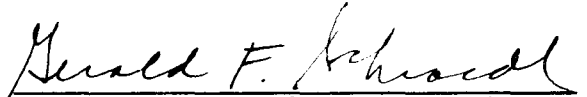
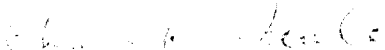
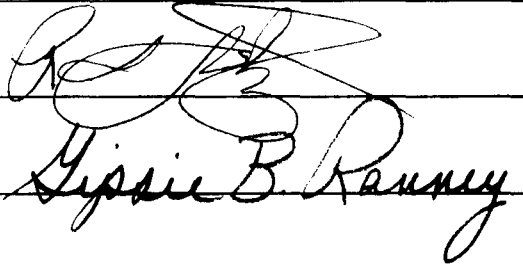


To the Graduate Council:

I am submitting herewith a dissertation written by C. Clifford Boyd, Jr. entitled "An Evolutionary Approach to the Prehistory of Upper East Tennessee and Adjacent Areas." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Anthropology.


Gerald F. Schroedl, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:


Vice Provost
and Dean of The Graduate School

AN EVOLUTIONARY APPROACH TO
THE PREHISTORY OF UPPER EAST TENNESSEE
AND ADJACENT AREAS

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

C. Clifford Boyd, Jr.

August 1986

To My Wife, Donna

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ABSTRACT

Temporal and spatial variation in functional and stylistic attributes of lithic and ceramic artifacts from upper East Tennessee, Southwest Virginia, and western North Carolina are documented using concepts of an evolutionary theory of cultural selection. In all, 29,098 lithic and 7,625 ceramic artifacts were selected for this study from 164 sites using purposive and random sampling techniques. Chronological ordering of these artifacts and their contexts was based on 43 existing radiocarbon dates for Early Archaic through Protohistoric period contexts, and comparison with radiocarbon dated components outside the study area. Nominal and ratio-level artifact attributes were partitioned into functional and stylistic classes for analysis using frequency distribution comparisons, graphs, and principal component, cluster, and canonical discriminant analyses.

The study identified significant temporal trends in functional and stylistic traits. Functional evolutionary changes in projectile point form (from stemmed to unstemmed) and size (from large to small in unstemmed points) occurred over time and are related to changes from an atlatl dart to bow and arrow technology. Changes over time in settlement location were also functional in an evolutionary sense, with later intensive occupation on or near river floodplains tied to agricultural intensification. Stylistic traits of ceramic surface treatment increased in diversity over time with an increasing importance of these attributes as intercultural communicative elements. The study demonstrates that the division of attributes and even artifact classes into functional and stylistic classes improves the

interpretation of their evolutionary significance. The results of the study also suggest that the concept of cultural selection can become part of a more inclusive evolutionary theory.

TABLE OF CONTENTS

CHAPTER	PAGE
I. STATEMENT OF PROBLEM	1
Introduction	1
Theoretical Orientation	3
Culture Chronology and Settlement Studies--Problems	14
Summary	16
II. MATERIALS AND METHODS	18
Introduction	18
Review of Sampling Procedures and Problems	18
Contexts and Materials Sampled	23
Data Presentation and Analysis	42
Analysis Methods	47
Summary	53
III. CHRONOLOGY	55
Introduction	55
Evaluation of Prehistoric Chronologies	56
Chronological Relationships of Dates and Artifacts in the Study Area to Those From Other Regions	64
Summary	92
IV. FUNCTIONAL VARIATION	94
Introduction	94
Functional Variation in Ceramic Artifacts	94
Functional Variation in Lithic Artifacts	101
Functional Variation in Site Location	117
Summary	129
V. STYLISTIC VARIATION	133
Introduction	133
Temper and Surface Treatment Variation in Ceramic Artifacts	134
Morphological Variation in Projectile Points	147
Summary	172
VI. CONCLUSIONS	175
BIBLIOGRAPHY	181
VITA	197
APPENDIXES (Microfiche in pocket)	
APPENDIX A. SITE CONTEXTS	
APPENDIX B. LITHIC AND CERAMIC CODING FORMATS	
APPENDIX C. LITHIC DATA FILES	
APPENDIX D. CERAMIC DATA FILES	

LIST OF TABLES

TABLE	PAGE
1. Lithic and Ceramic Artifact Samples Selected for Analysis	19
2. Metric Attributes Measured for Selected Stemmed and Triangular Projectile Points	50
3. Chronology for the Mountain Region of Western North Carolina	57
4. Chronology for the Blue Ridge Province of Southwest Virginia	58
5. Chronology for the Watauga Reservoir	59
6. Chronology for the Appalachian Summit of North Carolina	60
7. Chronology for the Lower Little Tennessee River Valley	61
8. Suggested Chronology for the Study Area	65
9. Radiocarbon Dates from the Study Area	67
10. Sherd Thickness Means and Standard Deviations by Temper Class	96
11. Lithic Artifact Raw Material Class Definitions	102
12. Lithic Artifact Technological Class Definitions	103
13. Debitage Raw Material Frequencies for Dated Contexts	104
14. Core and Core Tool Raw Material Frequencies for Dated Contexts	105
15. Bifacial Tool Raw Material Frequencies for Dated Contexts	106
16. Diagnostic Lithic Artifact Types by Raw Material	109
17. Projectile Point Area Means and Standard Deviations	110
18. Projectile Point Area Means and Standard Deviations by Raw Material Type	111
19. Site Location by Temporal Period for the Watauga Reservoir Sites	119

TABLE	PAGE
20. Site Location by Temporal Period for the New River Survey Sites	122
21. Site Location by Temporal Period for the Southwest Virginia Survey Sites	123
22. Site Location by Temporal Period for the Upper Watauga River Valley Sites	124
23. Site Location by Temporal Period for Sites in the Great Smoky Mountains	125
24. Ceramic Temper Class Frequencies by Dated Contexts	136
25. Total Ceramic Surface Treatment Frequencies by Temper Class	139
26. Ceramic Rim Sherd Surface Treatments by Dated Context	140
27. Ceramic Neck Sherd Surface Treatments by Dated Context	141
28. Ceramic Body Sherd Surface Treatments by Dated Context	142
29. Eastman Rockshelter Ceramic Temper and Surface Treatment Distributions	148
30. Diagnostic Lithic Artifacts from Dated Contexts	150
31. Daugherty's Cave Diagnostic Lithic Artifacts	151
32. Selected Stemmed Projectile Point Raw Material, Stem Shape and Base Shape Variation	153
33. Selected Triangular Projectile Point Raw Material and Base Shape Variation	155
34. Principal Component Pattern Matrix for Stemmed Projectile Point Analysis	157
35. Temporal Groups for Canonical Discriminant Analysis of Stemmed Projectile Points	160
36. Canonical Discriminant Analysis Results for Stemmed Projectile Points by Time	161

TABLE	PAGE
37. Canonical Structure of the First and Second Canonical Variates--Stemmed Projectile Points by Time	162
38. Principal Component Pattern Matrix for Triangular Projectile Point Analysis	165
39. Temporal Groups for Canonical Discriminant Analysis of Triangular Projectile Points	167
40. Canonical Discriminant Analysis Results for Triangular Projectile Points by Time	168
41. Canonical Structure of the First and Second Canonical Variates--Triangular Projectile Points by Time	170

LIST OF FIGURES

FIGURE	PAGE
1. The Study Area with Site and Survey Locations	2
2. The 1979 Test Excavations at 40WG17	24
3. Stratigraphy of Radiocarbon-Dated Ditch at 40CK10	29
4. Plan View of Excavation Units at 40SL34	31
5. Area of Watauga Reservoir Surveyed in 1983-1984	36
6. Phipps Bend Area Site Locations	38
7. Schematic Diagram of Ceramic Vessel Portions	45
8. Metric Attributes Measured for Selected Projectile Points	48
9. Nominal Stem and Base Shape Attributes Coded for Selected Projectile Points	49
10. Early Woodland Period Calibrated Dates	71
11. Middle Woodland Through Protohistoric Dates with Calibrations Based on Damon et al. (1974)	76
12. Middle Woodland Through Protohistoric Dates with Calibrations Based on Stuiver (1982)	77
13. Rim Sherd Thickness Means and Confidence Interval Approximations by Temper Class	97
14. Neck Sherd Thickness Means and Confidence Interval Approximations by Temper Class	98
15. Body Sherd Thickness Means and Confidence Interval Approximations by Temper Class	99
16. Mean Areas and Approximations to Confidence Intervals for the Mean for Different Projectile Point Types	112
17. Mean Areas and Approximations to Confidence Intervals for the Mean for Projectile Points by Raw Material Type	114
18. Surface Treatment Class Richness for Body Sherds	145
19. Cubic Clustering Criterion Plot for Stemmed Projectile Point Cluster Analysis	158

FIGURE	PAGE
20. Plot of CAN2 by CAN1--Canonical Discriminant Analysis of Stemmed Projectile Points by Time	163
21. Cubic Clustering Criterion Plot for Triangular Projectile Point Cluster Analysis	166
22. Plot of CAN2 by CAN1--Canonical Discriminant Analysis of Triangular Projectile Points by Time	171

CHAPTER I

STATEMENT OF PROBLEM

Introduction

Much of the archaeological information collected from upper East Tennessee in the past three decades has not been adequately reported or synthesized into a unified picture of prehistoric culture variability and change. Moreover, the interrelationships between upper East Tennessee and the adjoining subregions of Southwest Virginia and western North Carolina have received only cursory examination. These three subregions comprise the study area for this project. The Tennessee component of the tri-state study area includes that portion of the upper Tennessee valley north and east of Knoxville, Tennessee, with portions of the Blue Ridge and Ridge and Valley physiographic provinces of upper East Tennessee, and the Pigeon, French Broad, Nolichucky, Clinch, Powell, Holston, and Watauga River drainages. The North Carolina component includes the Appalachian Summit area of the western portion of the state, and primarily sites along the Watauga and New River drainages. The Virginia component includes the southwestern Virginia counties covered in Holland's (1970) archaeological survey, primarily encompassing portions of the Blue Ridge and Ridge and Valley provinces, and the Powell, Clinch, Holston, New, and Dan River drainages (Figure 1). Comparative artifact and site information related to this study area is derived from the Great Smoky Mountains of Tennessee and North Carolina (Bass 1977), the lower Little Tennessee River valley (Davis et al. 1982; Kimball 1985), the southern

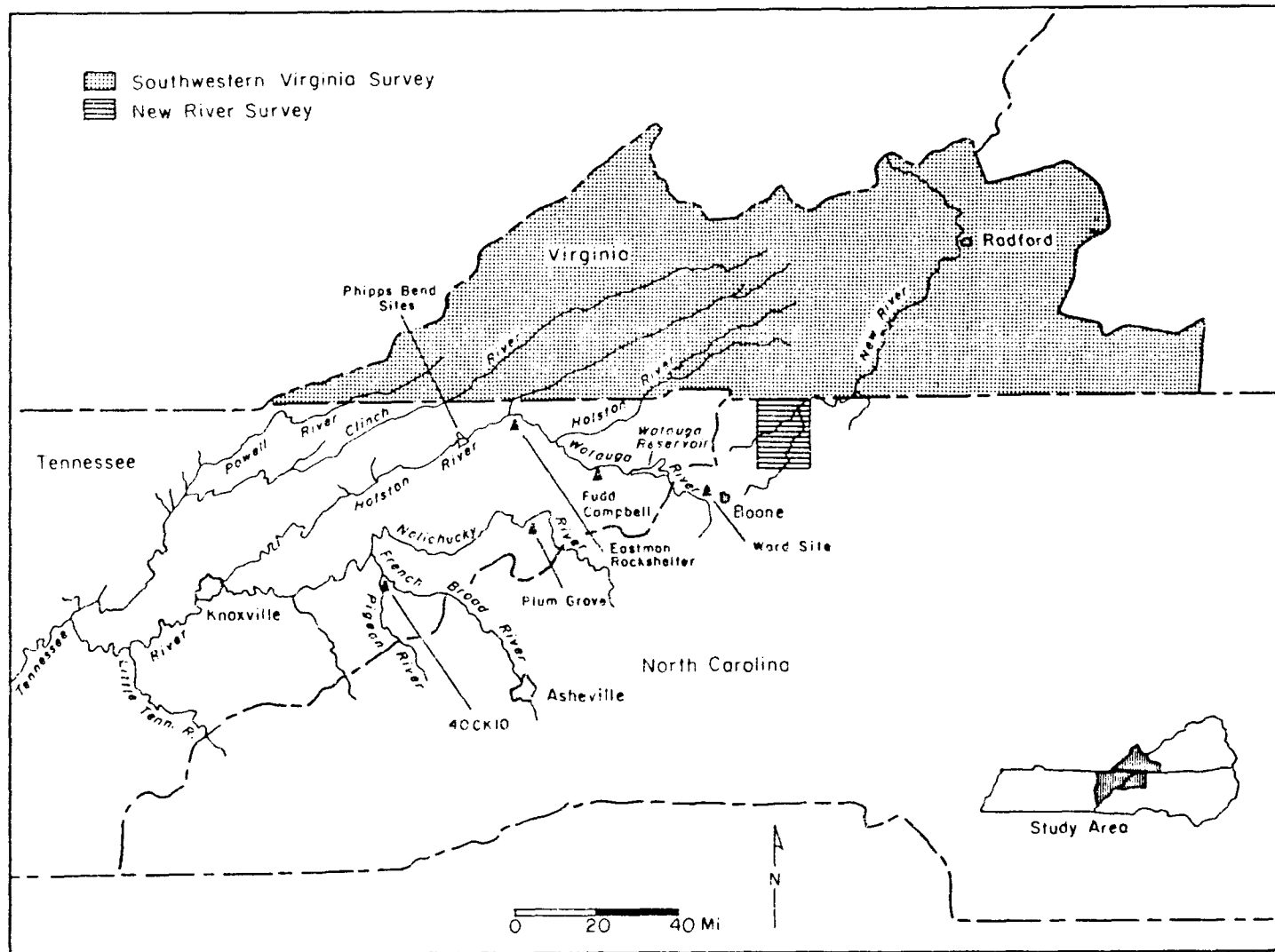


Figure 1. The Study Area with Site and Survey Locations.

portion of the North Carolina Appalachian Summit region (Dickens 1976; Keel 1976), and the Piedmont province of North Carolina (Coe 1964). These three subregions have been chosen as the study area for this research because of the need to better understand their prehistory. The general purpose of this research is to document variation in lithic and ceramic artifacts in these subregions using concepts derived from the evolutionary theory of cultural selection (Dunnell 1980; Rindos 1984) and to describe this variation through time and across space. This chapter introduces the theoretical orientation of this study, and specific research problems of the study area.

Theoretical Orientation

Recent studies of prehistoric culture chronology and settlement variability in the southeastern United States have used a variety of approaches and methods, ranging from more traditional typological groupings by qualitative formal attributes (Chapman 1973; Geier 1983), to the statistical analysis of quantitative attributes to derive chronologically significant artifact groupings (Kimball and Baden 1985; Schroedl et al. 1985) and settlement patterns (Baden 1985; Peebles 1978; Steponaitis 1978). This diversity in research methodology is one result of the discipline-wide dissatisfaction with and reaction to traditional archaeological goals and methods which began in the 1960s and gave rise to the "new archaeology" (Binford 1977). Although more than two decades have passed since the inception of this debate between "traditional" archaeologists and those archaeologists who wished to adopt a "scientific approach," little consensus in

concepts and methodology has resulted (Meltzer 1979). Perhaps the two most obvious results of this ongoing debate have been 1) a greater reliance on quantitative and mathematical measurements and indices in archaeological analyses, and 2) the more formal statement of hypotheses to be tested. While mathematics is the language of science, its use in a field of inquiry does not make that field "scientific" (as exemplified by its use in astrology). The formal statement of "hypotheses" does not make an archaeological report or analysis "scientific," either. Many of the problems in the development of archaeology as a science in general, and its application to the study of artifact variability in the southeastern United States in particular, have stemmed from the misinterpretation and unclear application of the concepts paradigm, theory, and hypothesis.

Kuhn (1970:viii) defines paradigms as "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners." Paradigms, therefore, give scientific research a structure by limiting the types of facts, or observations, that are obtained, analyzed, and explained. The acceptance of a paradigm by a scientific community sets the problems for that community, limits their possible solutions, and may even clarify the rules to follow in their solution (Kuhn 1970:37-40). The paradigm thus establishes a "normal science" (Kuhn 1970:10). Paradigms change (i.e., a scientific revolution occurs) when detailed scientific analyses based on the paradigm produce anomalies (novelties) which are inconsistent with the paradigm (Kuhn 1970:64-65).

A critique of Kuhn's interpretation of paradigms and scientific

revolutions by Meltzer (1979:645) stresses that Kuhn actually discusses three classes of paradigms: 1) metaphysical paradigms--ways of looking at subject matter that are shared by the scientific community as a whole; 2) sociological paradigms--scientific habits, or "an accepted method of practicing science prior to the development of a theory" (Meltzer 1979:647); and 3) construct paradigms--the methodological techniques for solving particular problems. Meltzer (1979:653-654) concludes that the "new archaeology" has not produced a scientific revolution in the field, because it has not altered the metaphysical paradigm of American archaeology - both "new" and "old" archaeologists treat artifacts, sites and other archaeological manifestations as "systems of fossilized behavior, capable of reconstruction in anthropological terms" (Meltzer 1979:653). Major changes in the field have occurred in the construct paradigms, or the methods used by archaeologists to reconstruct past behavior.

As defined by Clarke (1977) and Hodder (1981), paradigms are "approaches, interests, and assumptions" (Hodder 1981:7) and, as such, are sociological paradigms (in Meltzer's terminology). Four of these paradigms prominent in archaeology include the anthropological, geographical, ecological, and morphological paradigms (Hodder 1981:7-11). As Meltzer would see them, these paradigms are all independently operative in archaeology, because of the absence of a unified archaeological theory. This lack of a general archaeological theory is also stressed by other researchers (Binford 1977; Dunnell 1980, 1986). However, Dunnell (1978, 1980, 1986) is notably different from Binford and others in stressing the development of a theoretical structure

unique to archaeology (i.e., change in the "archaeology as anthropology" metaphysical paradigm) before lower level sociological and construct paradigms can be integrated into a fully unified archaeological research strategy. Clarke (1968) had also stressed the uniqueness of archaeology as a discipline, but still relied on paradigmatic borrowing from other social sciences, and the "integration" of archaeology into the social sciences (Hodder 1981:11).

