preform flakes struck from cores and these reduced bifacially?

5. At what stage were the blanks or preforms exported?

Archaic habitation sites: It is particularly unfortunate that 38FA100 is virtually destroyed; investigation of a good example of an apparent Archaic habitation site in the inter-riverine Piedmont will have to wait for a future project. We recommend, instead, testing at 38CS69, a concentration of lithic debris, including probable fire-cracked rock, located on a terrace overlooking a stream. This site is known only from the excavation of a 1x1m test pit during the survey but it appears to be highly concentrated, perhaps representing habitation.

Some of our information needs relative to possible habitation sites in the inter-riverine Piedmont will undoubtedly be fulfilled by analysis of data from excavations at 38YK25A by a Winthrop College (Rock Hill) archeological field school under the direction of Veletta Canouts. These excavations were undertaken in close cooperation with the Institute of Archeology and Anthropology and were addressed to many of the problem domains identified in this report. Preliminary analyses of the data recovered from this Late Archaic site on the edge of the I-77 right-of-way strongly support the estimates, made in this report of the research potential of shallow prehistoric sites in the inter-riverine Piedmont.

Limited excavation at 38CS69 should be sufficient to yield a large sample of tools and debitage, ascertain the presence of fire-cracked rock and features, and measure the overall density of artifacts. These data categories are pertinent to the hypothesized attributes of habitation sites outlined earlier.

Mississippian habitation site Site 38CS92 seems to be badly disturbed by recent land clearing activities, but it would probably be rewarding to clear the topsoil and disturbed soil from an extensive area of the site to reveal possible postholes, storage pits, or burial pits which might be present. These data would be relevant to testing the hypothesis that this site represents a permanent farmstead vs. a seasonal hunting camp. These data could probably be relatively easily collected by horizontal skimming of the uppermost

strata at the site. The emphasis in this suggested program of excavation would be on discerning features rather than attempting to discern intrasite patterning in artifact distribution at this badly disturbed site. Excavation of dispersed excavation units about the site, however, should yield a larger and more representative sample of artifacts than we have at present.

Extraction sites. Two ridge top lithic scatters seem especailly suited for a program of spatially extensive excavation, 38FA117A and 38FA118. The latter site was sampled by collecting a logging road that crossed the site, but adjacent areas seem to have intact, sandy B horizon beneath the pine forest. A sample grid should be laid out in the western part of the right-of-way immediately south of the road in what seems to be a fairly concentrated part of the site. Site 38FA117A was discovered by excavation of a test pit in a sampling unit. Though we know almost nothing about this site, its topographic position is similar to most of the "extraction sites" in the corridor and the presence of two flakes in a fairly intact A_{2e} horizon suggests that this locus has both the density and degree of preservation to reward intensive sampling.

Relevant data categories at these sites would include all classes of lithic debitage, possible fire-cracked rock, and possible features such as hearths, postholes, and pits. If these sites do indeed represent extractive loci, we should not expect to find fire-cracked rock, post holes, and pits.

Questions to be asked at these sites include:

1. What time(s) in prehistory were these loci used?

2. What stages in tool manufacturing processes are represented by debitage in various raw material categories?

3. Are features--hearths, post holes, and pits--present?

4. Can distinct occupational loci be isolated within the site area? Is the site composed of the outputs of a number of discrete episodes of occupation? What are the dimensions and internal structure of any clusterings representing occupational loci?

5. If discrete occupational loci within the site area can be recognized, what are the similarities and differences between loci?

6. Does the sample of lithics collected during the survey adequately represent the artifactual contents of the site as estimated from the excavated sample? This would apply only to 38FA118. Relevant variables here would include proportions of different artifact classes and, hence, Indexes of Biface Discard and Early Stage Reduction, proportions of different raw materials and the mean and Coefficient of Variation (C.V.) of metric attributes of thinning flakes.

A Two-Stage Sampling Design for Intensive Investigation of Sites

A two-stage sampling strategy is recommended for the prehistoric sites listed above for intensive investigation. Sampling Stage I would consist of collection of data from a large number of dispersed excavation units throughout the site area. This would serve the purpose of defining the site spatially and revealing any gross patterning in the distribution and density of various classes of material and features within the site. Stage II would consist of more intensive excavation of certain areas within the site to test hypotheses generated from the results of Stage I and to investigate any functionally-specialized areas which might become apparent. A similar excavation strategy is proposed by Goodyear (1975d) for investigating Dalton sites in the Cache Basin in Arkansas.

Operationalizing this sampling strategy will involve a number of decisions best made in the field. Thirty to forty 5' x 5' excavation units per site would probably be optimum for purposes of good coverage of the sampled areas and statistical analyses. Thirty-six units dispersed in a 300' x 300' area would constitute a 1% sample; 30 units in a 125' x 150' area would constitute a 4% sample. Ideally, the units would be unaligned and stratified in a grid for dispersal, but it may prove much more efficient on a heavily wooded site to lay out a randomized systematic sample or some compromise between systematic and unaligned random sampling designs. Given the nature of the apparent stratigraphy and site formation processes at these sites, it will probably be sufficient to excavate squares in one level, surface to subsoil. Optimum screen size should be arrived at by experiment but at least part of the fill in each unit should be screened through 1/4" mesh to recover debitage in size classes comparable to those collected from the surface during the survey.

The maximum benefit from this two-stage sampling strategy would be realized only if some preliminary analysis of the Stage I data took place before the finalization of plans for Stage II. Possibly the data from Stage I sampling at a site could be processed and described while Stage I sampling at another site was taking place. Then the excavators could return to the first site and begin Stage II, informed by the results of Stage I, at the site. It is possible that large quantities of data will be recovered during Stage I. If so, analytical techniques appropriate to the recognition of patterning might include the preparation of artifact distribution maps with the use of the SYMAP computer program.

Stage II would proceed with either excavation of features discovered in Stage I or excavation and mapping of artifact clusters possibly attributable to single episodes of occupation. The initial sampling might reveal horizontal patterning of <u>in situ</u> artifacts similar to that at the Brand site in Arkansas (Goodyear 1974, 1975d). Alternatively, the Stage I sampling might reveal no intrasite patterning or features and plans for Stage II investigation might be abandoned.

Procedures for Limited Testing

Two sites are recommended for limited testing. Site 38CS69 occupies a small level terrace area overlooking a creek. Excavation of several 5' x 5' pits should reveal whether the inferences based on the test pit data from the survey are fairly accurate and whether this locus can indeed be considered a habitation site.

Site 38CS92 appears to be badly disturbed by land clearing but limited test pitting and horizontal skimming in the area of greatest ceramic concentration should reveal the presence or absence of features. This testing could begin with the placement of a few 5' x 5' squares about the site and expansion of any of these units which yielded relevant data on the nature of Mississippian occupation. If features were located, samples of their fill could be processed by water screening or flotation for small-scale recovery of any artifactual or ecofactual materials.

Analyses

The main categories of data would be lithic artifacts and their location within a site. The field procedures outlined above are guided by the assumption that an archeological site should exhibit a formal-spatial structure reflecting the differentiation of activities and social units performing these activities in the past. The differential spatial clustering of tools, debitage, etc. then, may reflect either different activities or the outputs of different episodes of occupation. In analyzing data from these intensively sampled sites, we would be attempting to define the structure of the distribution of various classes of artifactual material and various types of features and, subsequently to discern spatial correlation between various classes of artifacts and features in order to test hypotheses about past activities at the site (cf. Binford, et al. 1970) and the site-forming processes themselves (cf. Schiffer 1972, 1976).

Analysis of lithics from the sites should proceed with the use of a functional typology similar to that presented earlier in this report. In addition, analysis of metric attributes of samples of flakes may serve to test hypotheses about site function using the "Biface Thinning Flake Method." Some artifacts will probably be found which will be useful in recognizing the time periods of prehistoric occupation at the sites. Quantities of non-quartz lithic material are anticipated at both ridge top "extraction" sites. Differential distribution of various raw materials might be useful in isolating discrete episodes of occupation and analyses of metric attributes of debitage in various raw material categories might be relevant to some of the hypotheses about lithic resource procurement outlined. It would be desirable at this time to have further petrographic analysis of non-quartz material performed in order to better identify source areas and estimate how much diversity in source areas is represented at single sites or a single cluster within a site. Statistical tests for correlation would probably be useful in evaluating the spatial covariation between various classes of artifacts or various kinds of raw materials.