Dunnell (1980) has suggested the use of concepts from evolutionary biology to build a general archaeological theory. His initial applications of these concepts to archaeological data (Dunnell 1978), and the more eloquent development and application of these concepts by Rindos (1980, 1984, 1985) have clarified the changes needed in the archaeological metaphysical paradigm in order to bring about a "scientific revolution" (at least by means of a Darwinian evolutionary model).

First, the concept of directed culture change common to anthropological cultural evolution (as developed by Herbert Spencer [1880]) must be rejected; culture change must be seen as a two-part process, not linear progress. Second, cultural variation must be emphasized over any typological groupings of cultures or their products; a typological approach does not effectively model culture change. The existence of this variation (created by whatever means) is the first part of the process of culture change. Third, the concept of cultural selection of this available variation must be accepted as the mechanism, or second part, of the process of culture change. Cultural selectionism, like the synthetic theory of biological evolution (Mayr

1963), emphasizes two stages: 1) variability in human behavior, and 2) the selection of certain behaviors because they increase the fitness or "differential reproductive success" (Rindos 1984:43) of the members of a culture.

The acceptance of these elements by archaeologists would constitute a change from the "anthropological" metaphysical archaeological paradigm to one based on Darwinian evolutionary concepts. This paradigmatic shift is necessary before a general archaeological theory of cultural selection can develop. And, as Dunnell (1980) and others have indicated, such a theory, incorporating concepts of evolutionary biology into a unique cultural framework, is the only one which can provide testable explanations for culture process.

This brings us to a brief consideration of theory and how it is variously defined and applied. A theory may be defined as "a set of interrelated, rather high-level principles or laws that can provide an explanatory framework to accommodate a broad range of phenomena" (Salmon 1982:140). According to Hempel (1966:60), theories explain empirical regularities and predict new ones. Laws, or explanatory statements causally relating two particular events (Hempel 1966:53) or classes, are major components of theories. These laws may be either universal or general in form or statistical or probabilistic "empirical generalizations" (Hempel 1966:54-59; Salmon 1982:9). Although many philosophers of science consider both types as equally legitimate "laws," statistical empirical generalizations in archaeology do not "explain" relationships between two classes, and, in fact,

universally applicable archaeological laws would be very difficult to develop (Dunnell 1986).

Setting aside the problems with the definition and interpretation of laws, it is clear to most researchers what is needed for the development of theory. First, theories must be internally consistent in their form and entities; second, bridge principles must be defined and established which link the theory to empirical phenomena (Hempel 1966:72-75). Binford (1977) interprets the development of theory in two stages: general theory (see the definition above), and what he terms "middle range theory," which is comparable to Hempel's (1966:74) bridge principles. General theory relates to an "understanding of the process responsible for change and diversification in the organizational properties of living systems" (Binford 1977:7). Or, as Dunnell (1971:34) states, theories "provide the basis for explanation of phenomena." In this sense, Dunnell and Binford are referring to the same entity in their discussions of "general" theory development. Binford's (1977:6) middle range theory attempts to link 1) "contemporary facts to statements about the past," and 2) the "static facts of the archaeological record to statements of dynamics." Although Binford (1977) feels that both levels of theory should be developed simultaneously, he has emphasized middle-range theory development, particularly in terms of site formation process, in much of his recent writing (e.g., Binford 1983). Moreover, his rather narrow application of middle-range research has been criticized (Raab and Goodyear 1984) because it has not stressed the hierarchical nature of such theories, and their linkage to general theory.

Finally, Clarke (1973) uses the term "subtheory" to refer to a hierarchical series of middle range theories which are necessary elements in the development of "general" theory. These subtheories--pre-depositional, depositional, post-depositional, retrieval, analytical, and interpretive--progressively link "static" material remains to "dynamic" general statements (theories) about them. This model of theory development more accurately reflects the original conceptions of middle range theory as reviewed by Raab and Goodyear (1984).

Theories, as formal statements of relationships between units (Dunnell 1971:34), can generate less formal hypotheses (or ideas) which explain specific empirical events and which can be tested (Dunnell 1971:37; Hempel 1966:16). Salmon (1982:32) defines hypotheses as "any statement subjected to evidential testing." While theories, particularly general theories, are "ideational" statements which provide a basis for explaining phenomena (Dunnell 1971:34, 38), hypotheses are "phenomenological," providing explanations for the relationships between empirical entities.

The requirement that hypotheses be tested, or amenable to empirical testing, emphasizes the inductive character of hypotheses (Dunnell 1971:38). As inductively tested statements, they risk falsification (Salmon 1982:35-36) if the test "fails." Conversely, a successful test does not "prove" the hypothesis, but does strengthen its credibility as an explanation. Confirmation of an hypothesis can therefore be stated in terms of probabilities or degrees of confirmation (Salmon 1982:31-56).

The testing of hypotheses, generated by a theory, can then lead

back to theory. Refinements in hypotheses, based on repeated testing, can provide better explanations for phenomena which, in turn, provide "insights into appropriate theoretical concepts and relationships between such concepts" (Salmon 1982:178).

Thus, the development of archaeological theory--a necessary procedure if archaeology is to become a science--will most likely depend on change in archaeology's metaphysical paradigm. A new paradigm, which views archaeological data as significant in their own right, can incorporate cultural selection as a general theory for the explanation of culture change. Lower-level (middle range) theories and testable hypotheses linking this general theory to empirical phenomena can be developed and tested. As Rindos (1984:74) states, "we should adopt a case-study approach to the understanding of selective components of cultural variation and change." Through testing, this process, these hypotheses, and by inference, the general theory itself, can be strengthened or weakened. In this study, temporal and spatial variation in lithic and ceramic artifacts and settlement location from upper East Tennessee, Southwest Virginia, and western North Carolina are used as a "case-study" in the application of some concepts of cultural selection. By documenting the variation in attributes of these artifacts over time and space, evolutionary patterns in their change can be discerned. Such research will not necessarily produce new descriptive statements about the distribution of prehistoric material culture, but it can lead to new explanations of observed regularities or changes.

In terms of such an archaeological theory of cultural selection

as outlined above, an important middle range theory or proposition concerns the classes of cultural variation of archaeological data. Dunnell (1978) defines these classes as functional and stylistic variation. Functional elements are "forms that directly affect the Darwinian fitness of the populations in which they occur" (Dunnell 1978:199), while "style denotes those forms that do not have detectable selective values" (Dunnell 1978:199). Dunnell (1978:197) considers functional traits to be those affected by the process of natural selection; whatever the origin of these traits, the important questions are how and why they become "fixed" in a population. Stylistic traits, on the other hand, are not only generated by random process, but their behavior and distribution are also determined by random and "historical" processes.

Although Dunnell (1978) considers function and style to be a "fundamental dichotomy" in archaeological data, Rindos (1985, personal communication, 1985), in defining two related terms--CS1 and CS2--sees a much closer relationship between the directly selective and symbolic (stylistic) elements of culture. CS1, or cultural selection of the first kind, is "the selection that arises from the direct selective advantage given individuals because they possess a certain trait" (Rindos 1985:73). Cultural selection of the first kind, then, is functional because it enhances the fitness of individuals. CS2, or cultural selection of the second kind, acts to bring about the selection or rejection of a trait without concern for the "direct selective advantage" (Rindos 1985:73) it provides its bearers.

Rindos (1985:73-74) stresses the importance of CS2 in cultural

systems, because no functional behavior can be selected for (CS1 processes) outside the context of other cultural traits and their interaction. CS2 processes include this interaction as well as other processes, such as enculturation, and thus control the evolution of traits in a culture. So, the "fit" of cultural traits and symbols, whether they are directly selective or not, must be "understood in the context of CS2" (Rindos 1985:74). Thus, the dichotomy of functional and nonfunctional (stylistic) units of culture is unrealistic; the acceptance or rejection of functional traits is affected by other stylistic and symbolic areas of culture.

It is recognized that cultural selectionism is an important attempt to provide a unified, general archaeological theory. Cultural selectionism, in combination with the well-established concepts of the synthetic theory of biological evolution, can form part of a more inclusive theory of evolutionary change (Leonard and Jones 1985). However, the major application of this theory has been Rindos' (1980, 1984) own development of the theory as a basis for explaining the origins of agriculture. This study applies this theory to change in lithic and ceramic artifacts. In order to do this, the variation in the data must first be identified and classified, because this is the information which will be directly or indirectly selected by the two kinds of cultural selection. Consequently, the first specific goal of this research is to document the variation through time and across space in lithic and ceramic artifacts from upper East Tennessee, Southwest Virginia and western North Carolina as a "case study" in the application of selectionist concepts. The attributes of these

artifacts are classified according to the function/style dichotomy, while recognizing that stylistic attributes may be "functional" in a symbolic sense although they do not directly enhance the fitness of the bearers.

The second specific goal is to evaluate the replicative success (Leonard and Jones 1985) of these traits over time. If one considers that artifacts, as the products of human behavior, are components of the human phenotype, then change in the frequency distributions of traits of artifacts over time will be indicative of cultural change. The replicative success of these traits is a useful measure of change in both functional and stylistic traits, because the concept does not imply "that some degree of selective advantage or disadvantage is conferred as a result of the transmission of a trait" (Leonard and Jones 1985:7). In this process, traits of any category (physiological, behavioral) and any scale are considered equivalent components of the human phenotype. This allows for comparability in the analysis of specific traits, and for their analysis at different hierarchical levels. Changes in the replicative success of functional artifact classes affects the reproductive success of their makers, and tie observable artifact frequency distributions to Darwinian evolutionary concepts, thus producing a more inclusive theory of evolutionary change.

Classification of lithic and ceramic artifacts and attributes using the function/style dichotomy is useful in the study of diverse artifact collections from several sites and subregions for several reasons. First, it provides a means of ordering these diverse

collections in terms of concepts (function and style) which can be interpreted in an evolutionary sense. Second, this standardized classification makes it easier to compare the variation in artifact attributes over time, and thereby observe changes in the frequency distributions of traits indicating evolutionary culture change. These changes serve to define the major chronological boundaries of the study area in a Darwinian rather than Spencerian evolutionary sense.

Culture Chronology and Settlement Studies--Problems

The refinement of prehistoric culture chronology has long been a major area of interest for most archaeologists working in the southeastern United States (Smith 1986; Stoltman 1978; Walthall 1980). Refinements in the regional chronology have provided the framework for the attainment of what Thomas (1979:141-142) has called "the intermediate objective" of contemporary archaeology--the reconstruction of past lifeways.

However, even with the revisions and current refinements of the chronology of the the region, and its numerous subregional chronologies, many areas of the southeastern United States are still poorly understood at this basic level. One such "subregion" is upper East Tennessee. Until recently, archaeological survey and excavation in this area was largely conducted by amateur archaeologists, with varying degrees of interest in the professional dissemination of their research, and usually with little or no professional supervision (for example, see Lewis and Kneberg 1951, 1957). As a result, much of the information and most of the artifacts from sites excavated before the

1970s are scattered throughout private collections in the area.

Beginning in the mid-1970s, and continuing to the present, professional archaeologists from the Universities of Tennessee (Bass 1977; Boyd et al. 1984, 1986; Faulkner 1982; Faulkner and Dean 1982; Kline 1982; and McIlhany 1978), Georgia State (Dickens 1980), and Alabama (Lafferty 1981) began conducting archaeological research in the area. Although little of the research is published as yet, some tantalizing chronological information has been obtained, particularly concerning the very early appearance of ceramic technology in the area (Lafferty 1981), the origins of the historic Cherokee (Dickens 1976, 1984; Schroedl 1984), and the transition between Late Prehistoric and Protohistoric cultures in the area (Dickens 1980; Howard Earnest, personal communication, 1985). For this reason, the area of upper East Tennessee is important and needs to be investigated more systematically.

Besides subregional gaps, a more serious chronological problem which is not unique to southeastern prehistory concerns the use of chronologies to attain the "ultimate" archaeological objective--definition and explanation of culture process (Thomas 1979:143-146). More refined cultural chronologies, such as those of Stoltman (1978) and Walthall (1980) still interpret cultures as small compartments, with later culture compartments (or "bricks") stacked on top of earlier ones. Like taxonomies of living organisms, they are convenient for classifying and identifying cultures with certain combinations of characteristics as synchronically cohesive units. But, in no way can they be interpreted as explaining culture process or change. This

inability to use chronology as a model for change is a cause of the revision and renaming of chronological units (Stoltman 1978), and of much subsequent frustration. Such chronology constructions only represent modal clusters of characteristics. They only demonstrate what has happened as a result of change through time; they cannot explain how or why this happened.

Because of the problems with the culture chronology of upper East Tennessee, studies of past lifeways and settlement patterns are also limited. Such studies, although based on chronology, can also be useful in the interpretation of culture change. However, as with most chronological models, settlement patterns are essentially described as static, synchronic units. This reconstructionist (Dunnell 1980) use of settlement data is again useful for classificatory and taxonomic purposes. But, by its very synchronic nature, it cannot explain or depict culture change. So, as it stands now, neither culture chronology, or settlement studies can be used to model culture change. However, the same types of data, and the observed patterns from this data, can be better explained using a theory of cultural selection.

Summary

A metaphysical paradigm, incorporating concepts of cultural selection, has been outlined. This study will analyze the temporal and spatial distribution of lithic and ceramic artifacts from the upper East Tennessee-western North Carolina-Southwest Virginia study area in terms of this paradigm. Radiocarbon dates and other chronological

information are used to provide a frame of reference for examining evolutionary trends in lithic and ceramic artifact attributes.

CHAPTER II

MATERIALS AND METHODS

Introduction

For this study, lithic (n=29,098) and ceramic (n=7625) artifacts have been selected from 164 sites in upper East Tennessee, western North Carolina, and Southwest Virginia (Table 1). These samples include materials from uncontrolled surface collections, controlled surface collections, test excavations and major site excavations. The samples were selected because of their association with radiocarbon dates or their stratigraphic integrity, or because of the chronological and evolutionary information they provide about the tri-state study area. The artifacts analyzed were coded for computer analysis using lithic and ceramic artifact coding formats developed for the Tellico Archaeological Survey (Davis et al. 1980; Kimball 1982). All lithic artifacts were coded using the nominal low-level format, while ratio-level continuous measurements (the high level format) were also taken on complete projectile points in the samples.

Review of Sampling Procedures and Problems

The major goal of the sampling methods employed in this study was to obtain systematic samples of sites, contexts, and artifacts from the study area for all time periods and for as many environmental zones (river terraces, hill slopes, uplands) as possible. Sampling archaeological contexts, however, is always a complex problem, because archaeological contexts and artifacts are not evenly distributed over

Table 1. Lithic and Ceramic Artifact Samples Selected for Analysis.

Site/Survey Areas ^a		Artifact Frequencies ^b	
Number	Name	Lithic Artifacts	Ceramic Artifacts
40GN9		--	25
40WG17	Plum Grove/Jackson Farm	184	427
40CR3	Fudd Campbell	1,423	661
40CK10		--	186
40SL34	Eastman Rockshelter	--	175
44RU14	Daughterty's Cave	258	123
31WT22	Ward Site	407	896
Watauga Reservoir Survey (112 sites and six single artifact loci)		25,497	3,505
Upland Watauga Drainage (15 sites)		657	14
Phipps Bend Area (3 sites)		136	514
New River Survey (13 sites)		341	281
Southwest Virginia Survey (14 sites)		195	818
Total	164 sites	29,098	7,625

^aIndividual sites and site contexts sampled are listed in Appendix A.

^bIndividual context ceramic and lithic artifact inventories appear in Appendixes C and D.

the horizontal and vertical space of an archaeological site or survey area (Brown 1975). Thus, for most archaeological sites and collections, the target population (the population about which information is desired) (Cochran 1977:5) is unknown. Although probabilistic "non-site" sampling of space has recently been used to alleviate this problem (Davis 1980; Davis et al. 1982; Dunnell and Dancey 1983; Thomas 1975), most archaeological sites and surveys (as is the case with those entities sampled here) are nonprobabilistic.

In reviewing surveys and excavations conducted in three states by a variety of researchers, ranging from excavations conducted over 30 years ago to current fieldwork, variability in survey and excavation techniques is great. Some surveys (e.g., Holland 1970) collected all exposed artifacts from sites, only to have a large proportion of them discarded later, while other surveys have been more selective in collecting primarily temporally diagnostic artifacts (e.g., Boyd 1986, and the Watauga drainage upland surveys). Excavations conducted before the late 1960s often used only trowel or shovel sorting as a recovery technique, while later excavations have used a variety of screening methods, screen size, and excavation level sizes. Finally, as noted earlier, the sites and artifacts examined in many cases have not been formally reported or described; only preliminary reports, manuscripts, or papers exist as references. In some cases (e.g., Eastman Rockshelter, the Fudd Campbell site), analyses are currently in progress and not all the material or records are available for study.

For these reasons, a variety of statistical sampling techniques,

as well as purposive selection (Cochran 1977:10), have been used to select the coded and analyzed artifacts. Although the target populations of sites and artifacts were unknown, a sampled population, and a sampling frame (a list of sampling units, or objects, to be sampled) (Cochran 1977:6) could tentatively be defined in most cases. Stratified random sampling (Cochran 1977:89-90), wherein the sampling frame is divided into strata, or internally homogeneous subpopulations, was used to select samples of sites from the New River and Southwest Virginia (Holland 1970) surveys. This stratification by physiographic zones was done because site location was clearly defined. This method was also used to select projectile points for measurement from the projectile point subpopulations or "clusters" from the Phipps Bend area sites 40HW44 and 40HW45 (Lafferty 1981).

Simple random sampling (Cochran 1977:18) was used to select sites from the Watauga drainage upland surveys, and to select samples of artifacts for analysis from 31AL89, from the Plum Grove (40WG17) test units excavated by Earnest, and from sites 40GN9, 40CK10, and 40SL34 (Faulkner and Dean 1982; Polhemus 1985; Smith n.d.). All random sampling was primarily from a table of random numbers and was without replacement (Cochran 1977). However, in some cases the exact numbers of artifacts and contexts to be sampled were unknown, because reports and inventories for these contexts were incomplete or unavailable. Due to temporal and financial constraints on the project, a basic sampling fraction of 10% was used for most of the random sampling. After the materials to be analyzed were examined more closely and

inventoried, this sampling fraction was, in some cases, adjusted higher or lower.

Interval sampling was used to select additional projectile points for measurement from 31WT22. Many projectile points from this site were unavailable for study or difficult to locate; this method, although non-random, was selected because it seemed to produce a larger sample of points in a shorter amount of time.

Finally, certain unique or poorly represented sites or contexts were purposively sampled because of the special contribution they might make toward understanding culture change in the study area. Radiocarbon dated features and excavation levels were particularly selected from the Holland (1970) survey sites, 31WT22, Daugherty's Cave, and the Phipps Bend sites, because the radiocarbon date provides an objective, independent measure of the temporal affiliation of the associated artifacts. In addition, radiocarbon samples were processed from Plum Grove (n=3), 40CK10 (n=2), the Fudd Campbell site (n=4), and 31MC41 (n=1) to obtain additional C-14 dates from these sites. Purposive selection was also made of certain unique sites, such as quarries from the New River and Southwest Virginia surveys, a ceramic artifact-bearing upland site from the Watauga drainage, and Watauga drainage sites in the uplands directly above the Watauga Reservoir. Also, notes and observations were taken on sites and artifacts not sampled or coded. The sampled contexts are described in greater detail below.

The following descriptions provide a brief history of the sites and surveys selected for this study, and the specific contexts sampled. A detailed inventory of all contexts used in this study is located in Appendix A.

Samples From Plum Grove (40WG17) and 40GN9

The Plum Grove site (40WG17), also known as the Jackson Farm and Tulip Farm site, is a large, multi-component site in Washington County, Tennessee, located along the Nolichucky River (Figure 2). It was first professionally identified in 1970 by Howard Earnest (Dickens 1980), and is presently owned by the U.S. Forest Service. In winter, 1977, a flood of the Nolichucky River caused extensive damage to the eastern and southern portions of the site. Earnest, along with part-time Forest Service personnel, later excavated several exposed and disturbed features, drew wall profiles, and conducted a systematic surface collection of the damaged areas.

In the summer of 1979, intensive testing and excavation of the eastern portion of the site was conducted as a joint field project of Georgia State University, Western Carolina University, The University of Tennessee, and the U. S. Forest Service (Dickens 1980).

A systematic sampling scheme was used to place two-meter test units at 50 m intervals along the site grid. Two additional squares were excavated along the R1000 line to obtain a clearer soil profile. The 26 test units were excavated to evaluate the "distribution, relative density, and temporal affiliations of cultural remains over the

Figure 2. The 1979 Test Excavations at 40WG17.

site" (Dickens 1980:12). In addition, three larger areas were exposed at the base of the plowzone. Work in Areas A and B emphasized the excavation of features recorded in 1977-78 and the stabilization of flood-damaged areas, while work in Area C evaluated subplowzone features in an intact portion of the site (Dickens 1980:12). Preliminary ceramic analyses indicated a concentrated late Pisgah settlement near the western portion of the study area (center of the site), while the later Qualla ceramics were more dispersed (Dickens 1980:18). Several of the Protohistoric Qualla burials had associated European glass trade beads dating to the late sixteenth - early seventeenth centuries (Smith n.d.).

For this study, samples were selected for analysis from two large Pisgah phase pit features (Features 43 and 45) containing abundant ceramic, lithic, faunal, and botanical remains and from which three radiocarbon samples were taken. From Feature 43, ceramic artifacts from the 85-90 cm level (all sherds > 4 cm maximum length), which was radiocarbon dated, were analyzed, as were the sherds in the 90-100 cm level. From Feature 45, the 60-65 cm and 80-90 cm levels were examined because these levels were radiocarbon dated, and the 55-60 cm and 90-100 cm levels were also examined, because these levels had higher ($n > 25$) frequencies of sherds. Lithic artifacts from all feature levels were also analyzed. In addition to the material from the 40WG17 test units excavated on the western portion of the site by Earnest, 184 lithic and 427 ceramic artifacts were analyzed for this study from Features 43 and 45.

Finally, materials from test excavations by Earnest at

Protohistoric site 40GN9 were sampled and examined (Earnest n.d.). At this site, which is on private land, six burials and six refuse-filled pits were excavated. The predominant ceramic types were Dallas-type shell tempered jars and plain sand-tempered bowls designated Nolichucky Plain by Earnest (n.d.). Both types, along with some European trade items, were associated with individual burials on the site. The complete vessels from the burials were examined, and sherds from Feature 6, including eight rim sherds, and a 10% random sample of body sherds (n=17) were coded for analysis. Based on an analysis of historic artifacts by Marvin Smith (n.d.), 40GN9 represents an earlier (pre-A.D. 1570) Protohistoric component than the one at Plum Grove (A.D. 1570-1650). 40GN9 and similar sites may represent a distinct Protohistoric component in this area (Earnest n.d.).

Selected Contexts From The Fudd Campbell Site (40CR3)

In the summer of 1982, the University of Tennessee conducted archaeological investigations at the Fudd Campbell site 2.5 miles southwest of Elizabethton, Tennessee (Kline 1982). The site was within the proposed right-of-way of the Tennessee Department of Transportation's State Route 67 Relocation and Improvement Project, and the fieldwork was conducted to determine the extent of the remaining site area, identify the cultural components represented, locate and sample undisturbed subsurface deposits and assess the site eligibility for the National Register of Historic Places. Much of the site had been previously destroyed by various other construction projects, the land-owner and unsupervised amateurs.

The 1982 investigations resulted in the intensive surface

collection of 36 10 m² units, the excavation of 34 2m² test units placed at 10 m intervals in two columns over the area to be impacted, and the excavation of 35 features of various kinds (Kline 1982). Although one feature was considered Late Prehistoric in age (based on artifact associations), the other features and the most intensive occupation of the site dated to the Early Woodland period.

The Early Woodland period has been extensively investigated in upper East Tennessee at such sites as Camp Creek (40GN1) (Lewis and Kneberg 1957), Ebenezer (40GN6), Snapps Bridge (40WG1), and 40HW44 and 40HW45 at Phipps Bend (Lafferty 1981). However, detailed, up-to-date artifact analyses, site records and radiocarbon dates exist only for the Phipps Bend sites (Lafferty 1981).

Because of this lack of reported information on the Early Woodland period, and because several Fudd Campbell features possessed sufficient botanical remains to be dated, four features from this site with the largest artifact samples were selected for radiocarbon dating and artifact analysis. All lithic and ceramic artifacts from the four features--Features 1, 21, 24, and 34--were coded for analysis, and complete projectile points were also coded using the high level projectile point coding format (Davis et al. 1980; Kimball 1982). As a result, 1,423 lithic and 661 ceramic artifacts were analyzed from the Fudd Campbell site.

Sampled Artifacts From 40CK10

Situated on a bluff overlooking the confluence of the Pigeon and French Broad Rivers in Cocke County, Tennessee, 40CK10 has a large early Pisgah phase component and a smaller late Middle Woodland

component (Polhemus 1985). In April, 1985, as part of a project funded by the National Geographic Society and Tennessee Historical Commission to locate the sixteenth century Indian town of Tanasqui, 40CK10 was surveyed and tested (testing and surface collection is continuing on a part-time basis). Survey techniques included small diameter core transects, proton magnetometer survey and controlled surface collection of over 1100 10 ft² units, after the area was plowed and disked. Testing was conducted to recover charcoal samples for radiocarbon dating from a low platform mound and from a possible ditch fortification identified along the southern site periphery (Figure 3). Radiocarbon samples from two zones of the ditch fill were obtained. The upper zone had Pisgah phase pottery, while the lower zone had Middle - Late Woodland pottery. Mostly limestone, sand, or crushed quartz tempering was noted for the pottery of this lower zone.

The ceramic artifacts from these two zones were sampled and analyzed. Ten percent random samples of sherds were selected from the upper zone (North half of 2.5 ft ditch section--48 sherds; South half--18 sherds selected from all the Pisgah body sherds). A 20% random sample of non-Pisgah body sherds from the south half of the upper zone (n=20) was analyzed and all sherds from the lower zone were coded for analysis. In all, 186 sherds were coded from 40CK10. Additionally, approximately 10% of all the 10 ft² surface collection units were examined as they were being washed, and observations about the ceramic and lithic artifacts from these units were noted. Practically all the material was early Pisgah in its cultural and temporal

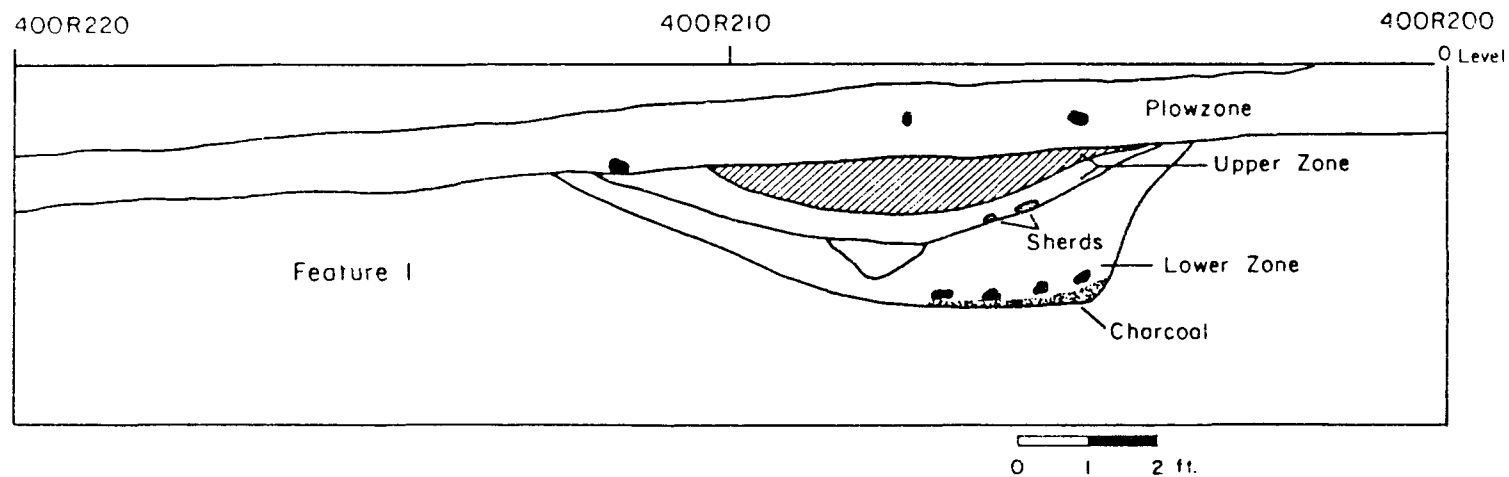


Figure 3. Stratigraphy of Radiocarbon-Dated Ditch at 40CK10.

affiliation, constituting one of the largest systematic Pisgah phase ceramic collections from East Tennessee.

Selected Contexts From Eastman Rockshelter (40SL34)

Excavations at Eastman Rockshelter (40SL34), on the Tennessee Eastman Company property in Kingsport, Tennessee, were conducted in two field seasons by an amateur archaeologist, S. D. Dean (Figure 4). During the first field season from July 23, 1979 to November 29, 1979, 28 5 ft² units were excavated in 6 in levels to a maximum depth of 8.5 ft, and 40 features and 11 human burials were excavated (Faulkner and Dean 1982:2). The deposits ranged from Late Prehistoric in age to possibly intact Clovis Paleoindian deposits.

With an agreement that the University of Tennessee-Knoxville Department of Anthropology would analyze recovered remains and provide additional support, a second field season was conducted between November 9, 1980 and January 1, 1981. This resulted in the excavation of 12 5 ft² units to a maximum depth of 12 ft, and the recording of 29 additional features (Faulkner and Dean 1982:2).

Eight radiocarbon and one thermoluminescent dates were run on features from the lower (proposed Clovis or Pre-Clovis) levels of the site, and from features from proposed Early Woodland levels (Faulkner 1982; Sutton 1982). However, dates from the possible Clovis or pre-Clovis levels were much later than expected, indicating possible contamination of the samples, rapid aggradation of alluvial sediments in the shelter during the Late Archaic, or possible colluvial redeposition of the earlier artifacts from upslope (Faulkner 1982:3).

Analyses of the lithic, faunal, feature and ceramic data are in

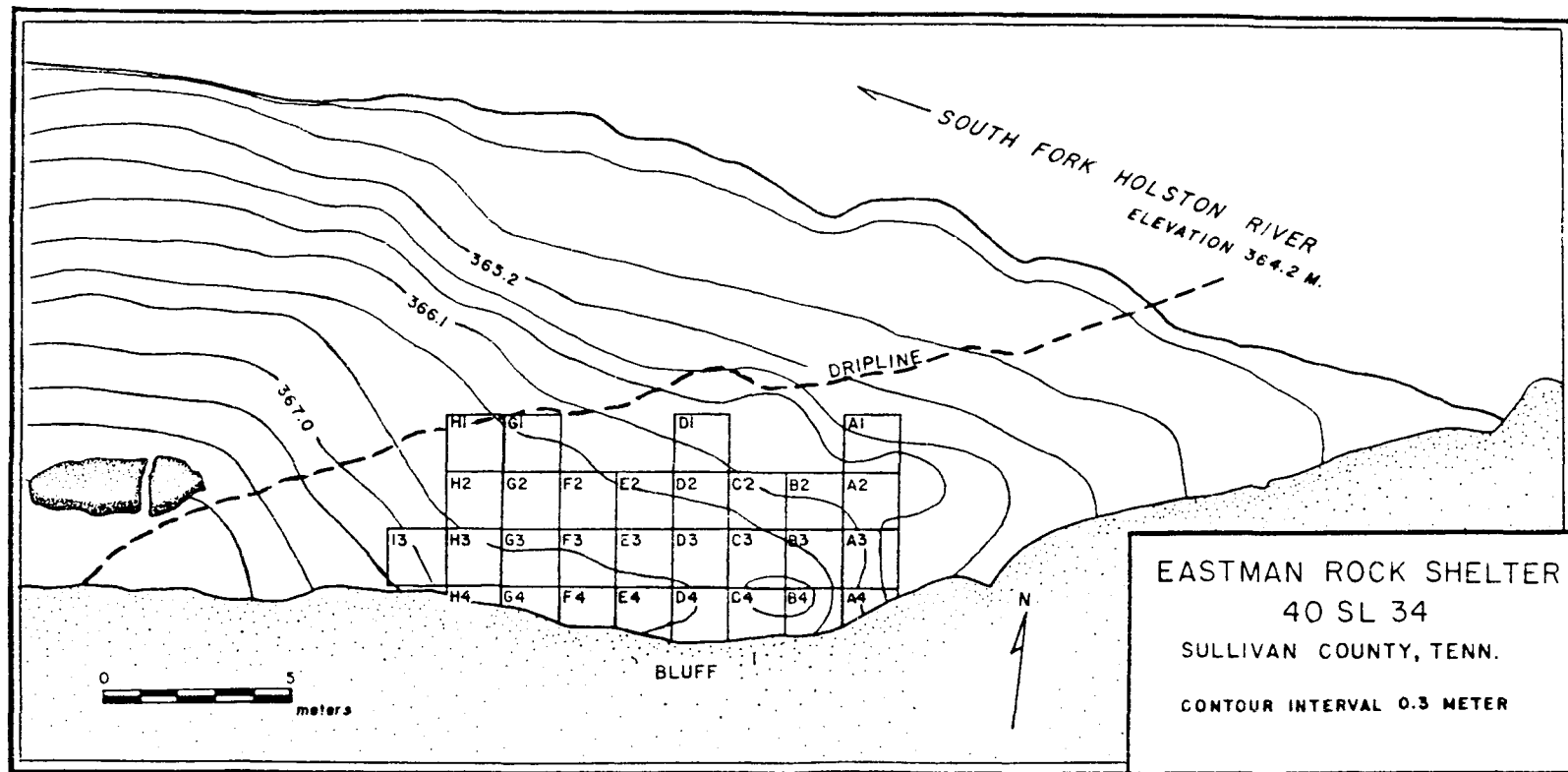


Figure 4. Plan View of Excavation Units at 40SL34.

progress and thus not all site materials or records were available for study. However, ceramic artifacts from unit excavation levels were sampled for analysis. Of 31 units excavated, three--G-1, B-3, and E-3--were randomly selected for analysis and formed a 9.7% sample of test units. Ceramic artifacts within these units were recovered from Levels 1-11, with most of the sherds coming from Levels 7-11, which a previous cursory analysis had indicated were the Early Woodland levels. For each level, a 20% random sample of sherd samples with $n > 10$ was selected for analysis, while the sherds from levels with less than 10 sherds were completely analyzed. This nested sampling procedure resulted in the selection of 175 sherds for coding and analysis.