We do not anticipate that most categories of ecofactual data, i.e., pollen, charred floral remains, faunal remains or chemical residues of occupation, will be preserved in these sites. Some analyses of potential samples should be carried out, however, at the time of these excavations to determine the feasibility of analyzing these data classes in future research on similar sites.

Recommendations for the Investigation of Historic Sites

Sites and Data Categories

We recommend intensive sampling and mapping at two probable early nineteenth century house places: 38FA108 and 38CS89. A sampling strategy similar to that outlined for prehistoric sites would be applicable to the historic sites, as well. Analysis of artifactual materials would be useful in estimating the date of occupation, defining activity areas and determining the range of activities associated with each site. Careful mapping of any above-ground features such as chimney piles, foundation stones, and roads should be carried out at the house places themselves, and additional mapping of agricultural modifications should be carried out in the surrounding area.

Historical Archeologist Recommended

We recommend that the responsibility for the investigation of these sites be given to an archeologist whose primary field interest and expertise is historical archeology. The rough outline of historic site research presented here and in the budget presented in this chapter were prepared in consultation with Kenneth Lewis and Richard Carrillo, two historical archeologists at the Institute of Archeology and Anthropology. The historic site research outlined here is deliberately vague; we recommend that the archeologist who carries out this research be allowed at least a month prior to the beginning of fieldwork to prepare a research design. A separate budget for this research is presented later in this report.

Documentary Research

Exploration of the previously outlined historical archeology problem domains will require examination of the Fairfield and Chester County records and the records in the South Carolina State Archives for information pertinent to these sites and the communities of which they were a part. This research too, should be carried out prior to commencement of the fieldwork. We recommend that the services of a person knowledgeable about documentary research in South Carolina be hired for this purpose.

Investigation of Stream Valley Sediments in the Piedmont

Our third recommendation for mitigation of the impact of Interstate 77 is a program of investigation of stream floodplain sediments in the corridor. This program would have two goals: (1) determination of the feasibility of recovery of Holocene paleo-environmental data from the alluvium in upland stream valleys and (2) determination of the extent of historic period alluviation in upland stream valleys and its probable effect on the visibility of the archeological record in the corridor. The specific recommendations presented below and the budget figures were prepared in consultation with Dr. Don Colquhoun of the Department of Geology, University of South Carolina-Columbia and Dr. Don Thompson of the Department of Biology, University of South Carolina-Aiken.

This program of research should, obviously, be undertaken with the direct participation of geological and other specialists with an interest in Holocene environments in the Piedmont. It is especially fortunate that the University of South Carolina system already has the capabilities, in terms of both interested and experienced researchers and adequate laboratory facilities, for the kind of interdisciplinary research program recommended here.

Relevant classes of paleo-environmental data include: (1) the stratigraphy of the floodplain sediments, (2) the structure of any buried soil horizons, (3) pollen in good stratigraphic context, (4) plant macrofossils, (5) the texture and mineralogical content of sediments, and (6) radiocarbon dates of any macrofossil remains. Two readily accessible floodplain areas within the corridor would be selected by a collaborating geological specialist. Observation of present-day topography, use of seismic refraction, or even limited augering should serve to locate buried backswamp or channel areas which might contain permanently saturated deposits conducive to the preservation of both pollen and plant macrofossils. Then one or more backhoe trenches could be excavated crosscutting these features and adjacent terrace or natural levee deposits. It may prove desirable to shore these trenches to insure safe working conditions. Subsequently, portions of the trench walls would be profiled, examined by geologists and archeologists, and samples of sediments taken for pollen and sedimentological analyses. Relict soil horizons containing information on local vegetation in the past might be observed and pollen data, if recovered, should provide a basis for reconstruction of the floral communities of the region. Textural and mineralogical analysis of sediments should provide information on erosional and physical/chemical weathering processes in upstream portions of the watershed.

It is probable that the eighteenth century land surface will be readily recognizable, providing at least minimal temporal control over the data. If adequate quantities of plant macrofossils are recovered in good stratigraphic context, some monies in the proposed budget should be reallocated for some radiocarbon dates.

It is anticipated that this study will, at very least, provide a preliminary assessment of the feasibility and potential of such research and, in all liklihood, add significantly to our knowledge of the environmental parameters of prehistoric human adaptation in the South Carolina Piedmont. The results of this research would preferably be written-up in cooperation with the participating scientists in other fields and published in a chapter or appendix in the I-77 mitigation final report--and perhaps in separate articles in the journals of other disciplines.

Proposed Budgets for Mitigation of the Impact of Interstate 77

A. Salaries and Wages

1.	Archeologist, 11 mo. at $750/mo. (prehistoric)	$ 8,250
2.	Archeologist, 4 mo. at $1250/mo. (historic)	5,000
3.	Research assistant, 11 mo. at $583/mo. (prehistoric)	6,413
4.	Research assistant, 4 mo. at $583/mo. (historic)	2,332
5.	4 crewpersons, 12 wks. at $125/wk. (prehistoric)	6,000
6.	3 crewpersons, 4 wks. at $125/wk. (historic)	1,500
7.	Typist, 12 wks. at $178/wk.	2,136
8.	Records clerk, 12 wks. at $178/wk.	2,136
9.	2 laboratory assistants, 8 wks. at $80/wk.	1,280
10.	Illustrator, 4 wks. at $186/wk.	744
11.	Photographer, 4 wks. at $220/wk.	880
12.	Fringe benefits for permanent employees at 13.55% of salaries	3,779
13.	Hospitalization coverage at $26.08 per person month	991
14.	Indirect University costs, 52% of salaries and wages	19,069
	Sub-total of Salaries and Wages	$60,510

B. Operating Costs

1.	Photographic supplies	$ 300
2.	Other expendable supplies	500
3.	Map and document reproduction	200
4.	Printing of reports	1,800
5.	Rental of field housing/laboratory	1,000
	Sub-total of Operating Costs	$ 3,700

C. Contractual Services

1.	Back hoe hire w/operator, 2 days at $180/day	$ 360
2.	Sedimentologist, 5 days at $125/day	625
3.	Sedimentological analyses, texture and minerology (ca. 30 samples)	160
4.	Seismic refraction study in the field	200
5.	Palynological analyses (ca. 30 samples)	200
6.	Carbon 14 analyses, 15 samples	1,500
7.	Petrological analyses (ca. 30 samples)	180
	Sub-total of Contractual Services	$ 3,040

D. Travel

1.	Mileage to and from site, 6600 miles at 14¢	$ 925
2.	Mileage reimbursement for consultants, 1000 miles at 14¢	140
3.	Travel out of state for consultation	450
4.	Per diem at $10 per person for a total of 160 days	1,600
	Sub-total for Travel	$ 3,115
	Grand Total	$70,365

APPENDIX A.