Sampled Artifacts From Daugherty's Cave (44RU14)

Daugherty's Cave is a stratified cave site in Russell County, Virginia, on Big Cedar Creek south of its confluence with Clinch River. The site was excavated from May to August 1967 in 5 ft squares comprising a 30x10 ft rectangular block. Vertical excavation was by natural zones (designated Zones A-L); however, within zones, arbitrary 0.4 ft levels were excavated. In addition to material from excavation levels, 42 features were identified and excavated (Benthall 1986). Two features were radiocarbon dated: Feature 30, a Middle Archaic feature, and Feature 19, a Middle Woodland refuse-filled pit with predominantly Wright Check Stamped pottery (Benthall 1986). Also, the Early Archaic Zone J was radiocarbon dated. The lithic and ceramic artifacts from 15 features (including the radiocarbon dated ones) were analyzed, along with diagnostic artifacts from the general excavation levels and zones. These latter lithic and ceramic artifacts were

selected from those specimens illustrated in the report plates, because these artifacts were on trays and easily accessible at the Research Center for Archaeology at Yorktown, Virginia, and also constituted nearly all the temporally diagnostic artifacts excavated from the site. A total of 258 lithic and 123 ceramic artifacts was coded from 44RU14. Apparently, there was good separation between the sterile and artifact-bearing zones and this analyzed sample, therefore, represents the major constituents of the temporal sequence at the site.

Sampled Contexts From The Ward Site (31WT22)

The Ward site (Ayres 1984; Senior 1981), in Watauga County, northwestern North Carolina, is an important upland site because "it is the only identified, intact village site dating to the late prehistoric period" (Loucks 1982:1) in this area. The site has been collected and excavated by faculty and students of the Department of Anthropology, Appalachian State University since summer, 1971. Research during the 1972-1974, 1979, and 1980 field seasons concentrated on the presumed northern half of the site and the definition of a palisade line and the excavation of one historic and two prehistoric structures (Loucks 1982:5-9). The 1982 field season, directed by Loucks, concentrated on the presumed southern half of the site, using a stratified systematic unaligned sampling method to locate excavation units (Loucks 1982:11). Because the results of the 1982 investigations and the lithic and ceramic analyses are reported in Loucks (1982), the samples selected for coding and analysis in this study were taken from the pre-1982 investigations.

The Late Prehistoric component of the site was the major emphasis in this analysis. This component is interesting because many of the ceramic artifacts have Pisgah and Dan River-like surface treatments (Dickens 1976; Gardner 1980) with soapstone or mica schist temper--a combination of several attributes generally viewed as culturally distinct. Material from this component was concentrated in the plowzone (Stratum I) and in the grayish brown midden immediately beneath it (Stratum II) (Loucks 1982:18-23). Simple random samples of five Stratum I units (4.7% sample) and two Stratum II units (14.3% sample) were selected. All lithic and ceramic artifacts from these samples were analyzed. In addition, artifacts from late prehistoric features with large numbers of artifacts ($n > 30$) were also analyzed; these included Features 3, 20, 37, 41, 100, 109, 111, and 46.

The numbers of projectile points selected by this process were small; therefore, additional projectile points were selected for measurement (along with some large sherds) from a museum showcase, and from a list of projectile points provided by Dr. Harvard Ayres. This last series of points was selected by a 10% interval sample. A total of 407 lithic artifacts and 896 ceramic artifacts was selected for analysis.

The Watauga Reservoir Survey

The 7100 acre Watauga Reservoir in Johnson and Carter Counties, Tennessee, was inundated by the Tennessee Valley Authority (TVA) in late 1948. Because much of the planning and construction was done during World War II, no pre-inundation survey of reservoir lands was conducted (Boyd et al. 1984; Boyd 1986). During the summer and fall

of 1983, TVA drained the reservoir from 1,959 to 1,825 ft AMSL for purposes of dam repair. This exposed the upper half of the reservoir lands, and, as a consequence, TVA, the U. S. Forest Service, and the University of Tennessee undertook a site survey in this exposed area (Riggs 1985) (Figure 5). The survey began in late October, 1983, and continued part-time until late February, 1984. As a result, 112 sites and six single artifact loci were identified. Ten of these sites were tested by excavating one or more 1 m^2 test units to varying depths; at one site, 40JN89, two 3 m^2 blocks were also excavated (Boyd 1986). Because this material represents one of the most comprehensive and most recent archaeological collections for upper East Tennessee, all the material from the surface collections, test excavations, and dated features is used in this analysis. In all, 25,497 lithic and 3,505 ceramic artifacts were collected and are analyzed.

Watauga River Drainage Upland Sites

The United States Forest Service owns and manages much of the uplands above the Watauga Reservoir, and many other areas within the Watauga River drainage system. The Iron Mountain and Stone Mountain chains, forming parts of the Blue Ridge physiographic province, have steep slopes and are generally difficult to traverse. Therefore, most of the sites located in these upland areas are in saddles or gaps between ridges or near springs or other water sources (Howard Earnest, personal communication 1985). At the time of this study, a total of 73 Watauga drainage sites had been collected by Mr. Howard Earnest, U. S. Forest Service Archaeologist for the Cherokee National Forest.

Most of these sites were identified and collected as a result of

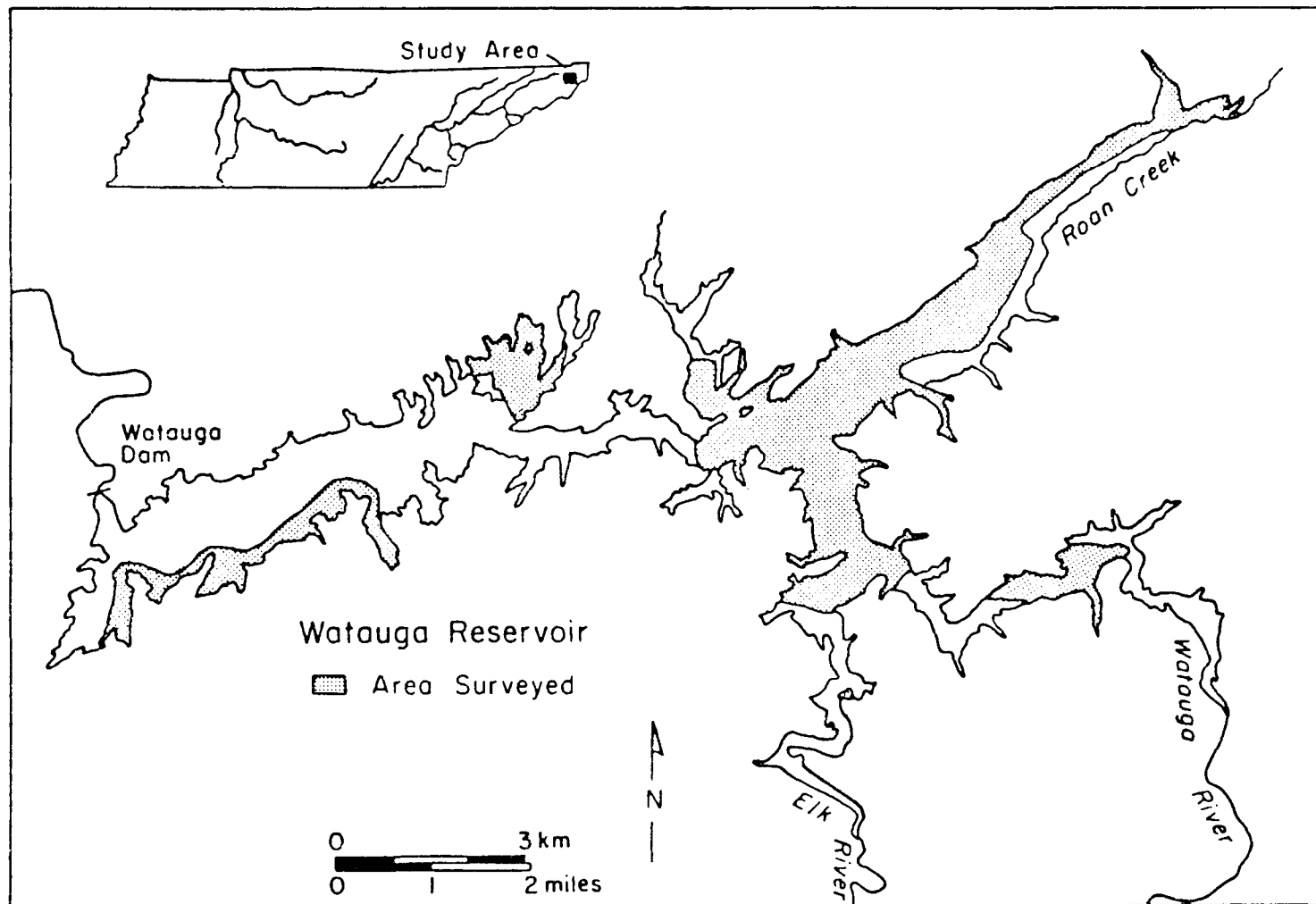


Figure 5. Area of Watauga Reservoir Surveyed in 1983-1984.

surveys of Forest Service lands where roads were to be cut or timber sales conducted. As a result, the goal of site collection was to identify a site in the affected area, not to completely collect the site; collections from most sites are therefore fairly small. Of 73 sites, seven (W21-2, W27-1, W27-2, W30-1, W30-2, W33-1, W33-2) were located in the uplands directly overlooking the Watagua Reservoir, and were purposely selected for analysis. Another site, W55-3, in a gap near some springs, was unusual because it contained late prehistoric ceramic artifacts; therefore, it was also selected for analysis. Of the remaining 65 sites, a 10.8% random sample of seven sites was selected for coding and analysis. These sites included W101-1, W94-5, W45-1, W36-1, W111-4, W100-1, and W92-2. Notes were also taken on investigations at the Flint Mill Gap site (W104), Courtland Place (Price 1983), and the Wolf Creek site (40CK20) (Bass 1985). In addition, Earnest had excavated nine test units and some backhoe trenches at the Plum Grove site (40WG17), in the western area of the site not tested by Dickens (1980). From Test Units 1 and 2, all rim sherds were coded, and 10% random samples were taken of the body sherds (Test Pit 1--nine sherds; Test Pit 2--10 sherds) and these were also coded for analysis. For the 15 Watauga drainage upland sites, 657 lithic and 14 ceramic artifacts were analyzed,

Samples Selected From The Phipps Bend Project Sites

During the fall of 1975, a Phase II intensive survey was conducted on the proposed Phipps Bend Generating Plant site near Surgoinsville, Tennessee (Graham and Alexander 1976). As a result of this survey, 22 sites were identified (Figure 6). Seven of these required

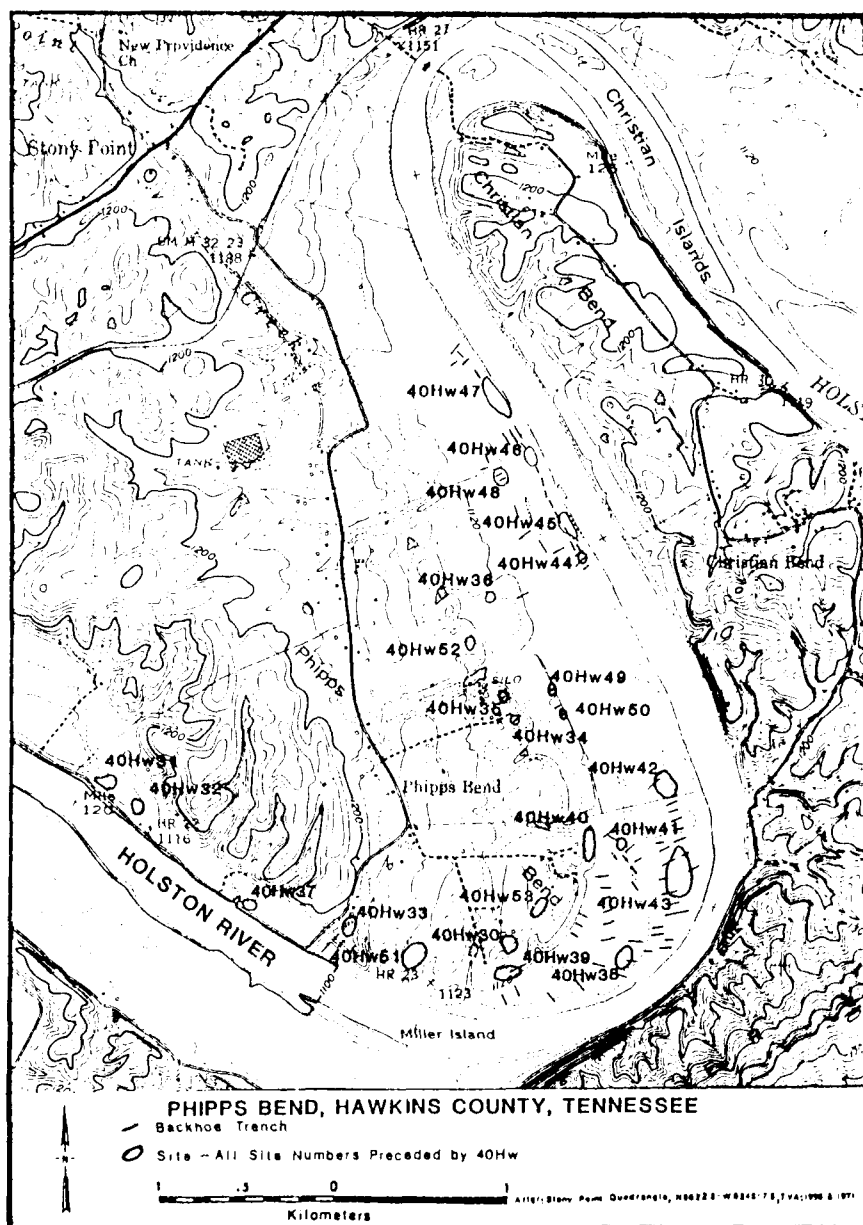


Figure 6. Phipps Bend Area Site Locations.

further testing because they contained stratified midden deposits or possible undisturbed features. The Phase III research program began in late June, 1976, and terminated in mid-November, 1976, and consisted of controlled surface collection, stratified random sampling of the plowzone, stripping of the plowzone, and hand excavation of undisturbed deposits (Lafferty 1981:23).

One of the major accomplishments of the Phipps Bend project was the radiocarbon dating of 15 features or level contexts (Lafferty 1981:483-494), primarily dating various Early Woodland ceramic phases (Swannanoa and Long Branch) (see Chapter III). For this study, artifacts from dated features at three sites (40HW30, 40HW44, 40HW45) were analyzed. From 40HW30, materials from Feature 8, a mid-Late Woodland feature, were analyzed. From 40HW44, artifacts from Feature 1, a Pisgah phase midden lens, were analyzed, along with Long Branch Features 19, 20, and 22. From 40HW45, artifacts from Swannanoa Features 40, 44, and 56 were analyzed.

Because few projectile points were available for measurement from these features, additional random samples of projectile points from feature, surface, and excavation level contexts (from 40HW44 and 40HW45) were selected for measurement. A 10% sample (n=4) from Lafferty's (1981:256-258) Upper Valley Cluster was selected; a 33% sample (n=3) from Lafferty's (1981:250-255) Ebenezer Cluster was selected; and a 10% sample (n=4) from Lafferty's (1981:246-250) McFarland Cluster was selected for measurement and analysis. A total of 136 lithic and 514 ceramic artifacts is analyzed from these samples.

Survey Along The New River (North Carolina/Virginia)

Perhaps the earliest archaeological survey in the New River valley was conducted as part of C. G. Holland's survey of Southwest Virginia in 1964 (Holland 1970; Robertson and Robertson 1978), during which he located two sites in the North Carolina and 11 sites in the Virginia portion of the valley. In 1965, Harvard G. Ayres also conducted a survey in the valley for the Smithsonian Institution, locating an additional 15 sites (Ayres 1965). Subsequently, several archaeologists have conducted surveys in the valley, largely as mitigation efforts in response to the proposed Blue Ridge Hydroelectric Dam project (Robertson and Robertson 1978:1-2). Although this project was cancelled, survey and limited testing have continued to the present (Mark Mathis, personal communication, 1985). For this study, site samples were selected from materials from surface collections and test excavations by Jill Loucks and Mark Mathis between 1981 and 1982 (Mark Mathis, personal communication, 1985). The total sample of 138 sites was stratified into 3 strata--1) main valley sites (n=74); 2) upland sites (n=40); and 3) rock shelters (n=24) and simple random samples of 5 (6.75%), 3 (7.5%), and 2 (8.3%) sites were selected within each stratum.

One upland and two floodplain sites were also purposefully selected for analysis because of their large ceramic samples. The upland site (31AL89) had been collected by an amateur, and only a 10% simple random sample of all the sherds was analyzed because of uncertainties about exact context and time limitations. In all, 281 sherds and 341 lithic artifacts comprise the New River survey sample. Nine of the

projectile points were also measured using the Tellico Archaeological Survey projectile point high level coding format (Kimball 1982).

C. G. Holland's Survey of Southwest Virginia

The first archaeological survey of Southwest Virginia was conducted by Henry Mercer in the 1890s. Subsequently, Waldo Wedel, Ralph Solecki, and others conducted surveys in the area (Holland 1970:vii-viii). Evans' (1955) study of Virginia ceramic artifacts was also important, in that it consolidated much of the ceramic information for the area.

Holland's (1970:vii) survey was conducted during the summer of 1963 and the spring of 1964. As a result, 229 sites were recorded in 18 Virginia counties and two North Carolina counties. A total of 45,522 artifacts and 12,730 animal bones and riverine snail and mussel shells was collected. Twelve of the sites were test excavated by "strata cuts," usually 5 ft² units excavated in arbitrary 6 in levels (Holland 1970:5). The other site collections consist of uncontrolled surface collections of all exposed artifacts within the site limits. Because of its broad areal extent and extensive descriptions of sites and artifact collections, sites from this survey were selected for more detailed analysis.