SUMMARY OF I-77 SURVEY UNIT DATA

Sampling Units	Vegetation and Survey Conditions	Visibility Rank 1/	Test Pit Results 2/	Prehistoric Sites	Historic Sites 3/
0-IV	Under construction, not surveyed.	-	- -	--	--
1-III	Under construction, not surveyed.	-	- -	--	--
2-V	Under construction, not surveyed.	-	- -	--	--
3-II	Under construction, not surveyed.	-	- -	--	--
4-V	Mixed pine and deciduous woods in old fields.	0	n n	none	none
5-III	Mostly mixed pine and deciduous woods.	0	o n	none	none
6-II	All wooded, mostly pine with some deciduous.	0	n n	none	39FA99
7-I	Mixed pine and deciduous woods.	0	n n	none	none
8-II	Part deciduous, part mixed pine and deciduous.	0	n n	none	none
9-I	Mostly young pines, logging roads, and gullies.	1	o n	38FA104	none
10-III	Mostly young pines and some deciduous in old pastures.	0	n n	none	none
11-III	Clearing growing up in young pine and deciduous. Logging road and eroded spots.	1	n p	38FA107	38FA107 38FA108
12-V	Hardwoods near creeks, pine elsewhere, logging road.	1	n n	none	
13-II	Pine with some cedar in old fields, logging road and gullies.	1	o p	38FA110	none
14-I	Almost all mature planted pines.	0	n p	38FA117	none
15-III	Pines with some deciduous, logging road and erosion.	1	n n	none	none
16-IV	Mostly hardwood, rest pine. Logging road.	1	o n	38FA119	none
17-II	Pine in old fields, hardwoods in ravines.	0	n n	none	none
18-I	Pines in uplands, bottomland hardwoods, recent logging.	1	o n	none	none
19-IV	Bottomland hardwoods in old pasture, mixed pine and deciduous in uplands.	0	o n	none	none

SUMMARY OF I-77 SURVEY UNIT DATA

Sampling Units	Vegetation and Survey Conditions	Visibility Rank 1/	Test Pit Results 2/	Prehistoric Sites	Historic Sites 3/
20-II	Mostly pasture, part mixed pine and deciduous, dirt road.	1	n n	none	none
21-II	Mixed pine and deciduous with recent logging, some pasture.	1	n n	none	none
22-I	Mostly pine, logging roads and recent logging.	1	o n	38FA112	none
23-I	Pasture, hardwoods, cornfield, dirt and paved roads.	1	n n	38FA114	none
24-II	Mostly pines in old fields, some hardwoods, recent logging.	1	n n	none	none
25-III	Woods mainly pine, some exposed soil in pasture around pond.	1	n n	38CS93	none
26-I	Part young pines in old fields, rest mixed pine and deciduous.	0	n n	none	none
27-II	Mostly pasture and recently logged pines, logging road.	1	o n	38CS88	38CS89
28-V	Mostly pine with hardwoods in bottoms, logging road and large gullies.	1	n n	none	none
29-I	Mostly pine in old fields, logging road and large gullies.	1	n n	38CS71	none
30-III	Mixed pine and deciduous, logging road.	1	n n	38CS64	none
31-I	Mostly mixed pine and deciduous, rest overgrown fields.	0	n n	none	none
32-I	Mixed pine and deciduous woods, corner in beanfield.	0	n p	38CS68	none
33-IV	Pine with some deciduous in old fields, some clearings and gullies.	1	o n	38CS67	none
34-I	Mostly pasture, rest mixed pine and deciduous, dirt road and driveway.	1	n n	38CS83	none

SUMMARY OF I-77 SURVEY UNIT DATA

Sampling Units	Vegetation and Survey Conditions	Visibility Rank 1/	Test Pit Results 2/	Prehistoric Sites	Historic Sites 3/
35-V	Mostly bottomland hardwoods and pine, pasture, eroded areas and gullies.	1	o n	38CS82	none
36-II	Mostly beanfield ½ harvested, rest pine woods.	1	o n	none	none
37-I	Pasture, mixed pine and deciduous, gullies, erosion.	1	n n	38CS80	none
38-I	Mixed pine and deciduous in old fields, bottomland hardwoods, logging road.	1	o p	38CS77	none
39-I	Mostly mixed pine and deciduous, pine in old fields.	0	n n	none	none
40-I	Hardwoods with some pines, pasture, sunken road and logging road.	1	n n	none	none
41-IV	Mature hardwoods, some pines in old field, gullies.	1	n n	none	none
42-III	Young pines, some hardwoods, bad thickets.	0	n n	none	none
43-III	Under construction, not surveyed.	-	- -	--	--
44-IV	Under construction, not surveyed.	-	- -	--	--
45-IV	Under construction, not surveyed.	-	- -	--	--
46-IV	Cleared and bulldozed, under construction.	2	o o	38YK25	none
47-I	Cleared and bulldozed, under construction.	2	o o	38YK24	none
48-III	Mostly overgrown pasture, rest mainly hardwoods.	0	n n	none	none
49-I	Mostly planted pines, corner in pasture, recent logging, logging road.	1	o n	none	none

Stream Crossings	Vegetation and Survey Conditions	Visibility Rank 1/	Test Pit Results 2/	Prehistoric Sites	Historic Sites 3/
1	Under construction, not surveyed.	-	- -	--	--
2	Under construction, not surveyed.	-	- -	--	--
3	Under construction, not surveyed.	-	- -	--	--
4	Under construction, not surveyed.	-	- -	--	--
5	Under construction, not surveyed.	-	- -	--	--

SUMMARY OF I-77 SURVEY UNIT DATA

Stream Crossings	Vegetation and Survey Conditions	Visibility Rank 1/	Test Pit Results 2/	Prehistoric Sites	Historic Sites 3/
6	Bridge construction, bulldozed areas, overgrown pasture.	2	o o	38FA100	none
7	Mixed pine and deciduous woods.	0	o n	none	none
8	Mixed pine and deciduous woods.	0	o n	none	none
9	Overgrown pasture with eroded spots.	1	o p	38FA102, 105	none
10	Pasture growing up in young trees.	0	n n	none	none
11	Mixed pine and deciduous woods.	0	n n	none	none
12	Bottomland hardwoods, pines, logging road.	1	o n	38FA115	38FA115
13	Bottomland hardwoods.	0	n n	none	none
14	Bottomland hardwoods, large pines, logging road.	1	o n	none	none
15	Bottomland hardwoods, large pines, recent logging, logging road.	1	o n	none	none
16	Mixed pine and deciduous in old fields, bottomland hardwoods.	0	n n	none	none
17	Pasture with a few trees.	0	n n	none	none
18	Pasture, area of hardwoods.	0	n n	none	none
19	Bottomland hardwoods, pine, recent logging, logging road.	1	o o	none	none
20	Bottomland hardwoods, pine.	0	n n	none	none
21	Pasture with eroded spots.	1	o n	none	none
22	Mostly bottomland hardwoods and cedar.	0	n n	none	none
23	Oak-pine woods.	0	n n	none	none
24	Bottomland hardwoods, overgrown clearing, recent logging, logging road, eroded spots, gullies.	1	o n	38CS90-92	none
25	Bottomland hardwoods.	0	n p	38CS86	none
26	Pine, some deciduous, recent logging, eroded spots.	1	n p	38CS66, 71	none
27	Mixed pine and deciduous woods.	0	n p	38CS69	none
28	Mixed pine and deciduous woods in old fields.	0	n n	none	none
29	Mixed pine and deciduous woods in old fields, gully.	1	o n	none	none
30	Mostly hardwoods, some pine.	0	n n	none	none

SUMMARY OF I-77 SURVEY UNIT DATA

Stream Crossings	Vegetation and Survey Conditions	Visibility Rank 1/	Test Pit Results 2/	Prehistoric Sites	Historic Sites 3/
31	Mostly hardwoods, some pine, recent logging, logging road.	1	o n	none	none
32	Bottomland hardwoods, pine, pasture, eroded spots, gullies.	1	o n	none	none
33	Bottomland hardwoods, beanfield.	1	o n	38CS81	none
34	Pasture, eroded spots.	1	o n	none	none
35	Predominantly pine in old fields.	0	n p	38CS77	none
36	Hardwoods, cedar, pine.	0	n n	none	none
37	Hardwoods, few pine, pasture, sunken road.	1	o o	38CS94	38CS78
38	Bottomland hardwoods in old fields, mixed pine and deciduous on upland.	0	o n	none	none
39	Bottomland hardwoods, pine, pasture, eroded spots.	1	n n	none	none
40	Under construction, not surveyed.	-	- -	--	--
41	Under construction, not surveyed.	-	- -	--	--
42	Under construction, not surveyed.	-	- -	--	--
43	Cleared and bulldozed, under construction.	2	o o	38YK39	none
44	Cleared and bulldozed, under construction.	2	o o	none	38YK38
45	Hardwoods, field with eroded spots.	1	o n	38YK37	none
46	Fields, clearing for construction, eroded spots.	2	o o	38YK40	none

1/ Visibility Rank
0 = visibility nil
1 = some roads or active erosion
2 = much exposed ground

2/ Test Pit Results
o = no pit dug
n = test pit dug with negative results
p = test pit dug with positive results

3/ See Appendix H for data on agricultural modifications

APPENDIX B.