The artifact collections from 13 of Holland's sites were selected as data bases for computer analysis. Based on the site location descriptions, sites were divided into ridgetop or river terrace sites, and sites with only surface collections were selected from within these two strata. Out of 24 surface collected ridgetop sites, three (44CA1, 44MY19, 44WY9) were randomly selected using the RAN2 program

of the University of Tennessee Computing Center. Two of the surface collected sites from river terraces were purposively selected for analysis, because 44LE14 had a large collection of Lee series (Pisgah) sherds, and because 44PU11 was a ferruginous sandstone quarry (Holland 1970:18-19, 29). Three additional sites were randomly selected from the total surface collected river terrace sites (44MY8, 44PU2, 44SM30). Finally, samples of lithic and ceramic artifacts were analyzed from excavated levels of tested sites which were radiocarbon dated. These included 44LE17 (Cut A), Levels 0-6 in, 6-12 in, 12-18 in; 44MY11, Level 18-24 in; 44GY10 (Square B) Layer B; 44SM5, Levels 0-6 in, 6-12 in; and 44PU9, Level 12-18 in. A total of 195 lithic artifacts and 818 ceramic artifacts from these sampled contexts was analyzed. Unfortunately, some time after the materials had been housed at the Smithsonian Institution, practically all the lithic debitage was discarded, apparently to facilitate storage of the lithic tools and ceramic artifacts. Although Holland (1970) provides descriptions and inventories of lithic debitage raw materials in his report, the examination of other aspects of lithic technology is limited by this loss.

Data Presentation And Analysis

The data used in this study are grouped into three major classes for analysis and discussion purposes. First, uncorrected radiocarbon dates for the dated contexts and radiocarbon dates from other related contexts, are presented in Chapter III, along with calibrations (Damon et al. 1972, 1974; Stuiver 1982). These dated contexts are primarily

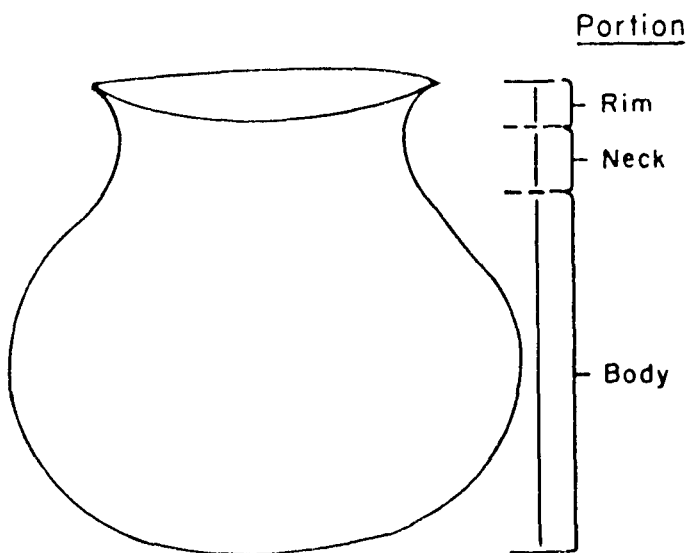
features and midden zones, but also include some stratigraphic and excavation levels. These dates provide an objective temporal frame of reference for the functional and stylistic analyses to follow.

The functional analysis of the coded artifact data and settlement pattern information is presented in Chapter IV. Again, functional attributes refer to "those forms that directly affect the Darwinian fitness of the populations in which they occur" (Dunnell 1978:199), and not to function as traditionally defined by archaeologists (i.e., as artifact use). For lithic artifacts, the major functional dimensions are: 1) the raw material used in the production of the artifact; 2) the technology used to modify this raw material; and 3) the final form this artifact takes.

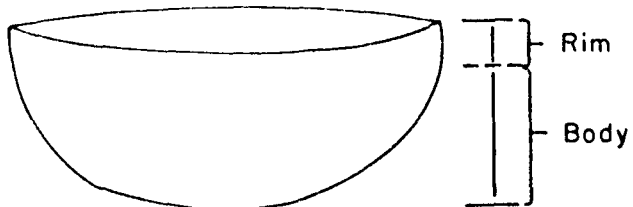
In a subtractive technology such as lithic technology, raw material size determines the maximum size of the tool which can be produced, and this in turn affects the efficiency of the tool, its potential uses, and its use-life. Although the basic reduction techniques of bifacial thinning, blade manufacture, and bipolar reduction were used by Paleoindian groups (MacDonald 1968), and the production of ground stone tools may be almost as old (Chapman 1975:161), the use of different techniques to reduce different raw materials and produce different tools is also a functional attribute in the Darwinian sense. Finally, lithic artifact form, in its general sense, is functional, in that the size of the artifact and its shape will influence its use and functional efficiency. With some projectile point collections, for example, the size of dart points has been demonstrated to be significantly larger than that of arrow tips (Tucker 1980). The use of bow

and arrow technology may be considered more functionally efficient than an atlatl and dart point technology. Form, then, may not only relate to technology or available raw material, but ultimately to function in a Darwinian sense. For this analysis, frequency distributions of the nominal attributes of raw material, blank (or technological/morphological class), and working edge (Kimball 1985; Schroedl et al. 1985) are examined for the lithic artifacts. In addition, mean projectile point areas (one-half the length x width of complete specimens) for different projectile point types and projectile point raw material types are calculated and compared to examine variation in projectile point size over time.

For ceramic artifacts, a major functional attribute is the use of aplastic temper inclusions to prevent breakage of the pot during firing. Again, temper size is functional in the sense of its relationship to vessel wall size: it is hypothesized that larger temper sizes can only be used for thicker vessels, because of breakage. Temper size is then related to ceramic vessel use-life and portability. For this reason, metric data have been collected on rim, neck, and body sherd thickness (Figure 7) and cross-tabulated with temper type. Finally, settlement patterning and location are functional in the Darwinian sense in that sites are located to exploit nearby resources (e.g., quarries, sites near cultivable land or water sources) or as elements in a communication/distribution system (Peebles 1978; Steponaitis 1978). Therefore, available information on settlement distribution in the study area (Bass 1977; Boyd 1986; Holland 1970; McIlhenny 1978; Purrington 1982, 1983; Purrington and Doughit



Jar Form



Bowl Form

Figure 7. Schematic Diagram of Ceramic Vessel Portions.

1976) is summarized by frequency distributions of site locations in major environmental zones. For this analysis, traditional lithic and ceramic artifact type fossils must be relied upon as temporal indicators of site occupation, because most surveyed sites have obviously not been radiocarbon dated.

The stylistic analysis of sampled lithic and ceramic artifact attributes in Chapter V relies on a definition of style as "those forms that do not have detectable selective values" (Dunnell 1978:199). Some researchers, however, (e.g., Rindos 1985) see the process of stylistic selection (CS2) as an important communicative element in cultural selection. Variation in style, although not amenable to evolutionary explanation (Dunnell 1978:199) can be examined in terms of replicative success (Leonard and Jones 1985) of certain attribute states, and in terms of diversity (Kintigh 1984; Rindos 1985). Both measures rely on frequency distributions of nominal classes and are useful in depicting variation and change over time.

The major nominal stylistic attributes examined for ceramic artifacts are temper class and surface treatment. Although, as noted above, temper (particularly in terms of its use, size and relationship to vessel wall thickness) does have a functional aspect, the kind of aplastic material used as a tempering agent shows a great deal of stochastic variation (see Holland 1970). On some sites in the study area, significant frequencies of ceramic artifacts with different tempers exist contemporaneously (Holland 1970; Loucks 1982; Senior 1981). Thus, many different ceramic series (as defined by different

tempering agents) may be contemporaneous. This variation is then historical and not directly related to Darwinian fitness (Dunnell 1978).

Ceramic artifact surface treatment and decoration are considered important stylistic attributes; the plastic clay medium is amenable to the creation of a nearly infinite variety of decorative motifs. Surface treatment and surface treatment examined in combination with temper class are used as measures of spatial interaction between cultural groups (Dunnell 1978) and, of course, are used to measure temporal variation because of their "historical significance" (Dunnell 1978:196). In this study, frequency distributions of surface treatment and temper are examined for stylistic patterning over time.

For lithic artifacts, in most cases, the traditional stylistic attribute is the morphology of projectile points. In addition to nominal data, ratio-level data (Figures 8 and 9 and Table 2) exists for selected complete projectile points, and this data is used in multivariate analyses to evaluate the strength and utility of traditional projectile point types as temporal markers and whether or not these types are truly stylistic (as defined here).

Analysis Methods

Three multivariate techniques are used in the metric projectile point analysis: principal component, cluster and canonical discriminant analysis. All three techniques are useful in examining cultural selection, because they measure variation in the data set. Principal component analysis (Hair et al. 1979:224; Kim 1975:469; SAS Institute

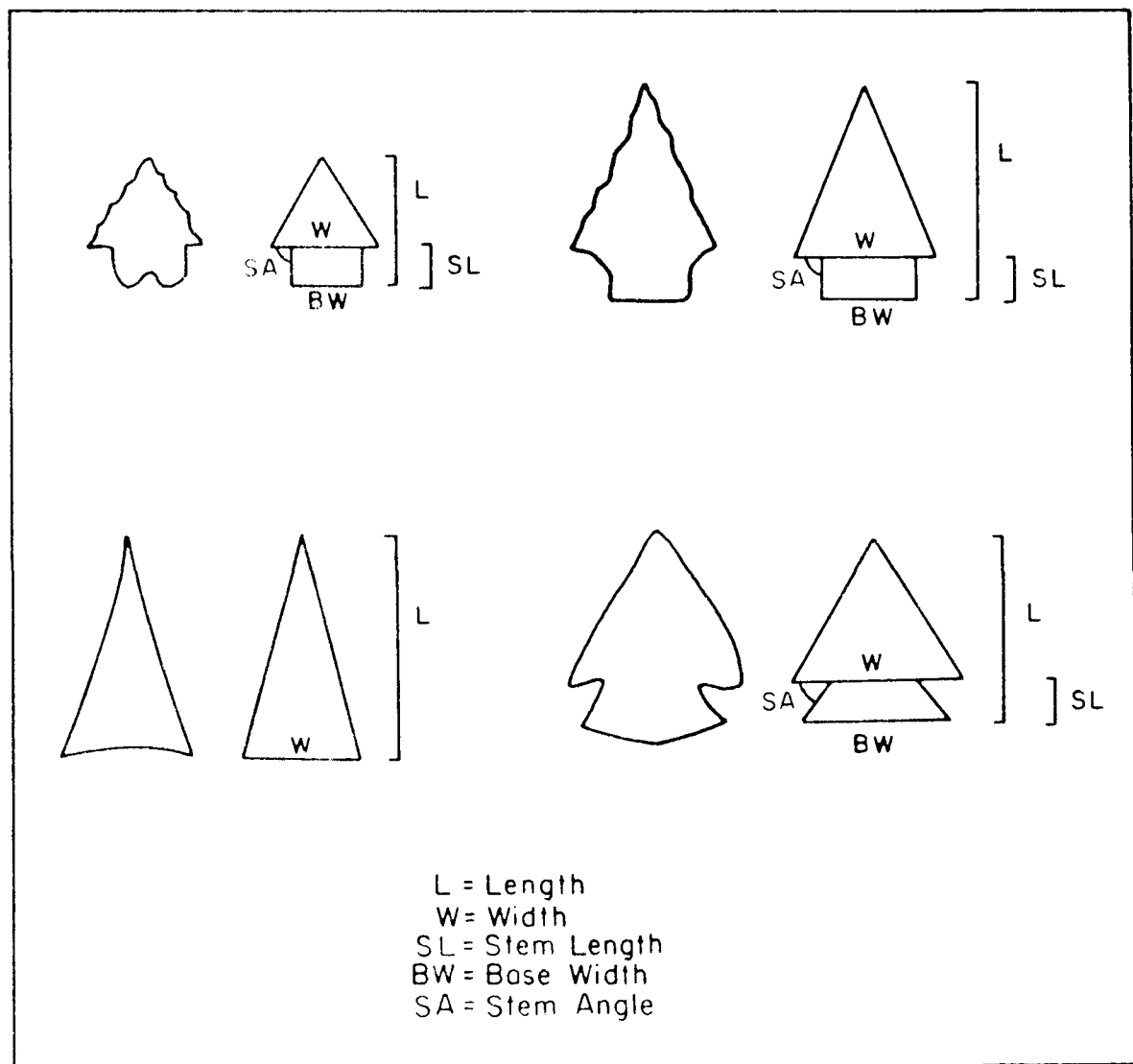
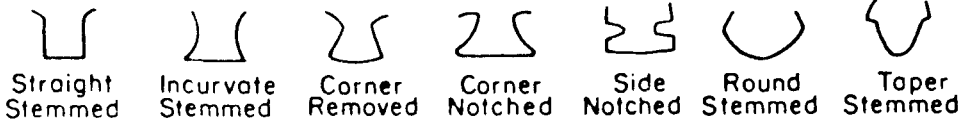


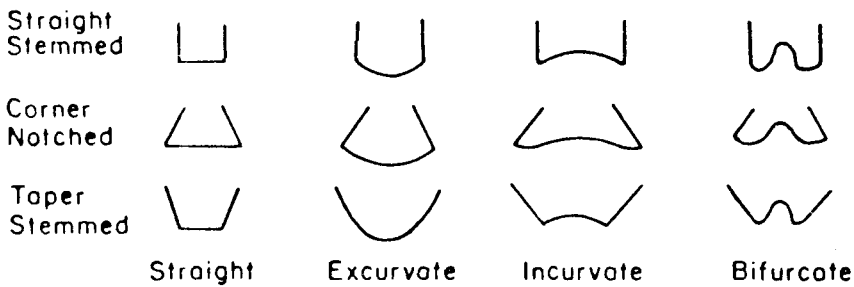
Figure 8. Metric Attributes Measured for Selected Projectile Points.



A. Stem Shape



B. Base Shape



C. Examples of Bi-Variate Discrete Types Using Stem Shape and Base Shape Attributes.

Figure 9. Nominal Stem and Base shape Attributes Coded for Selected Projectile Points.

Table 2. Metric Attributes Measured for Selected Stemmed and Triangular Projectile Points.

Attribute ^a	Definition
Length	Maximum length to nearest 0.1 mm
Width	Width of blade to nearest 0.1 mm
Thickness	Maximum thickness to nearest 0.1 mm
Stem Length	Stem length to nearest 0.1 mm (stemmed points only)
Neck	Neck width to nearest 0.1 mm (same as width for triangular points)
Stem Width	Stem width to nearest 0.1 mm (stemmed points only)
Base Curvature	Base curvature to nearest 0.5 mm
Stem Angle	Stem angle averaged to nearest 1 degree for both sides of stem (stemmed points only)
Lateral Edge 1 Curvature	Right blade edge curvature to nearest 0.5 mm (with catalogue number and distal end of point facing up, lateral edge 1 is on the right)
Lateral Edge 2 Curvature	Left blade edge curvature to nearest 0.5 mm

^aAttributes and definitions are derived from Davis et al. 1980.

1985:621-637) is a multivariate technique used to summarize the relationships between a number of variables which have been measured on a set of objects. It can be used to reduce the number of original variables, based on their linear relationships, to a smaller set of principal components, or it can be used to standardize a data set by producing component scores for the measured objects. The original data measurements and the results of the principal component analysis are used to compute component scores for each object measured (Hair et al. 1979:247). These scores can then be used as the data sets for other multivariate analysis techniques such as regression, cluster, or discriminant analysis. This latter use of principal component analysis is relied upon here to standardize the projectile point measurements, because different degrees of accuracy have been used for different measurements and (in the case of stemmed points) stem angle measurements have been taken. After the separation of stemmed and unstemmed points into distinct groups, the SAS Institute (1982:309-345) FACTOR statistical procedure (using the principal component method) is used to standardize these data sets, and produce component scores for subsequent analyses.

The unrotated component scores generated by these procedures are then clustered by Ward's hierarchical clustering algorithm, as presented in SAS (1982:423-431; 1985:45-73, 267-268). This algorithm defines the distance between two clusters as "the ANOVA sum of squares between the two clusters added up over all the variables" (SAS Institute, Inc. 1985:267). As in all hierarchical clustering techniques, each individual object starts out as a cluster, from which subsequent

clusters are formed based on the above distance measures of similarity. An advantage of the SAS routine is that several statistics useful in evaluating the number of clusters are produced, including the Cubic Clustering Criterion (CCC) (Sarle 1983; SAS Institute Inc. 1982:423-431; 1985:65-67). Simulation studies have shown that this statistic is one of the most accurate for determining the true number of clusters in a cluster analysis (Milligan and Cooper 1985; SAS Institute Inc. 1985:66-67).

Finally, discriminant analyses (Hair et al. 1979:82-122) are performed using the SAS (1982:369-380; 1985:155-169) CANDISC procedure to compare the projectile point groupings defined by the cluster analysis to temporal groupings of the projectile points. Canonical discriminant analysis is similar to principal component analysis in that it is a dimension-reduction technique, and the SAS CANDISC procedure "performs a canonical analysis to find linear combinations of the variables that best summarize the differences [discriminate] among the classes" (SAS Institute Inc. 1985:41). The dependent (categorical, classification) variables are the projectile point temporal groups or clusters, and the independent (metric) variables are the six or 10 quantitative variables measured for the unstemmed and stemmed points, respectively. As with the cluster analysis, the component scores are used as the input data for the discriminant analysis. Evaluation of the discriminating efficiency of the two sets of classes will be by inspection of the Wilk's lambda statistic produced by SAS (1985:162) and plots of the canonical structure and group centroids.

Cluster and discriminant analyses are two important statistical

methods for the evaluation of significant groups of items. Cluster analysis groups objects into significant clusters based on their similarity, and provides an objective means of evaluating traditional projectile point types. If the traditional projectile point type designations are valid, then projectile points of the same "type" should cluster together if their morphology is distinctive enough. Discriminant analysis, on the other hand, statistically measures the differences between groups of artifacts. This analysis can then evaluate the strength of any statistically significant projectile point clusters, as well as the strength of traditional temporally distinct types.

Both analyses, then, provide objective means of evaluating the strength of traditional projectile point types. This is important, because such types are relied upon as chronological markers. They also more objectively depict variation in typological classes than nominal categories, and this variation is a necessary element in understanding and explaining culture change. Multivariate analyses of this kind have previously been used to evaluate traditional types (Hoffman 1985; Kimball 1982; Tucker 1980), and in some cases have indicated that better discrimination results from nonmetric rather than metric projectile point attributes (e.g., Kimball 1982:171-176).