DESCRIPTION OF PREHISTORIC SITES RECORDED BY THE I-77 SURVEY

Site No.	Topographic Position	Slope Direction	Approx. %	Distance to Permanent Water	Extent
38RD104	Ridge top	-	0	800'	nd
38FA100	Gently sloping hillside	S	5[1]	200'	at least 300' dia.
38FA101	Ridge top	NE	5	500'	nd
38FA102	Ridge top	var.	5	500'	ca. 200' long
38FA103	Ridge top	-	0	300'	ca. 500' long
38FA104	Hillside	E	15	1000'	isolated find
38FA105	High creek terrace	SE	var.	200'	nd
38FA106	Ridge top	N	10	1200'	nd
38FA107	Ridge top	S	0-5	2000'	nd
38FA110	Ridge top	var.	0-10	800'	nd
38FA112	Hillside	SE	5-10	400'	ca. 50' long
38FA114	Gently sloping hillside	W	0-5	1000'	nd
38FA115	Hilltop beside creek	-	0	200'	ca. 100' long

[1] As noted in the text, the most intensively occupied part of 38FA100 is approximately level.

DESCRIPTION OF PREHISTORIC SITES RECORDED BY THE I-77 SURVEY

Site No.	Topographic Position	Slope Direction	Approx. %	Distance to Permanent Water	Extent
38FA116	Ridge top	-	0	700'	ca. 40' long
38FA117	Ridge top	-	0	1200'	at least 400' long ?
38FA118	Ridge top	E	0-5	1600'	at least 700' long
38FA119	Ridge top	S	5	900'	nd
38CS64	Ridge top	-	0	500'	nd
38CS65	High creek terrace	S	0-5	250'	nd
38CS66	Ridge top	S	0-10	300'	nd
38CS67	Hillside	SW	5-10	500'	nd
38CS68	Hillside	E	10-15	300'	test pit
38CS69	Hilltop beside creek	-	0	100'	test pit
38CS71	Ridge top	S	0-5	800'	ca. 100' long
38CS72	Ridge top	var.	0-10	300'	as much as 500' long
38CS73	Ridge top	S	5-10	500'	nd
38CS74	Ridge top	SW	5	1200'[1]	nd
38CS75	Ridge top	-	0	1200'[1]	ca. 100' x 200'

[1] Possible water source in floodplain slough 400 - 500' distant

DESCRIPTION OF PREHISTORIC SITES RECORDED BY THE I-77 SURVEY

Site No.	Topographic Position	Slope Direction	Approx. %	Distance to Permanent Water	Extent
38CS76	Ridge top	SW	5-10	1200'	nd
38CS77	Hillside beside creek	NW	5-10	50'	test pit
38CS79	Hillside	N	10	2600'[1]	nd
38CS80	Hillside	SE	5-10	1800'	test pit
38CS81	Hillside	W	5	200'	ca. 40' dia.?
38CS82	Gently sloping hillside	S	5-10	400'	10-20' dia.
38CS83	Gently sloping hillside	S	5	500'	nd
38CS84	Ridge top	-	0	300'	nd
38CS85	Ridge top and hillside	S	5-10	350'	nd
38CS86	Creek terrace?	N	0-5	40'	test pit
38CS87	Gently sloping hillside	SE	5	100'	nd
38CS88	Hillside	N	10	1200'	isolated find
38CS90	Hillside	N	10-15	200'	isolated find
38CS91	Low creek terrace	-	0	100'	nd

[1] Possible water source in bottomland slough in closer proximity

DESCRIPTION OF PREHISTORIC SITES RECORDED BY THE I-77 SURVEY

Site No.	Topographic Position	Slope Direction	Approx. %	Distance to Permanent Water	Extent
38CS92	Gently sloping hillside	S	0-5	600'	ca. 300' dia.
38CS93	Gently sloping hillside	N	0-5	100'	isolated find
38CS94	Hillside overlooking creek	N	5	100'	nd
38YK24	Gently sloping hillside	N	0-5	500'	nd [1]
38YK25	Gently sloping hillside	N	0-5	0-500'	nd [1]
38YK26	Gently sloping hillside	S	0-5	100'	50' dia.
38YK37	Low hill beside creek	-	0	100'	ca. 40' x 100'
38YK39	Low hill beside creek	var.	0-5	100'	nd
38YK40	Gently sloping hillside	SW	5-10	500'	nd

[1]These sites were exposed by clearing of vegetation for I-77 construction in units 46-IV and 47-I. Distribution of artifacts almost continuous over much of the cleared area.

Key to abbreviations:

var.: Slope highly variable
nd.: No data; attribute could not be adequately observed.

APPENDIX C.

TYPOLOGICAL ANALYSIS OF PREHISTORIC MATERIALS FROM I-77 SURVEY SURFACE COLLECTIONS

Site no. and method	Fire crkd (grams)	Chnks	Other flks	Thinning flks	Flake tools	Unif	Flk cores	Points	Bif frags	Bif blanks	Other artifacts
38RD104, c	0	2	25	9	0	0	3	0	0	1	0
38FA99, g	(no prehistoric artifacts)										
38FA100, c	487[1]	20	38	2	3	1	0	1 Palmer	0	2	1[2]
38FA100, g	0	1	19	18	0	4	1	4 Morrow Mtn 2 Guilford 1 large stemmed	8	2[3]	2[4]
38FA101, c	0	2	9	4	0	1?	0	0	0	0	0
38FA102, c	0	4	6	7	0	0	0	1 Guilford?	0	0	0
38FA103, c	0	11	24	10	2	0	0	0	3	3	0
38FA104	(isolated find)									1[5]	0
38FA105	(no collections made)										
38FA106, c	0	2	4	0	0	0	0	0	0	0	0
38FA107A,c	0	9	6	13	1	0	1	0	1	1	1[6]

Notes:
1 38FA100 controlled, fire-cracked rock not sampled adequately in this specimen
2 38FA100 controlled, a core chopper
3 38FA100 grab, 2 probable Morrow Mountain preforms
4 38FA100 grab, 2 ovate biface tools
5 38FA104 isolated find, probable Morrow Mountain or Guilford preform
6 38FA107A controlled, core tool, possible chopper for adzing and planing wood

TYPOLOGICAL ANALYSIS OF PREHISTORIC MATERIALS FROM I-77 SURVEY SURFACE COLLECTIONS

Site no. and method	Fire crkd (grams)	Chnks	Other flks	Thinning flks	Flake tools	Unif	Flk cores	Points	Bif frags	Bif blanks	Other artifacts
38FA107B,c	0	1	2	0	0	0	0	0	1	0	0
38FA107, tp	0	0	1	0	0	0	0	0	0	0	0
38FA108, c	(no prehistoric artifacts)										
38FA109, g	(no prehistoric artifacts)										
38FA110A,tp	0	2	0	1	0	0	0	0	0	0	0
38FA110B,g	0	0	0	0	0	0	0	1 unclass. frag.	0	0	0
38FA112, c	0	3	4	2	0	0	0	0	0	1	0
38FA113	(Historic house place, no collections made)										
38FA114, c	0	0	2	1	0	0	0	0	0	1	0
38FA115, c	0	10	11	3	0	0	0	0	1	1	0
38FA116, c	2?	9	10	14	0	1[1]	0	0	3	0	0
38FA117A,tp	0	0	0	1	0	0	0	0	0	1	0
38FA117B,c	0	6	6	4	0	0	0	0	1	0	0
38FA118, c	0	7	45	62	1	0	0	1 Morrow Mtn 1 Guilford?	7	2	1[2]
38FA119, c	0	0	0	1	0	0	0	0	0	1	0

Notes: [1] Fragment of early Archaic (?) end-scraper of light grey Fort Payne (?) chert
[2] Fragment of ~~adz-like biface~~ light grey and blue mottled chert

TYPOLOGICAL ANALYSIS OF PREHISTORIC MATERIALS FROM I-77 SURVEY SURFACE COLLECTIONS

Site no. and method	Fire crkd (grams)	Chnks	Other flks	Thinning flks	Flake tools	Unif	Flk cores	Points	Bif frags	Bif blanks	Other artifacts
38CS64, c	0	15	13	15	0	0	0	0	4	3	0
38CS65, c	0	5	6	6	1	0	0	0	0	0	0
38CS66, g	0	12	13	3	1	0	2	0	1	4	0
38CS67, c	0	1	16	5	0	0	0	0	0	0	0
38CS68, tp	0	0	0	1	0	0	0	0	0	0	0
38CS69, tp	26	1	3	1	0	0	0	0	0	0	0
38CS70	(historic cemetery, no prehistoric artifacts)										
38CS71, c	0	4	3	12	0	0	0	0	0	0	0
38CS72, c	0	17	18	22	0	1	0	1 Guilford? 1 Palmer?[1]			
38CS72, tp	0	0	0	0	0	0	0	1 Guilford	0	0	0
38CS72, g	0	0	0	0	0	0	0	0	0	1	0
38CS73, g	0	0	0	0	0	0	0	1 Morrow Mtn	2	0	0
38CS74, g	0	3	0	1	0	0	0	1 Savannah Riv ?	0	0	0
38CS75, c	0	7	50	45	0	0	2	1 Savannah Riv	4	3	0

[1] This is a blade midsection of a beveled and serrated point, probably a Palmer, of Carolina Slate or ignimbrite

TYPOLOGICAL ANALYSIS OF PREHISTORIC MATERIALS FROM I-77 SURVEY SURFACE COLLECTION

Site no. and method	Fire crkd (grams)	Chnks	Other flks	Thinning flks	Flake tools	Unif	Flk cores	Points	Bif frags	Bif blanks	Other artifacts
38CS76, c	0	2	9	2	0	0	0	0	0	0	0
38CS77, tp	0	0	1	0	1	0	0	0	0	0	0
38CS78	(historic rock ford, no prehistoric artifacts)										
38CS79	(no collections made)										
38CS80, tp	0	1[1]	1[1]	0	0	0	0	0	0	0	0
38CS81, c	0	0	2	5	0	0	0	0	0	0	0
38CS81, g	0	0	0	0	0	0	0	0	2	0	0
38CS82, c	0	9	14	1	0	0	0	0	0	0	0
38CS83A,c	0	6	13	3	0	0	0	0	0	0	0
38CS83B,c	0	97	96	22	1	0	0	0	0	1	0
38CS84, c	0	10	27	23	0	1	1	0	2	0	0
38CS84, g	0	0	0	0	0	0	0	0	0	1	0
38CS85, g	0	0	0	0	0	0	0	1 unclass.	0	0	0
38CS86, tp	0	0	1	0	0	0	0	0	0	0	0

Note: [1] Identification of these specimens as humanly-modified is tenative

TYPOLOGICAL ANALYSIS OF PREHISTORIC MATERIALS FROM I-77 SURVEY SURFACE COLLECTIONS

Site no. and Method	Fire crkd (grams)	Chnks	Other flks	Thinning flks	Flake tools	Unif	Flk cores	Points	Bif frags	Bif blanks	Other artifacts
38CS87	(no collections made)										
38CS88	(isolated find)							1 Morrow Mtn			
38CS89	(historic house place, no prehistoric artifacts)										
38CS90	(isolated find)							1 Guilford			
38CS91	0	0	1	0	0	0	0	0	0	0	0
38CS92A,c[1]	0	19	10	19	0	0	0	0	2	1	4[2]
38CS92B,c[3]	0	8	24	15	0	0	2	0	0	4	2[4]
38CS93, c	0	3[5]	0	0	0	0	0	0	0	0	0
38CS94, c	0	4	5	7	0	0	0	1 Savannah Riv	0	0	1[6]

Notes:
1 38CS92A, ca. 100' circle in center of site
2 1 core tool; 1 Chicora ware group sherd, complicated stamped; 2 Chicora ware group sherds, plain
3 38CS92B, the rest of site 38CS92
4 2 Chicora ware group sherds, plain
5 Quartz chunks found in one small spot, appear to be fragments of 1 biface
6 Core tool (?) of quartz, small chunk with battered edges

TYPOLOGICAL ANALYSIS OF PREHISTORIC MATERIALS FROM I-77 SURVEY SURFACE COLLECTIONS

Site no. and Method	Fire crkd (grams)	Chnks	Other flks	Thinning flks	Flake tools	Unif	Flk cores	Points	Bif frags	Bif blanks	Other artifacts
38YK24A, c	0	0	0	1	0	0	0	0	0	1	0
38YK24B, c [1]	0	13	48	21	0	0	0	1 Morrow Mtn	3[2]	1	0
38YK24C, c[3]	0	0	41	30	0	0	1	0	0	2	0
38YK24, g[4]	0	1	2	1	0	0	5	1 Kirk stemmed?	3	22[5]	0
38YK25A, c	0	19	61	46	5	0	2	6 Savannah Riv	6[6]	3	0
38YK25B, g	0	0	2	1	1	0	1	0	1	0	0
38YK25C, g	0	1	0	1	0	0	0	0	0	0	0
38YK25D, c	0	1	1	2	1	0	0	0	0	0	0

Notes:
1 This is a 25' dia. circle in an area of apparent concentrations;
2 Includes one tip of a relatively unweathered Carolina slate or ignimbrite arrow point (?)
3 This is a 25' dia. circle in an area of apparent concentrations;
4 This is a grab sample from throught the northern half of the cleared zone in Unit 47-I
5 Includes 3 probable Morrow Mountain point preforms
6 One circular biface tool, 1 tip fragment of a point (?), 4 miscellaneous small fragments of bifaces

TYPOLOGICAL ANALYSIS OF PREHISTORIC MATERIALS FROM I-77 SURVEY SURFACE COLLECTIONS

Site no. and Method	Fire crkd (grams)	Chnks	Other Flks	Thinning flks	Flake tools	Unif	Flk cores	Points	Bif frags	Bif blanks	Other artifacts
38YK25E, c	0	2	4	0	0	0	0	0	0	1	0
38YK25F, c	0	0	3	3	0	0	1	0	0	0	0
38YK26, g	0	1	3	1	0	0	0	1 Morrow Mtn	1[1]	0	0
38YK37, c	0	4	15	16	0	0	0	1 Stanley	0	2	0
38YK38	(no prehistoric artifacts)										
38YK39, c	64[2]	19	24	24	0	0	3	0	3	1	0
38YK39, g	0	2	0	0	0	0	0	1 Stanley 1 Kirk stemmed	3	0	1[3]
38YK40, g	0	0	8	13	0	0	1	1 Guilford	3	2[4]	0

Notes:
1 A probable blade fragment of a Savannah River point blade frag. of Carolina slate or ignimbrite
2 This is one piece of fire-cracked rock
3 A cobble hammerstone
4 This includes 2 probable Morrow Mountain point preforms

TYPOLOGICAL ANALYSIS OF PREHISTORIC MATERIALS FROM I-77 SURVEY SURFACE COLLECTIONS

KEY TO ABBREVIATIONS USED IN THIS APPENDIX

Collection Methods

c: controlled
g: grab
tp: test pit

Artifact Classes

Fire crkd: Fire-cracked rock
Chnks: Chunks
Other flks: Other flakes
Thinning flks: Thinning flakes
Flake tools: Flake tools
Unif: Steeply retouched unifaces
Flk cores: Flake cores
Points: Points
Bif frags: Biface fragments
Bif blanks: Biface blanks and preforms
Other artifacts: Other artifacts

APPENDIX D.