Summary

A total of 29,098 lithic and 7,625 ceramic artifacts has been selected from 164 sites in upper East Tennessee, western North Carolina, and Southwest Virginia to examine temporal variation in functional

and stylistic artifact attributes. A variety of sampling methods was used to select the artifacts under study. In addition to the coded and analyzed artifact data, ten new radiocarbon dates were obtained and are compared to other dates from the study area. The lithic and ceramic artifact attributes were defined in terms of the function style dichotomy. Functional attributes include lithic artifact raw material, technology, and morphology, ceramic artifact temper and sherd thickness relationships and settlement location. Stylistic attributes may include ceramic temper class and surface treatment and projectile point morphology.

Both nominal and ratio level data were collected on the lithic and ceramic artifacts analyzed and a number of statistical and visual techniques are employed in site and temporal comparisons, including frequency distributions, cross tabulations, bivariate plots, and principal component, cluster and discriminant analyses. These samples and their analysis are used to document and discuss material culture temporal change in terms of the distinction between functional and stylistic attributes.

CHAPTER III

CHRONOLOGY

Introduction

Before beginning a discussion of the functional and stylistic variation in lithic and ceramic artifacts through time, the prehistoric chronology of upper East Tennessee, Southwest Virginia, and western North Carolina must be evaluated. Radiocarbon dates and morphological comparisons of associated artifacts are used to temporally order the contexts in this study. When few or no dates exist for certain artifact categories, however, objective and subjective morphological attribute comparisons can be made with directly dated artifacts from regions largely outside the study area, such as the lower Little Tennessee River valley of Tennessee (Chapman 1975, 1977; Kimball 1985) or the Piedmont province of North Carolina (Coe 1964).

Although important for chronology building, the use of radiocarbon assays is not as straightforward as was once believed (Renfrew and Clark 1974). Errors in radiocarbon date determinations can be caused by contamination from humic acid and other sources (MacDonald 1983), sampling from mixed or poorly defined contexts, variability in atmospheric radiocarbon due to fluctuations in cosmic or solar radiation, inbuilt age due to prehistoric burning of dead wood, and interlaboratory error (Hall et al. 1985:62, 71-72; Renfrew and Clark 1974). As a result, several correction curves have been developed, based on calibrations with dendrochronologically dated samples (Clark

1975:264-265, Table 8; Damon et al. 1972, 1974; Stuiver 1982; Suess 1970).

Two such dendrochronologic calibration curves have been used to calibrate selected dates for the study area. The Damon et al. (1972, 1974) curves have been used for most of the dates; the Stuiver (1982) curve, which calibrates dates more recent than 0 A.D., has also been used to calibrate the Middle Woodland through Protohistoric dates. Because these calibrations are based on both dendrochronologic and radiocarbon determinations, they provide more accurate dates for the construction of a chronology for the study area. After an evaluation of previous chronologies for East Tennessee, Southwest Virginia, and western North Carolina, and the presentation of a proposed chronology for the study area, radiocarbon dated contexts from the study area are discussed.

Evaluation of Prehistoric Chronologies

Other chronologies suggested for East Tennessee, Southwest Virginia, and western North Carolina are presented in Tables 3 through 7. The chronologies of Purrington (1983), Hoffman and Foss (1980) and Boyd (1986) all apply to portions of the Blue Ridge province in western North Carolina, Southwest Virginia, and upper East Tennessee, respectively. Keel's (1976) chronology applies to the southern Appalachian Summit province of North Carolina (Table 6), while Kimball's chronology applies to the Ridge and Valley province of East Tennessee (Table 7).

An examination of these chronologies shows that, for the

Table 3. Chronology for the Mountain Region of Western North Carolina (from Purrington 1983).

Temporal Period	Dates	Diagnostic Artifacts
Transitional Paleoindian-Archaic	8500-7500 B.C.	Dalton-Hardaway points
Early Archaic	7500-6000 B.C.	Palmer, Kirk, Bifurcate points
Middle Archaic	6000-3000 B.C.	Stanly, Morrow Mountain, Guilford points
Late Archaic	3000-700 B.C.	Appalachian Stemmed, Otter points, soapstone bowls
Early Woodland	700-300 B.C.	Swannanoa Stemmed, Plott, Transylvania Triangular points, and Swannanoa ceramics
Early Middle Woodland	300 B.C.-A.D. 200	Camp Creek, Pigeon points, Pigeon ceramics
Middle Woodland	A.D. 200-600	Connestee, Haywood Triangular points, Connestee ceramics
Unnamed (Late Woodland)	A.D. 600-1000	Haywood, Pentagonal points, Connestee ceramics
Pisgah	A.D. 1000-1450	Pisgah points and ceramics
Qualla	A.D. 1450-1838	Qualla ceramics

Table 4. Chronology for the Blue Ridge Province of Southwest Virginia
(from Hoffman and Foss 1980).

Temporal Period	Dates	Diagnostic Artifacts
Early Archaic	7000-5500 B.C.	Kirk, St. Albans, LeCroy projectile points
Middle Archaic	5500-2500 B.C.	Stanly, Morrow Mountain, Guilford, Halifax projectile points
Late Archaic	2500-1000 B.C.	Lamoka, Savannah River points, steatite bowls
Early Woodland	1000 B.C.-A.D. 800	Jack's Reef points, Marcey Creek, Stony Creek ceramics
Late Woodland	A.D. 800-1600	Levanna, Madison points, Albermarle, Radford ceramics

Table 5. Chronology for the Watauga Reservoir (from Boyd 1986).

Temporal Period	Dates	Diagnostic Artifacts
PaleoIndian	11,000-8000 B.C.	Clovis preforms, projectile points
Early Archaic	8000-6000 B.C.	Kirk, St. Albans, Kanawha projectile points
Middle Archaic	6000-3000 B.C.	Morrow Mountain, Guilford, Halifax, Sykes projectile points
Late Archaic	3000-1000 B.C.	Savannah River, Iddins, Otterre projectile points, soapstone bowls
Early Woodland	1000 B.C.-A.D. 300	Quartz tempered fabric and cordmarked pottery, limestone tempered fabric marked, Camp Creek, Noli-chucky, Greeneville projectile points
Middle Woodland	A.D. 300-700	Sand tempered ceramics, limestone tempered cordmarked ceramics, Bradley spike points
Late Woodland/ Late Prehistoric	A.D. 700-1500	Limestone tempered plain, knot roughened ceramics, grit tempered stamped ceramics, Hamilton, Madison, Pisgah projectile points
Late Prehistoric/ Protohistoric	A.D. 1500-1600	Soapstone tempered ceramics

Table 6. Chronology for the Appalachian Summit of North Carolina (adapted from Keel 1976).

Temporal Period	Dates	Diagnostic Artifacts
Palmer	9000-8000 B.C.	Palmer points
Kirk Complex	7000-5500 B.C.	Kirk, Bifurcate points
Morrow Mountain Complex	5000-4500 B.C.	Morrow Mountain, Guilford points
Savannah River Phase	2500-800 B.C.	Appalachian Stemmed (Savannah River), Otter points, steatite bowls
Swannanoa Phase	700-200 B.C.	Small stemmed points, Swannanoa ceramics
Pigeon Phase	300 B.C.-A.D. 100	Pigeon (check stamped) ceramics
Connestee Phase	A.D. 200-600	Pigeon, Garden Creek, Connestee and Haywood points, Connestee ceramics
Unnamed Phase	A.D. 600-1000	Transitional Connestee to Pisgah ceramics
Pisgah Phase	A.D. 1000-1550	Pisgah ceramics
Qualla Phase	A.D. 1550-1800s	Qualla ceramics

Table 7. Chronology for the Lower Little Tennessee River Valley (from Kimball 1985)

Temporal Period/Unit	Dates
<u>Paleoindian Period</u>	
Undesignated Unit	c. 11,000-8000 B.C.
<u>Early Archaic Period</u>	
Undesignated Unit	7900-7500 B.C.
Lower Kirk	c. 7500 B.C.
Upper Kirk	7400-7000 B.C.
St. Albans	7000-6600 B.C.
LeCroy	6500-6100 B.C.
Kanawha	6500-6100 B.C.
<u>Middle Archaic Period</u>	
Stanly/Kirk Stemmed	6000-5500 B.C.
Morrow Mountain	5400-5000(?) B.C.
Undesignated Unit(s)	?
	c. 4300 B.C.
	?
<u>Late Archaic Period</u>	
Undesignated Unit	3000-2500 B.C.
Undesignated Unit	2200-900 B.C.
<u>Woodland I Period</u>	
Bacon Bend	900-200 B.C.
<u>Woodland II Period</u>	
Patrick	200 B.C.-A.D. 350
<u>Woodland III Period</u>	
Icehouse Bottom	A.D. 350-900
<u>Mississippian I Period</u>	
Martin Farm	A.D. 900-1000
<u>Mississippian II Period</u>	
Hiwassee Island I & II	A.D. 1000-1300
<u>Mississippian III Period</u>	
Dallas and Mouse Creek	A.D. 1300-1600

Paleoindian through Late Archaic periods, there is general agreement on the time spans for the periods represented, although some of the diagnostic artifact type names are different. This is not surprising for the Archaic period because the larger time spans allow for greater agreement, and because the temporal ranges are based on numerous radiocarbon dates and other associated information from work by Chapman (1975, 1977, 1981) and Coe (1964).

With the later periods, however, there are some notable differences concerning the dates and periods represented. Purrington (1983), Keel (1976) and Boyd (1986) are basically in agreement on the temporal range and artifact associations of the Early Woodland period. Hoffman and Foss (1980), on the other hand, consider a much longer time range for the Early Woodland in Virginia. Based on extensive multivariate ceramic analyses, Kimball (1985) presents a detailed breakdown of his Woodland and Mississippian chronologic units, but his Early Woodland I and II periods are roughly comparable in their temporal ranges and in some artifact types to Purrington and Keel's Swannanoa and Pigeon phases.

The greatest diversity in the designation of temporal periods in the chronologies presented occurs with the Middle and Late Woodland period designations. Purrington (1983), Keel (1976), and Boyd (1986) all have comparable Middle Woodland periods in their chronologies, while Kimball (1985) sees a continuum from A.D. 350-900 in his Woodland III period, and Hoffman and Foss (1980) do not define a Middle Woodland period at all. The latter two authors note that:

the term "middle Woodland" has been avoided not only because of the strong identification it carries in the Midwest with a developed mortuary cult and certain distinctive ceramic wares, but also in accordance with traditional archaeological terminology in the state of Virginia (Hoffman and Foss 1980: 185).

For the Late Woodland temporal designations, Purrington (1983) and Keel (1976) do not define a specific Late Woodland phase in western North Carolina, although they do set specific temporal limits for such a phase. Kimball (1985) also does not define a specific Late Woodland phase. Following tradition, Hoffman and Foss (1980) define all prehistoric and protohistoric cultures after A.D. 800 as "Late Woodland." Boyd (1986), for the Watauga Reservoir data, groups Late Woodland and Late Prehistoric together as a single period.

This diversity in the view of the chronological placement of Middle and Late Woodland periods is the result of the time transgressive nature of the archaeological record, the consequent lack of well-defined, distinctive Late Woodland contexts in many subregions, and the particularistic nature of the above chronologies. They reflect the available data for a specific river valley or park area, and not the entire study area.

For the post-Woodland time periods, the Pisgah and Qualla phases are well-defined in western North Carolina (Dickens 1976; Keel 1976; Purrington 1983), while Mississippian cultures are clearly defined for the lower Little Tennessee River valley (Kimball 1985; Schroedl et al. 1985). The nature of the Protohistoric period cultures of upper East Tennessee, however, is unclear, because so little information exists for this time period here (Boyd 1986).

This brief examination of extant chronologies relating to the

study area has noted several similarities and differences. Many of the problems in establishing chronologies stem from their difficulty in depicting continuous evolutionary change. "Culture bricks" with discrete temporal ranges are best viewed as heuristic devices; they do not accurately depict or explain evolutionary change.

Even so, with the evaluation of the chronologies above, a chronology for the study area can be proposed which will clarify subsequent discussion (Table 8). This chronology is basically very similar to the other chronologies discussed above for the Paleoindian through Early Woodland periods. Middle and Late Woodland, however, are considered a continuum, because, although there are contexts in the study area which can clearly be defined as Middle or Late Woodland, other contexts have unclear associations. Until further work is conducted on the latter end of this temporal range, this period should not be subdivided further. The Late Prehistoric designation subsumes the Mississippian Dallas, Mississippian-influenced Pisgah, and various Late Woodland cultures of Virginia under a less confusing label. The Protohistoric designation includes some late radiocarbon dated ceramic series from the study area. All of these periods and their artifact associations and radiocarbon dated contexts are discussed in greater detail below.

Chronological Relationships of Dates and Artifacts in the Study Area to Those From Other Regions

In this section, the radiocarbon dates and general temporal associations of artifact classes from the study area to those from

Table 8. Suggested Chronology for the Study Area.

Temporal Period ^a	Dates
Paleoindian	11,000-8000 B.C.
Early Archaic	8000-6000 B.C.
Middle Archaic	6000-3000 B.C.
Late Archaic	3000-1200 B.C.
Early Woodland	1200 B.C.-A.D. 300
Middle/Late Woodland	A.D. 300-1000
Late Prehistoric	A.D. 1000-1500
Protohistoric	A.D. 1500-1600

^aDiagnostic artifacts for these periods are described in the text.

other regions are discussed, along with some of the difficulties in interpretation of many artifact types. This discussion is divided into Paleoindian, Archaic, Early Woodland, Middle/Late Woodland and Late Prehistoric/Protohistoric temporal classes.

Paleoindian

Clovis and Hardaway-Dalton-like projectile points and preforms have been collected from surface contexts in the study area (Boyd 1986:100; Lewis and Kneberg 1951; Purrington 1983:107-110), usually along upland streams or rivers or on older terraces overlooking them. As yet, no stratified or securely radiocarbon dated contexts have been identified in the study area; but, by comparison with morphologically similar artifacts from dated contexts in other areas of North America, an estimated temporal range for these artifacts of 11,000 - 8,000 B.C. is suggested (Boyd 1986:132; Kimball 1985:276) for these artifacts. Only one probable Clovis preform from Watauga Reservoir, Tennessee, was analyzed for this study (Boyd 1986:100); therefore, this period is not discussed further.

Archaic

Although some dated contexts for the Early, Middle, and Late Archaic periods exist for the study area (see Table 9), as with the Paleoindian period, the temporal relationships of various artifact types are largely based on morphological comparisons to artifacts from dated contexts elsewhere.

For the Early Archaic period, Kirk (Chapman 1977), New River I and II (Robertson and Robertson 1978:84), and Palmer Corner Notched

Table 9. Radiocarbon Dates from the Study Area.