PROJECTILE POINT METRIC DATA

Early Archaic Points

Figure Number	Site Number And Method	Raw Material	Blade Length	Haft Element Length	Blade Base Width	Proximal Haft Element Width	Maximum Thickness
Palmer points:							
8a.	38FA100, c	Quartz	-	8.5 mm	-	17.5 mm	-
8b.	38CS72, c	Carolina Slate	-	-	-	-	-
Kirk points:							
8c.	38YK39, g	Carolina Slate	-	-	24.3 mm	-	7.7 mm
8d.	38YK24, g	Quartz	-	9.9 mm	24.5 mm	-	10.2 mm

PROJECTILE POINT METRIC DATA

Middle Archaic Points

Figure Number	Site Number And Method	Raw Material	Blade Length	Haft Element Length	Blade Base Width	Proximal Haft Element Width	Maximum Thickness
Stanley points:							
8e.	38YK39, g	Carolina Slate	-	-	(38.2 mm)	-	9.8 mm
8f.	38YK37, c	Carolina Slate	-	-	45.9 mm	-	9.2 mm
Morrow Mountain points:							
9a.	38CS73, g	Quartz	-	13.8 mm	24.3 mm	0	11.7 mm
9b.	38YK24B, c	Quartz	-	13.7 mm	24.5 mm	0	10.4 mm
9c.	38FA100, g	Quartz	(39.9 mm)	15.8 mm	23.5 mm	0	12.9 mm
9d.	38FA100, g	Quartz	(37.8 mm)	10.8 mm	23.4 mm	0	12.0 mm
9e.	38FA100, g	Quartz	(27.2 mm)	16.7 mm	26.7 mm	0	11.4 mm
9f.	38YK26, g	Carolina Slate	16.3 mm	16.6 mm	(24.1 mm)	0	6.5 mm
9g.	38FA100, g	Quartz	-	13.6 mm	23.3 mm	0	11.4 mm
9h.	38FA118, c	Quartz	-	-	26.5 mm	0	9.8 mm
9i.	38CS88, if	Quartz	-	-	29.1 mm	0	9.7 mm
Guilford points:							
11a.	38YK40, g	Quartz	(28.7 mm)	18.1 mm	20.9 mm	14.9 mm	10.8 mm
11b.	38CS72, tp	Quartz	(30.3 mm)	13.8 mm	21.1 mm	12.4 mm	10.5 mm
11c.	38FA100, g	Quartz	-	17.6 mm	20.1 mm	0	9.6 mm
11d.	38FA100, g	Quartz	-	14.6 mm	20.3 mm	0	10.8 mm
11e.	38CS90, if	Quartz	-	-	-	20.6 mm	-
11f.	38FA102, c	Quartz	-	-	-	16.8 mm	-
11g.	38FA118, c	Carolina Slate	-	-	-	-	-

PROJECTILE POINT METRIC DATA

Late Archaic Points

Figure Number	Site Number And Method	Raw Material	Blade Length	Haft Element Length	Blade Base Width	Proximal Haft Element Width	Maximum Thickness
Savannah River and other broad blade points:							
12a.	38YK25, c	Quartz	-	12.3 mm	-	(18.9 mm)	13.5 mm
12b.	38YK25, c	Quartz	-	12.8 mm	(26.1 mm)	-	11.8 mm
12c.	38YK25, c	Quartz	-	15.8 mm	31.5 mm	(19.5 mm)	11.2 mm
12d.	38YK25, c	Quartz	-	14.3 mm	(31.8 mm)	16.2 mm	(10.8 mm)
12e.	38YK25, c	Quartz	-	(15.3 mm)	(35.4 mm)	(18.8 mm)	14.9 mm
12f.	38YK25, c	Quartz	-	12.7 mm	30.0 mm	(18.5 mm)	16.5 mm
13a.	38CS94, c	Quartz	-	15.5 mm	33.3 mm	22.8 mm	15.0 mm
13b.	38FA100, g	Quartz	-	11.3 mm	(39.2 mm)	25.5 mm	10.4 mm
13c.	38CS75, c	Argillite	-	23.0 mm	-	11.1 mm	(5.4 mm)
13d.	38CS74, g	Tuffaceous(?)	-	(12.4 mm)	44.4 mm	(23.2 mm)	12.8 mm
13e.	38YK26, g	Carolina Slate	-	-	36.3 mm	-	12.5 mm

Note: Numbers enclosed by parentheses are estimates made to compensate for slight damage to points of measurement.

Key to Abbreviations for Collection Methods

c: controlled
g: grab
tp: test pit
if: isolated find

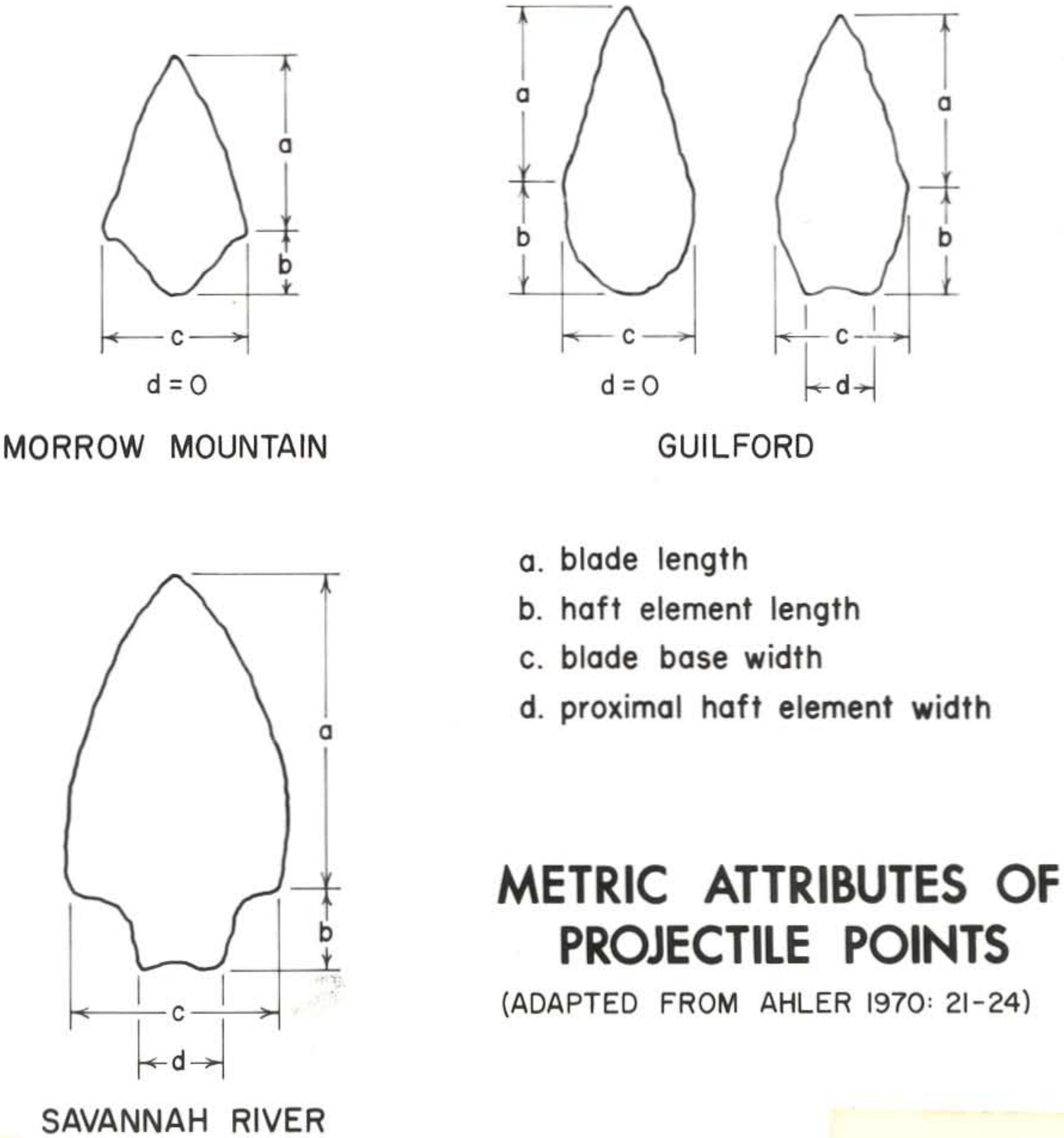

FIGURE 21: Metric attributes of projectile points.

APPENDIX E.

ANALYSIS OF METRIC ATTRIBUTES OF BIFACE THINNING FLAKES FROM I-77 CONTROLLED COLLECTIONS

Site[1]	n	Raw material					Length (mm)		Width (mm)		Thickness (mm)		Weight (g)	
		Q	S	T	C	O	$\bar{x}$	C.V.	$\bar{x}$	C.V.	$\bar{x}$	C.V.	$\bar{x}$	C.V.
38RD104	9	9	0	0	0	0	21.5	63	27.6	31	8.0	27	6.6	95
38FA100c	23	22	1	0	0	0	21.4	45	17.0	38	4.7	48	2.2	132
38FA102	7	7	0	0	0	0	12.9	24	16.0	24	4.2	31	1.0	95
38FA103	10	10	0	0	0	0	14.0	39	13.9	27	4.3	25	1.2	60
38FA107A	13	12	1	0	0	0	15.3	50	17.8	34	4.3	35	1.2	102
38FA116	13	6	7	0	0	0	12.2	32	12.6	26	3.0	38	0.7	91
38FA118	59	28	15	2	14	0	14.8	52	16.2	44	3.5	82	1.1	239
38CS64	15	15	0	0	0	0	15.7	57	17.7	49	4.1	37	1.5	107
38CS71	12	10	1	1	0	0	15.5	59	16.2	69	3.6	61	1.8	164
38CS72	22	21	1	0	0	0	16.7	47	16.3	40	3.8	48	1.3	103
38CS75	45	39	1	0	0	5[2]	15.5	30	17.5	45	3.9	41	1.1	111
38CS83	26	25	0	1	0	0	17.8	47	16.6	36	5.0	50	2.7	124
38CS84	23	15	6	2	0	0	17.2	61	17.1	57	4.0	51	1.8	148
38CS92A	19	11	3	3	1	1	17.6	62	17.2	38	4.5	43	2.1	102
38CS92B	15	9	1	5	0	0	26.3	29	29.1	55	6.7	40	5.0	79
38CS94	7	6	1	0	0	0	15.3	24	18.9	50	3.9	55	1.5	117
38YK24B	21	21	0	0	0	0	16.3	37	18.0	37	4.5	50	1.8	110
38YK24C	31	31	0	0	0	0	19.7	41	20.0	41	5.4	51	2.9	170
38YK25A	55	49	6	0	0	0	18.5	33	17.7	37	4.1	39	1.4	98
38YK37	15	11	4	0	0	0	18.3	38	14.6	31	3.8	48	1.1	136
38YK39	24	24	3	0	0	0	19.9	53	16.3	40	4.5	48	1.7	128

[1] Only collections with 5 or more thinning flakes were used in this analysis. Also, not all attributes were measureable on every flake.

[2] These flakes are all argillite.

ANALYSIS OF METRIC ATTRIBUTES OF BIFACE THINNING FLAKES FROM I-77 CONTROLLED COLLECTIONS

KEY TO ABBREVIATIONS:

Raw Material

- Q: Quartz
- S: Carolina slate or ignimbrite
- T: Tuffaceous
- C: Chert
- O: Other

$\bar{x}$: sample mean

C.V.: Coefficient of variation

$$C.V. = \frac{\text{standard deviation}}{\text{sample mean}} \times 100$$

APPENDIX F.

STREAM RANKING AND CHANNEL MORPHOLOGY

Stream Number	Drainage Rank	Channel Width	Channel Depth	Stream Bed	Flood Plain Width
1	1		(under construction)		
2	3		(under construction)		
3	1		(under construction)		
4	3		(under construction)		
5	1		(under construction)		
6	4	20'	10'	rocky	800'
7	1	10'	6'	i	500'
8	1	15'	4'	rocky	300'
9	2	15'	5'	rocky	200'
10	2	30'	5'	i	200'
11	1	8'	4'	sand and gravel	400'
12	5	50'	6'	sand and gravel	600'
13	1	6'	3'	rocky	50'
14	1	6'	5'	sandy	150'
15	1	10'	6'	sandy	150'
16	4	40'	10'	sandy	500'
17	1	6'	2'	sand and gravel	200'
18	1	6'	3'	sand and gravel	200'
19	1	12'	6'	sandy	400'
20	1	6'	6'	sandy	150'
21	2	6'	5'	rocky	150'
22	2	12'	6'	sandy	150'
23	2	4'	5'	rocky	50'
24	5	30'	5'	sandy	2600'
25	1	10'	4'	rocky	150'
26	5	40'	5'	sandy	600'
27	1	15'	3'	rocky	150'
28	2	10'	4'	rocky	150'
29	1	4'	10'	i	50'
30	2	3'	4'	sandy	200'
31	2	i[1]	i[1]	i[1]	150'
32	2	5'	3'	sand and gravel	200'
33	2	8'	4'	rocky	250'
34	1	3'	1'	no water	20'
35	1	10'	6'	sandy	300'
36	1	6'	4'	sand and gravel	200'
37	4	40'	6'	rocky	600'
38	5	80'	15'	i	1200'
39	1	i[1]	i[1]	i[1]	200'
40	1		(under construction)		

STREAM RANKING AND CHANNEL MORPHOLOGY

Stream Number	Drainage Rank	Channel Width	Channel Depth	Stream Bed	Flood Plain Width
41	1		(under construction)		
42	2		(under construction)		
43	3	i[2]	i[2]	i[2]	50'
44	1	i[2]	i[2]	i[2]	i[2]
45	3	10'	5'	sand and gravel	300'
46	1	3'	2'	rocky	50'

Key to abbreviation:

1: Insufficient data, attribute not observable.

[1] No well defined channel.
[2] Stream channel altered by construction.

APPENDIX G.

AREA OF ALLUVIAL CREEK BOTTOMS AND NUMBER OF LOWER RANK STREAMS WITHIN ONE-HALF MILE RADIUS CATCHMENTS OF SAMPLING UNITS AND PREHISTORIC SITES

Notes: (1) Bottomland was measured only if associated with streams of drainage rank 3 or greater.
(2) These variables were measured only for sampling units with visibility rank of 1 or 2.

Sampling Units	Total Area of Bottomland in Square Miles	Percentage of Catchment in Bottomland	Number of Rank 1 Streams	Number of Rank 2 Streams
0-IV		Under construction		
1-III		Under construction		
2-V		Under construction		
3-II		Under construction		
4-V	0.010	1.28	2	1
5-III	0.000	0.00	4	1
6-II	0.000	0.00	5	0
7-I	0.000	0.00	4	1
8-II	0.064	8.20	2	2
9-I	0.000	0.00	4	0
				1
10-III	0.000	0.00	6	1
11-III	0.000	0.00	5	1
12-V	0.000	0.00	4	0
13-II	0.000	0.00	4	1
14-I	0.000	0.00	5	0
15-III	0.000	0.00	6	1
16-IV	0.119	15.12	2	0
17-II	0.000	0.00	2	0
18-I	0.000	0.00	3	1
19-IV	0.243	30.97	2	1
20-II	0.087	11.11	4	2
21-II	0.003	0.36	3	1
22-I	0.000	0.00	5	1
23-I	0.000	0.00	6	1
24-II	0.017	2.19	4	2
25-III	0.000	0.00	4	0
26-I	0.003	0.36	5	1
27-II	0.000	0.00	3	1
28-V	0.000	0.00	4	1
29-I	0.040	5.10	2	0