Site/Area Name	Number	Context ^a	Lab No.	Carbon Years			Damon 1974			Stuiver 1982	Suggested Temporal Affiliation	Source
				BP	S	Age	BP	S	Age	Dendro Yrs S		
Daugherty's Cave	44RU14	Zone J	FSU-330	9790	400	7840 B.C.					Early Archaic	Benthall 1986
Daugherty's Cave	44RU14	F.30	FSU-329	5413	2600	3463 B.C.	6230	2603	4280 B.C.		Middle Archaic	Benthall 1986
Warren Wilson	31BN29	F.31	GX-2274	4865	280	2195 B.C.	5616	294	3666 B.C.		Late Archaic	Keel 1976
Warren Wilson	31BN29	F.34	GX-2275	3515	140	1565 B.C.	3915	191	1965 B.C.		Late Archaic	Keel 1976
Jynum Taylor	31WT152	F.5	UGa-1060	3801	80	1851 B.C.	4289	123	2339 B.C.		Late Archaic	Purrrington 1983
Phipps Bend	40HW44	F.70 L.2	DIC-804	2510	90	560 B.C.	2624	138	674 B.C.		Early Woodland	Lafferty 1981
Phipps Bend	40HW44	F.22	UGa-2096	2455	275	505 B.C.	2557	294	607 B.C.		Early Woodland	Lafferty 1981
Phipps Bend	40HW44	90N/4W										
		L. 13	DIC-980	2730	50	780 B.C.	2898	71	948 B.C.		Early Woodland	Lafferty 1981
Phipps Bend	40HW44	F.19	UGa-2098	2380	80	430 B.C.	2465	132	515 B.C.		Early Woodland	Lafferty 1981
Phipps Bend	40HW44	F.62	DIC-983	2410	225	460 B.C.	2502	248	552 B.C.		Early Woodland	Lafferty 1981
Phipps Bend	40HW45	Strat. L.7										
		Trench	DIC-805	2550	95	600 B.C.	2673	107	723 B.C.		Early Woodland	Lafferty 1981
Phipps Bend	40HW45	F.56	DIC-807	2630	200	740 B.C.	2848	206	898 B.C.		Early Woodland	Lafferty 1981
Phipps Bend	40HW45	F.40	UGa-2094	2920	80	970 B.C.	3140	85	1190 B.C.		Early Woodland	Lafferty 1981
Phipps Bend	40HW45	F.44	UGa-2095	2940	105	990 B.C.	3165	109	1215 B.C.		Early Woodland	Lafferty 1981
Phipps Bend	40HW45	F.105	DIC-984	2980	395	1030 B.C.	3217	396	1267 B.C.		Early Woodland	Lafferty 1981
Phipps Bend	40HW45	Strat.										
		Trench L.2	DIC-981	2600	80	650 B.C.	2735	94	785 B.C.		Early Woodland	Lafferty 1981
Fudd Campbell	40CR3	F.1	GX-11269	2410	95	460 B.C.	2502	142	552 B.C.		Early Woodland	This Report
Fudd Campbell	40CR3	F.21	GX-11297	2415	100	465 B.C.	2509	145	559 B.C.		Early Woodland	This Report
Fudd Campbell	40CR3	F.24	GX-11298	2365	100	415 B.C.	2447	145	497 B.C.		Early Woodland	This Report
Fudd Campbell	40CR3	F.34	GX-11299	2450	95	500 B.C.	2551	142	601 B.C.		Early Woodland	This Report
Fudd Campbell	40CR3	F.34	GX-11299	2450	95	500 B.C.	2551	142	601 B.C.		Early Woodland	This Report
Camp Creek	40GN1	M-515	M-515	2050	250	100 B.C.	2078	259	128 B.C.		Early Woodland	Lewis and Kneberg 1957
Daugherty's Cave	44RU14	F.19	FSU-328	1648	70	302 A.D.	1634	75	316 A.D.	400 ± 70 A.D.	Middle Woodland	Benthall 1986
Garden Creek	31HW2	Mound 2	GX-593	1145	85	805 A.D.	1126	99	824 A.D.	889 ± 85 A.D.	Middle Woodland (Connestee)	Keel 1976
	40CK10	F.1 lower zone	GX-11440	1220	90	730 A.D.	1199	103	751 A.D.	780 ± 90 A.D.	Middle Woodland (Connestee-like)	This Report; Polhemus 1985
	40JN90	F.1	GX-10246	1320	150	630 A.D.	1297	154	653 A.D.	673 ± 150 A.D.	Late/Middle Woodland	Boyd 1986; Riggs 1985
Watauga Reservoir	40JN90	F.1	GX-10246	1320	150	630 A.D.	1297	154	653 A.D.	673 ± 150 A.D.	Late/Middle Woodland	Boyd 1986; Riggs 1985
Phipps Bend	40HW30	F.8 Level A	DIC-982	1370	65	580 A.D.	1347	69	603 A.D.	655 ± 65 A.D.	Late Woodland	Lafferty 1981
Watauga Reservoir	40JN89	F.2	GX-10245	1290	155	660 A.D.	1267	163	683 A.D.	689 ± 155 A.D.	Late Woodland	Boyd 1986; Riggs 1985
Brunk Site	31BN151	B-3603	B-3603	810	70	1140 A.D.	811	76	1139 A.D.	1230 ± 70 A.D.	Late Prehistoric (Pisgah)	Moore 1981
Plum Grove	40WC17	F.43	GX-11150	1025	170	925 A.D.	1012	173	938 A.D.	996 ± 170 A.D.	Late Prehistoric (Pisgah)	This Report
Plum Grove	40WC17	F.45 L.60-65	GX-11188	385	105	1565 A.D.	423	112	1527 A.D.	1470 ± 105 A.D.	Late Prehistoric (Pisgah)	This Report
Plum Grove	40WC17	F.45 L.80-90	GX-11154	585	120	1365 A.D.	606	125	1344 A.D.	1332 ± 120 A.D.	Late Prehistoric (Pisgah)	This Report
Plum Grove	40CK10	F.1 upper zone	GX-11467	680	85	1270 A.D.	692	90	1258 A.D.	1291 ± 85 A.D.	Late Prehistoric (Pisgah)	This Report
Phipps Bend	40HW44	F.1	UGa-2097	615	95	1335 A.D.	633	90	1317 A.D.	1322 ± 85 A.D.	Late Prehistoric (Pisgah)	Lafferty 1981
Garden Creek	31HW1	Mound 1	GX-0595	515	70	1435 A.D.	543	80	1407 A.D.	1418 ± 70 A.D.	Late Prehistoric (Pisgah)	Dickens 1976; Keel 1976
Clark Site	44PK15			935	55	1015 A.D.	927	63	1023 A.D.	1110 ± 55 A.D.	Late Prehistoric (Crayson)	Gardner 1980
Southwest Virginia	44LE17	Cut B L.18-24	SI-131	740	120	1210 A.D.	747	124	1203 A.D.	1280 ± 120 A.D.	Late Prehistoric (Lee Series)	Holland 1970
Southwest Virginia	44MY11	Strat. Cut										
		L.18-24	SI-329	700	120	1250 A.D.	710	124	1240 A.D.	1287 ± 120 A.D.	Late Prehistoric (Radford)	Holland 1970
Southwest Virginia	44PU3	Strat. L.12-24		350	200	1600 A.D.	388	207	1562 A.D.	1500 ± 200 A.D.	Late Prehistoric (Radford)	Holland 1970
Southwest Virginia	44PU9	Strat. L.12-18	SI-130	620	120	1330 A.D.	638	124	1312 A.D.	1320 ± 120 A.D.	Late Prehistoric (Wythe Series)	Holland 1970
Watauga Reservoir	40JN89	F.1	GX-10244	350	130	1600 A.D.	388	140	1562 A.D.	1500 ± 130 A.D.	Protohistoric (Burke Series)	Boyd 1986; Riggs 1985
	31MC41	F.3	GX-11057	460	75	1490 A.D.	492	84	1458 A.D.	1434 ± 75 A.D.	Protohistoric (Burke Series)	This Report
Ward Site	31WT22	F.21	UGa-683	555	90	1395 A.D.	578	98	1372 A.D.	1404 ± 90 A.D.	Protohistoric (Burke Series)	Senior 1981
Ward Site	31WT22	F.13A	UGa-684	310	165	1640 A.D.	352	173	1598 A.D.	1530 ± 165 A.D.	Protohistoric (Burke Series)	Senior 1981

^aStrat. = stratigraphic; F. = feature; L. = level; Strat. = strata cut.^bCalculations based on Damon et al. 1972.

(Coe 1964), and MacCorkle, St. Albans, LeCroy, and Kanawha Bifurcated Base projectile points (Broyles 1966; Chapman 1975, 1977; Purrington 1983:110-113) are noted in the study area primarily as surface finds or in upland habitats. At Daugherty's Cave (44RU14), Zone J, with an associated Kirk projectile point, was dated to 7840 $\pm$ 400 B.C. (Table 9). Radiocarbon dates for stratified contexts containing morphologically similar artifacts in the lower Little Tennessee River valley (Chapman 1975, 1977), the North Carolina Piedmont (Coe 1964), and the Kanawha River valley of West Virginia (Broyles 1966) clarify their chronological relationships. The Kirk, New River, and Palmer Corner Notched types are all very similar morphologically and have an estimated temporal range of 7900 - 7000 B.C. (Kimball 1985:276). The bifurcate projectile point types are primarily differentiated by the angle of the basal "ears," with some indication that the sequential listing of type names above also reflects their early to late temporal relationship (see Purrington 1983:120). The suggested temporal range for these artifacts is 7000 - 6000 B.C. (Kimball 1985:276).

Diagnostic Middle Archaic period projectile points from the study area include Kirk/Stanly Stemmed (Chapman 1975, 1977), Morrow Mountain, Guilford, Halifax, Sykes (Coe 1964), and an unnamed short stemmed projectile point (Boyd 1986:107). The radiocarbon dates for zones bearing these artifacts indicate that the Kirk/Stanly Stemmed points are oldest, followed by Morrow Mountain, Guilford, and the other types. The suggested temporal range for the Middle Archaic period is 6000 - 3000 B.C. (Boyd 1986:132; Kimball 1985:276). A date from

Feature 30 at Daugherty's Cave (Table 9) fits within this temporal range, although it has a very high standard deviation.

For the Late Archaic period, several radiocarbon assays, if corrected, would fall in the 3000 - 1200 B.C. range for this time period (see Chapman 1981:141-144; Kimball 1985:284). Late Archaic period projectile point types recovered from the study area include Appalachian Stemmed or Savannah River Broadspears (Barber and Tolley 1984; Coe 1964; Lewis and Kneberg 1957), Iddins (Chapman 1981), and Otarre (Keel 1976:194-196) projectile points. Other type names occasionally mentioned for the study area include Lamoka, Merom, Perkiomen Broadspear, Riverton Stemmed, and Saratoga Parallel Stemmed projectile points (Holland 1970:84-94, 182). Many different type names have been assigned to morphologically comparable specimens, largely due to the varied experience and knowledge of the researchers in this area. This confusing abundance of type names is unfortunately a problem for subsequent periods as well, and succeeds only in masking any real geographical, functional, or temporal variation in the specimens.

For example, most of the Late Archaic period projectile point type names identified by Holland (1970) as existing in Southwest Virginia collections are names applied to projectile points from Late Archaic contexts in New York and Illinois. The implications are that some connection exists between these northern areas and Southwest Virginia during this period. While this may indeed be the case, the analyzed examples of these types (Holland 1970:182) indicate that they are morphologically comparable to stemmed projectile point types commonly found in East Tennessee and western North Carolina. A metric

comparison of projectile point samples further substantiates the lack of difference between many traditional "types" (see Chapter V). The Lamoka and Saratoga Parallel Stemmed points illustrated by Holland (1970:182) bear close similarities in their descriptions to Iddins Undifferentiated Stemmed points from East Tennessee (Boyd 1986:110; Chapman 1981; Kimball 1985:56) and Swannanoa Stemmed points from western North Carolina (Keel 1976:196-198). The Perkiomen Broadspear pictured by Holland (1970:182) is comparable in morphology to the Otarre projectile points described by Keel (1976:194-196). Thus, the use of traditional type designations, while necessary in the analysis of undated contexts, should be applied with caution only after a thorough knowledge of the particular study area.

Early Woodland

As seen in Table 9, a longer series of radiocarbon dates from the Early Woodland period in the study area provides a firmer independent chronological data base than exists for the entire Archaic period. The Early Woodland period uncorrected and Damon et al. (1974) corrected dates (means and standard deviations) are plotted in Figure 10. The earliest date is from 40HW45, Feature 105, with values of 1030 ± 395 B.C. (uncorrected) and 1267 ± 396 B.C. (Damon et al. 1974, corrected). However, the carbon sample was extremely small, and the date may be unreliable (Lafferty 1981:493). Two other corrected dates from 40HW45 from the second millenium B.C. were from features with grit tempered cordmarked pottery (Keel 1976:260-263; Lafferty 1981:308-312). There is a noticeable break between these dates and the other Early Woodland dates. Other dates overlap at one sigma and

Note: F. = Feature; L. = Level

Contexts

40HW45, F.105

40HW45, F.44

40HW45, F.40

40HW44, 90N/4W, L.13

40HW45, F.56

40HW45, Stratigraphic Trench, L.2

40HW45, Stratigraphic Trench L.7

40HW44, F.20, L.2

40HW44, F.22

40CR3, F.34

40CR3, F.21

40CR3, F.1

40HW44, F.62

40HW44, F.19

40CR3, F.24

40GN1

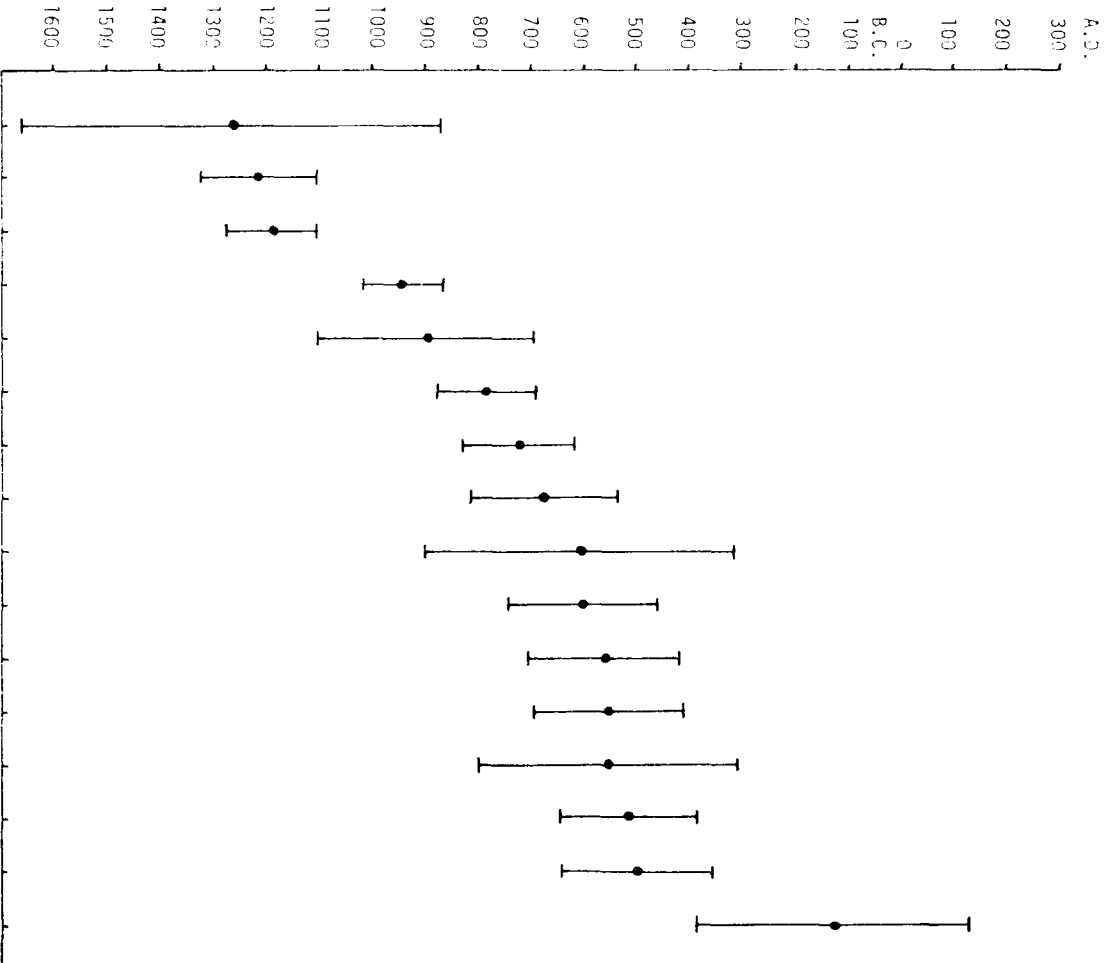


Figure 10. Early Woodland Period Calibrated Dates.

contain varying frequencies of quartz, sand, grit, and limestone tempered cordmarked, fabric-marked, and wicker-impressed sherds (see Boyd 1986:49, 52 and Coe 1964:28-29, 31-32 for a description of wicker impression). The corrected median date for this cluster of radiocarbon dates is 633 B.C.. The last date is from a lower level of the Camp Creek site (40GN1) (Lewis and Kneberg 1957) and, although associated with the Early Woodland site midden, is much later than the other dates. However, the organic sample material was from an arbitrary 1 ft level near the base of the midden, and because it was a "black humic deposit" (Lewis and Kneberg 1957:5), humic acid contamination might have affected the sample. Based on these dates, a suggested temporal range for this period in the study area is 1200 B.C. - A.D. 300.

In the comparison of the lithic artifacts to those from other contexts, some morphological continuities with preceeding Late Archaic stemmed forms may exist, with the Plott and Swannanoa Stemmed points described by Keel (1976:126-127, 196-198) as later developments in a "broad, straight-stemmed point tradition" (Purrington 1983:130) beginning in the Late Archaic period. However, uncertainties about the dating of these smaller stemmed points (Purrington 1983:130-131) weaken this contention. Other stemmed projectile points, notably the Bradley Spike point (Holland 1970:85; Keel 1976:126; Kimball 1985:58; Kneberg 1956:27) may have an Early or Middle Woodland temporal association, or both (see Kimball 1985:58). The Ebenezer projectile point (Lafferty 1981:250-256; Lewis and Kneberg 1957:64) is an Early Woodland projectile point with a tapered stem recovered from contexts with

Early Woodland pottery at Camp Creek (40GN1) and the Phipps Bend sites, where its' date range is approximately 1000 - 400 B.C. (Lafferty 1981:255). It has also been recovered from Feature 21 at 40CR3, which dated to 465 B.C. (uncorrected).

Although the use of stemmed projectile points in the study area continues into the Early Woodland period, unstemmed large triangular projectile points begin to be used during this period, and unstemmed triangular forms (decreasing in size through time) continue to be the dominant projectile point form until European contact. Again, morphologically comparable points have been given different type names by different researchers. Pigeon Side Notched points (Keel 1976:127-129) are morphologically similar to Nolichucky points (Kneberg 1957:65; Lafferty 1981:250) from East Tennessee and Potts points (Holland 1970:91) from Southwest Virginia. Camp Creek (Kneberg 1956:23) and Garden Creek (Keel 1976:130-131) Triangular projectile points with straight sides and incurvate bases are also morphologically comparable, as are Transylvania (Keel 1976:130) and Greeneville (Kimball 1985:56; Kneberg 1957:64) Large Triangular projectile points. The Greeneville, Nolichucky, and Camp Creek types, forming elements of Lafferty's (1981:246) McFarland Cluster, appear in the Phipps Bend area around 600 B.C., increasing in frequency through time (Lafferty 1981:250).

Ceramic technology first appears in the study area during this period (at least as early as 1000 B.C.) (Lafferty 1981:500), and is dominated by conoidal vessels with various kinds of crushed rock temper and cord or fabric-marked surfaces. The earliest pottery series in the study area are tempered with crushed quartz or coarse

sand and are called Watts Bar (Lewis and Kneberg 1957:7) and Swannanoa (Keel 1976:260-266), respectively. However, the distinctiveness of these two ceramic series may be questioned, because definitions of both include crushed quartz and sand tempered types, with cord and fabric-impressed surfaces also predominating in both. The confusion in identifying these series, and the misinterpretations the vague definitions have caused have yet to be resolved (Kimball and Baden 1985:136).

Lafferty (1981:307-314) suggests that Swannanoa Cordmarked ceramics in upper East Tennessee can be differentiated from Watts Bar ceramics by thickness, with Watts Bar Cord and Fabric-Marked sherds much thicker than Swannanoa sherds. The radiocarbon dates from the Phipps Bend sites also indicate that Lafferty's (1981:500, 506) Swannanoa phase dates from 1000 - 700 B.C., while Watts Bar pottery appears farther south, between Knoxville and Chattanooga, from 700 to 300 B.C.

The next ceramic phase discussed by Lafferty (1981:500) is the relatively brief Phipps phase (700 - 600 B.C.), wherein the transition from Swannanoa to limestone tempered Long Branch Fabric-Marked ceramics occurs. These ceramics dominate the following Long Branch phase (600 - 430 B.C.). This Early Woodland pottery type is also temporally earlier in upper East Tennessee than farther south or west (based on the Phipps Bend dates, and subsequent dates from the Fudd Campbell site).