AREA OF ALLUVIAL CREEK BOTTOMS AND NUMBER OF LOWER RANK STREAMS WITHIN ONE-HALF MILE RADIUS CATCHMENTS OF SAMPLING UNITS AND PREHISTORIC SITES

Sampling Units	Total Area of Bottomland in Square Miles	Percentage of Catchment in Bottomland	Number of Rank 1 Streams	Number of Rank 2 Streams
30-III	0.334	42.63	3	0
31-I	0.019	2.37	4	0
32-I	0.029	3.64	4	2
33-IV	0.000	0.00	3	1
34-I	0.000	0.00	4	0
35-V	0.037	4.74	4	2
36-II	0.033	4.19	4	2
37-I	0.000	0.00	3	1
38-I	0.000	0.00	1	0
39-I	0.000	0.00	2	1
40-I	0.222	28.26	0	0
41-IV	0.365	46.48	0	1
42-III	0.078	9.92	0	1
43-III		Under construction		
44-IV		Under construction		
45-IV		Under construction		
46-IV	0.001	0.18	2	1
47-I	0.147	18.72	0	0
48-III	0.132	16.76	1	3
49-I	0.000	0.00	3	0

Site Number	Total Area of Bottomland in Square Miles	Percentage of Catchment in Bottomland	Number of Rank 1 Streams	Number of Rank 2 Streams
38RD104	0.110	14.52	0	3
38FA100	0.160	20.40	4	0
38FA101	0.000	0.00	4	1
38FA103	0.000	0.00	4	1
38FA102	0.014	1.82	4	2
38FA105	0.044	5.65	6	2
38FA104	0.000	0.00	4	0
38FA107	0.000	0.00	5	1
38FA110	0.000	0.00	4	1
38FA117	0.000	0.00	5	0

AREA OF ALLUVIAL CREEK BOTTOMS AND NUMBER OF LOWER RANK STREAMS WITHIN ONE-HALF MILE RADIUS CATCHMENTS OF SAMPLING UNITS AND PREHISTORIC SITES

Site Number	Total Area of Bottomland in Square Miles	Percentage of Catchment in Bottomland	Number of Rank 1 Streams	Number of Rank 2 Streams
38FA116	0.000	0.00	8	1
38FA115	0.121	15.48	4	1
38FA119	0.119	15.12	2	0
38FA118	0.000	0.00	5	1
38FA106	0.237	30.24	3	2
38FA112	0.000	0.00	5	1
38FA114	0.000	0.00	6	1
38CS93	0.000	0.00	4	0
38CS90	0.116	14.76	2	1
38CS91	0.119	15.12	2	1
38CS92	0.113	14.39	2	1
38CS88	0.000	0.00	3	1
38CS87	0.000	0.00	3	1
38CS86	0.000	0.00	4	1
38CS71	0.040	5.10	2	0
38CS73	0.245	31.15	2	0
38CS72	0.333	42.44	2	0
38CS65	0.313	39.89	3	0
38CS64	0.334	42.63	3	0
38CS66	0.286	36.43	3	0
38CS69	0.059	7.49	3	2
38CS68	0.029	3.64	4	2
38CS67	0.000	0.00	3	1
38CS83	0.000	0.00	4	0
38CS84	0.044	5.65	6	2
38CS85	0.001	0.18	5	2
38CS82	0.037	4.74	4	2
38CS81	0.013	1.64	3	1
38CS80	0.000	0.00	3	1
38CS77	0.000	0.00	1	0
38CS94	0.175	22.29	1	0
38CS79	0.341	43.44	0	0
38CS74	0.316	40.25	0	1
38CS75	0.363	46.24	1	1
38CS76	0.170	21.66	0	1

AREA OF ALLUVIAL CREEK BOTTOMS AND NUMBER OF LOWER RANK STREAMS WITHIN ONE-HALF MILE RADIUS CATCHMENTS OF SAMPLING UNITS AND PREHISTORIC SITES

Site Number	Total Area of Bottomland in Square Miles	Percentage of Catchment in Bottomland	Number of Rank 1 Streams	Number of Rank 2 Streams
38YK25	0.001	0.18	2	1
38YK26	0.059	7.47	1	1
38YK24	0.147	18.72	0	0
38YK39	0.223	28.37	1	1
38YK37	0.150	19.12	2	2
38YK40	0.000	0.00	4	0

APPENDIX H.

PAST AGRICULTURAL MODIFICATIONS FOUND IN SURVEY UNITS

Sampling Units	Rock Piles	Terraces *	Predominantly Pine	Hillside Ditches	Extensive Gullying
0-IV			under construction		
1-III			under construction		
2-V			under construction		
3-II			under construction		
4-V	o	o	o	o	o
5-III	o	o	o	o	o
6-II	x	x	x	o	o
7-I	o	o	o	o	o
8-II	o	o	o	o	o
9-I	o	o	x	o	x
10-III	o	x	x	o	x
11-III	o	o	o	o	x
12-V	o	o	x	o	x
13-II	o	o	x	o	x
14-I	o	x	x	o	o
15-III	o	o	x	o	o
16-IV	o	o	x	o	o
17-II	x	o	x	o	x
18-I	o	o	x	o	o
19-IV	x	o	o	o	o
20-II	o	x	o	o	o
21-II	x	o	x	o	o
22-I	x	o	x	o	x
23-I	o	o	o	o	o
24-II	o	o	x	o	o
25-III	o	o	x	o	o
26-I	x	o	x	x	x
27-II	o	o	o	o	o
28-V	o	o	x	o	x
29-I	o	o	x	o	x
30-III	o	o	o	o	o
31-I	x	o	x	o	x
32-I	o	o	o	x	x
33-IV	o	o	x	o	x
34-I	x	o	o	o	o
35-V	o	x	x	o	x
36-II	o	o	o	o	o
37-I	o	o	x	o	x
38-I	o	o	x	o	o
39-I	x	o	x	x	o

PAST AGRICULTURAL MODIFICATIONS FOUND IN SURVEY UNITS

Sampling Units	Rock Piles	Terraces *	Predominantly Pine	Hillside Ditches	Extensive Gullying
40-I	o	o	o	o	o
41-IV	o	o	o	o	x
42-III	o	o	x	o	x
43-III			under construction		
44-IV			under construction		
45-IV			under construction		
46-IV			under construction		
47-I			under construction		
48-III	o	o	o	o	o
49-I	o	o	x	o	o
Total	9	5	23	3	17

Stream Crossings	Rock Piles	Terraces *	Predominantly Pine	Hillside Ditches	Extensive Gullying
1			under construction		
2			under construction		
3			under construction		
4			under construction		
5			under construction		
6	o	o	o	o	o
7	o	o	o	o	o
8	o	o	o	o	o
9	o	x	o	o	o
10	o	x	o	o	o
11	o	o	o	o	o
12	o	o	o	o	o
13	o	o	o	o	o
14	o	o	o	o	o
15	o	o	o	o	o
16	x	o	o	o	o
17	o	x	o	o	o
18	o	o	o	o	o
19	o	o	o	o	o
20	o	o	o	o	o

PAST AGRICULTURAL MODIFICATIONS FOUND IN SURVEY UNITS

Stream Crossings	Rock Piles	Terraces*	Predominantly Pine	Hillside Ditches	Extensive Gullying
21	o	x	o	o	o
22	o	o	o	o	o
23	x	o	o	x	x
24	o	o	o	o	o
25	o	o	o	o	o
26	x	x	x	o	o
27	o	x	o	o	o
28	x	x	o	o	o
29	o	o	x	o	x
30	o	o	o	o	o
31	o	o	o	o	o
32	o	x	o	o	x
33	o	o	o	o	o
34	o	o	o	o	o
35	o	o	x	o	o
36	x	o	o	x	o
37	o	o	o	o	o
38	o	o	o	o	o
39	o	x	x	o	x
40			under construction		
41			under construction		
42			under construction		
43			under construction		
44			under construction		
45	o	o	o	o	o
46	o	x	o	o	o
Total	5	10	4	2	5

Key: x - present
o - absent

* These terraces were used to help prevent erosion when plowing on steep hillsides.

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