While limestone tempered fabric and cordmarked pottery have long been recognized as predominant Early Woodland types in East Tennessee

(Kimball 1985:131; Lewis and Kneberg 1957:7), no such temper shift occurs in the Appalachian Summit region of North Carolina (Keel 1976). The late Early Woodland/early Middle Woodland Pigeon phase (Keel 1976:226-229, 241) includes predominantly crushed quartz tempered check stamped sherds which probably date between 300 B.C. and A.D. 100 and are stratigraphically above Swannanoa ceramics at the Warren Wilson site (31BN29) in North Carolina.

Middle/Late Woodland

A more complex picture is presented by the few Middle and Late Woodland dated contexts from the study area. For this reason, the Middle and Late Woodland periods are discussed together. The earliest dated context, from Feature 19 at Daugherty's Cave (Table 9, page 67), is clearly distinct from the other Middle Woodland through Late Pre-historic/Protohistoric dates in Figures 11 and 12. Associated artifacts were principally limestone tempered check stamped ceramics. Discounting the early dates from Feature 43 at Plum Grove and from 44PK15 (discussed below), the other Middle to Late Woodland dates (Table 9 and Figures 11 and 12) overlap at one sigma and are separated from the Late Prehistoric and Protohistoric dated contexts.

The earliest dated context in this group (Feature 8, 40HW30) has the most "typical" Late Woodland ceramic associations--thin limestone tempered plain sherds. The 31HW2, Mound 2, and 40CK10, Feature 1 (Lower Zone) dates are the latest in this group, and based on Keel's (1976:Table 11, 109-110) description of the ceramics from 31HW2, both contexts have similar ceramic artifact associations. Keel (1976:Table 11) noted primarily sand tempered Connestee Cordmarked and Brushed

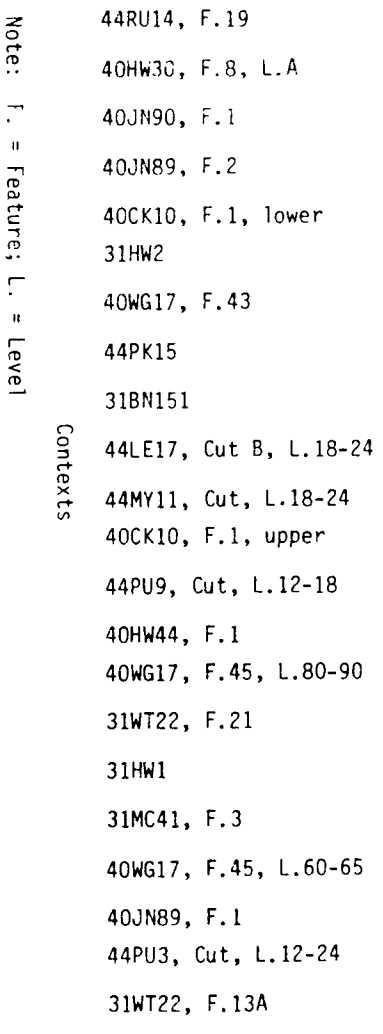


Figure 11. Middle Woodland Through Protohistoric Dates with Calibrations Based on Damon et al. (1974).

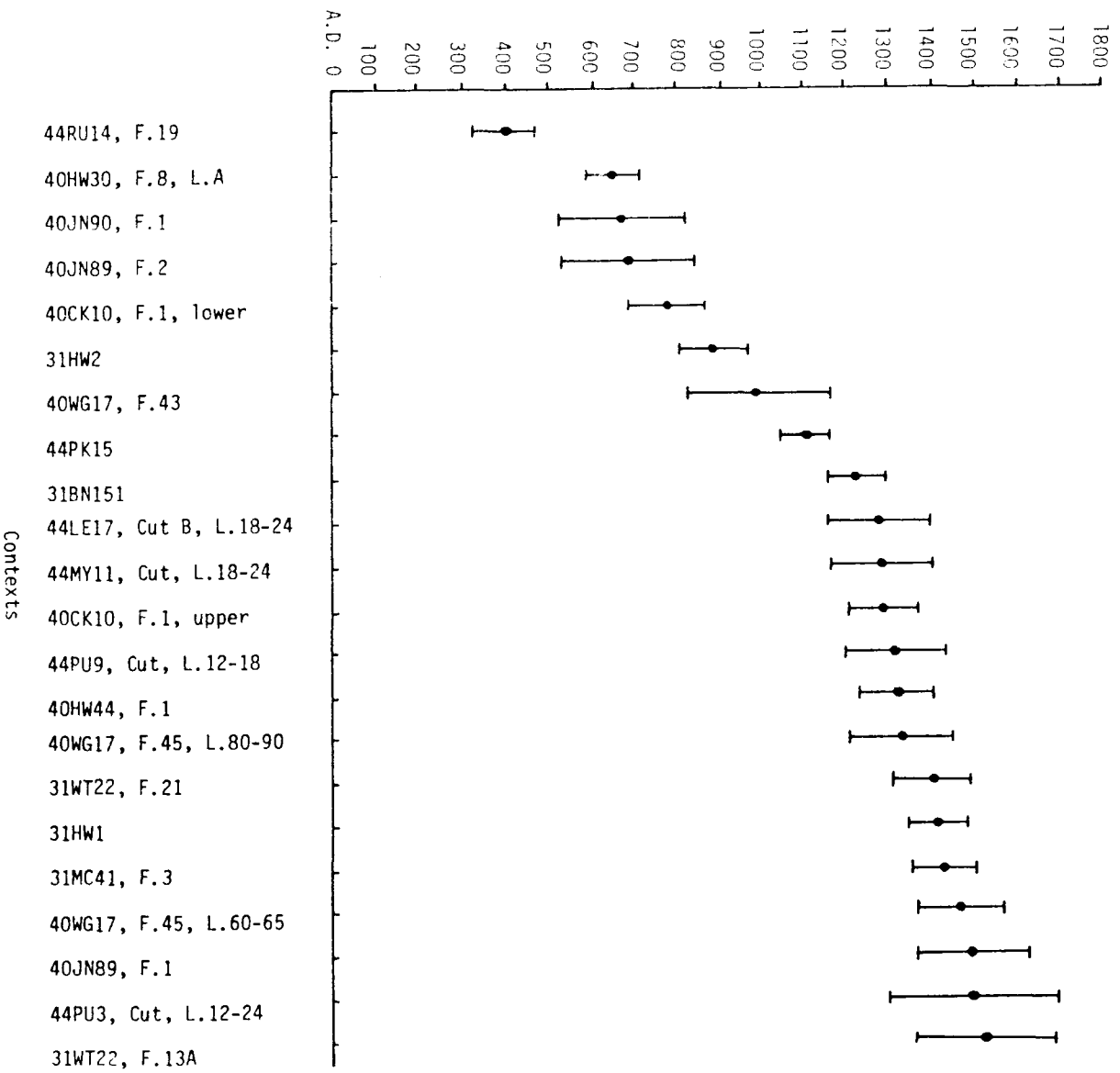


Figure 12. Middle Woodland Through Protohistoric Dates with Calibrations Based on Stuiver (1982).

sherds from the dated feature from Mound 2, while quartz, sand, and grit tempered cordmarked, grit, and limestone tempered check stamped and curvilinear complicated stamped sherds were recovered from the lower Feature 1 zone at 40CK10. Finally, the dated feature at 40JN90 (and the level immediately beneath it) produced quartz/limestone tempered net roughened and limestone tempered cordmarked ceramics, and Feature 2, 40JN89 produced large limestone tempered looped net impressed sherds (Boyd 1986; Riggs 1985). The limestone tempered cordmarked sherds appeared similar to Candy Creek Cordmarked ceramics (Lewis and Kneberg n.d., 1941); however, the net roughened and looped net impressed sherds were more similar to ceramic types from Southwest Virginia (Evans 1955; Holland 1970).

Although archaeological data for the Middle Woodland period in the Ridge and Valley province of East Tennessee (Chapman 1973; Chapman and Keel 1979; Cridlebaugh 1981) suggest close affinities of the Candy Creek-Conestee components of this area and western North Carolina, the Late Woodland cultures of both areas are still poorly defined and understood (Schroedl et al. 1986). Ceramic artifacts associated with the Middle/Late Woodland period dates presented here certainly indicate greater variation in ceramic surface treatments than is seen in the Early Woodland ceramics. Because the radiocarbon dates and associated artifacts suggest a continuum of a variety of traits during this period, the Middle/Late Woodland period is defined as a single chronological unit in upper East Tennessee, dating A.D. 300 - 1000. Although distinct Middle and Late Woodland contexts can still be identified in the study area, it is felt that this period

designation more accurately depicts the diversity of artifact types and our limited knowledge of this time period.

In terms of projectile point comparisons, some projectile point types, such as Bradley Spikes and Garden Creek Triangulars that are considered Early Woodland points are still recovered from Middle Woodland contexts (Chapman 1973:82-83; Keel 1976:130-131), and Jack's Reef Corner Notched points are recovered from Late Woodland contexts (McIlhany 1983:52-53). Smaller triangular projectile points, however, are dominant in the Middle/Late Woodland period. Specifically, Connestee Triangular points (intermediate in size between Garden Creek and Transylvania Triangulars and the small Haywood Triangulars discussed below) are predominantly associated with Middle Woodland Connestee ceramics in the pre mound midden at Garden Creek Mound Number 2 (31HW2) (Keel 1976:132) in North Carolina, and in the Middle Woodland Stratum II at the Icehouse Bottom site (40MR23) in East Tennessee (Chapman 1973:83).

During the Middle Woodland period, small triangular projectile point types first appear in North Carolina at Garden Creek Mound Number 2 (Keel 1976:132-133). Haywood Triangular and South Appalachian Pentagonal points were also recovered from the pre mound Connestee midden. At Icehouse Bottom (Chapman 1973:83) in Tennessee, Hamilton Triangular (Kneberg 1956:24) projectile points were recovered from the middle of Stratum II. Haywood and Hamilton Triangular points, as well as Madison and Levanna types from Southwest Virginia (Holland 1970:Plate 17; Keel 1976:133) are similar in size, raw material, and general morphology. Major morphological differences between these

types are defined in terms of the degree of curvature of their blade edges and bases (Kimball 1985:58-60). However, several recent studies (Kimball 1982:190-205; Schroedl et al. 1985:248-368) have demonstrated synchronic variability in small triangular projectile point morphology from Late Woodland to Early Mississippian contexts in East Tennessee. Some of this variability is understandable, in that morphological differences occur between mortuary and habitation contexts, but some variability may be idiosyncratic or due to resharpening, and not reflective of temporal or contextual differences. In any case, the production of small, triangular projectile points by approximately 500 A.D., and their continued use until their replacement with European metals and firearms, indicates a major technological shift in the Middle Woodland period in the study area to use of the bow and arrow.

The Middle Woodland ceramic series are well defined in East Tennessee and western North Carolina, based largely on work at the Icehouse Bottom site (Chapman 1973; Cridlebaugh 1981) and Garden Creek Mound Number 2 (Chapman and Keel 1979; Keel 1976; Schroedl et al. 1986). At both sites, sand tempered Connestee Plain and Brushed sherds were important ceramic types, along with cordmarked, simple and check stamped sherds (Chapman 1973:47-57; Cridlebaugh 1981:123-133; Keel 1976:107-111). Also at both sites, limestone tempered Candy Creek series sherds (including Mulberry Creek Plain and Candy Creek Cordmarked ceramics), and Middle Woodland Hopewell and Swift Creek sherds were recovered from the same contexts (Chapman 1973:57-68; Cridlebaugh 1981:133-147; Keel 1976:116-120). Although some researchers have suggested that Candy Creek series sherds are temporally

earlier than Connestee ceramics (see Kimball and Baden 1985:140), most researchers consider them contemporaneous (Schroedl et al. 1986). Additional Middle Woodland dates for the study area come from 44RU44 in Russell County, Virginia, where two features from a Candy Creek-Connestee ceramic-bearing zone produced uncorrected dates of A.D. 410 $\pm$ 80 and A.D. 180 $\pm$ 115 (McIlhenny 1983:44-46, 51). As noted earlier, the most important characteristic of the Middle Woodland ceramic collections from the study area is the greater variation in surface treatments: plain, brushed, cordmarked, simple stamped, and check stamped surfaces are all noted.

The picture of Late Woodland ceramic artifact characteristics for the study area is unclear, due to problems in the definition of the East Tennessee Hamilton Culture (Lewis and Kneberg 1946; Schroedl 1978; Schroedl et al. 1986) and the lack of a defined Late Woodland culture in western North Carolina (Keel 1976). Based on available information, some researchers (Kimball 1985:280) have seen a Middle to Late Woodland continuum in East Tennessee, with a gradual transition from limestone tempered cordmarked and stamped ceramics, to limestone tempered plain or brushed types. This shift from cordmarked to plain surfaces in the Late Woodland period was also noted by Kneberg (1961) in her definition of the Hamilton and Roane-Rhea complexes. Ceramics that have been designated Hamilton Plain have been recovered from 40HW30 (Lafferty 1981:327), but no other upper East Tennessee contexts containing comparable ceramics have been dated or fully documented. In the lower Little Tennessee River valley, several Middle Woodland through Early Mississippian contexts with limestone tempered plain

ceramics have been identified (Chapman 1973; Cridlebaugh 1981; Schroedl et al. 1985, 1986), and dated contexts at the Jones Ferry (40MR76) and Tomotley (40MR5) sites have led to the suggestion of a Woodland IV (Late Woodland) component (A.D. 600 - 900) based on this tentative evidence. In upper East Tennessee, however, features radio-carbon dated to the seventh century, A.D., at 40JN89 and 40JN90 produced not only some limestone tempered cordmarked sherds, but limestone and limestone/crushed quartz tempered net impressed and knot and net roughened sherds. These surfaces are more comparable to Late Prehistoric (Radford, Dan River) ceramic series from southwest Virginia, and do not fit well with other contemporaneous East Tennessee ceramics (Riggs 1985), although Evans (1955:131) has suggested a possible relationship between Middle Woodland Candy Creek Cordmarked ceramics and later Radford Cordmarked sherds in Virginia.

For western North Carolina, no name is given to a Late Woodland phase (Keel 1976:238-239; Purrington 1983:142) which is transitional between Connestee and the Late Prehistoric (Mississippian) Pisgah phase (Dickens 1976; Purrington 1983:142-148). Sand and grit tempered pottery continue to be produced (although more plain sherds may be noted) and some "Proto-Pisgah" ceramic traits of small element complicated stamping are noted in some Connestee sherds (Dickens 1976:Plate 64, 198). Thus, for the main Tennessee River valley and its major tributaries, and the Appalachian Summit of western North Carolina, gradual, in situ culture change occurred from the Middle Woodland to Late Prehistoric and Early Mississippian periods (Schroedl et al. 1986). The Middle and (particularly) Late Woodland evidence for upper

East Tennessee suggests different developments, including the use of ceramic attributes related to the later Radford ceramic series in Southwest Virginia (Holland 1970:64-67; Riggs 1985:176-179). The suggested temporal range for the Middle/Late Woodland, therefore, is best regarded as an artificial temporal division for organizational and descriptive purposes, and should not be considered as an accurate depiction of continuous culture change.

Late Prehistoric/Protohistoric

The Late Prehistoric and Protohistoric periods encompass cultures which are still called "Late Woodland" in Southwest Virginia (Egloff and Reed 1980; MacCord 1981) and "Mississippian" or "Mississippian-influenced" cultures of the Appalachians (Dickens 1984:2-3; Purrington 1983:142). The differences in the use of these terms largely reflects different degrees of influence by contact with and adoption of Middle Mississippian traits by these cultures (Dickens 1976:212). Suggested temporal ranges for the Late Prehistoric period are A.D. 1000 - 1500 and Protohistoric period are A.D. 1500-1600.

The two earliest Late Prehistoric period dates (Figures 11 and 12, pages 76 and 77), while showing a smooth transition between the later Woodland and Late Prehistoric date clusters, should be evaluated with caution. First, the A.D. 925 ± 170 date for Feature 43 at Plum Grove is from the 90-100 cm level of the feature, and the large standard deviation may indicate some contamination. The 44PK15 date from a feature context with crushed quartz tempered Grayson series (Holland 1970:51-58) ceramics in association, is the only date for this ceramic series and therefore cannot be compared or evaluated

further. As Holland (1970:58) suggests, however, it certainly pre-dates the Late Prehistoric/Protohistoric (A.D. 1300-1725) Dan River series (Gardner 1980:80-82).

Of the remaining Late Prehistoric period dates, those associated with Pisgah and Lee Series phase ceramic artifacts (Dickens 1976; Holland 1970) range from A.D. 1140 $\pm$ 70 at the Brunk site to A.D.1565 $\pm$ 105 at 40WG17. Those dates generally fall within the previously suggested temporal range for the Pisgah phase (Keel 1976:234). A variety of rectilinear complicated stamped designs and punctated rims is found on the ceramics from these contexts. As will be noted below, however, there are some problems in defining what constitutes early and late Pisgah phase ceramics.

Other temporally broad and difficult to define ceramic series are the Radford and Wythe series (Holland 1970:64-67, 69-73). The limestone tempered ceramics from 44MY11 are predominantly knot roughened or smoothed over roughening--dominant Radford surface treatment traits (Holland 1970:65-66). Riggs (1985:179), however, notes that "...the Radford series designation has been applied to practically all limestone tempered ceramics from southwestern Virginia." The date range for this series is A.D. 820 (MacCord 1979) to A.D. 1600 (Holland 1970:27); the two Radford dates cited here support a Late Prehistoric (and even early Protohistoric) temporal designation for these artifacts, although limestone tempered net impressed ceramics do date to the Late Woodland period at 40JN89 (Table 9, page 67).

The Wythe sand tempered ceramic series, although differentiated from the Dan River series by Holland (1970), is considered a variety

of Dan River ware by Gardner (1980:68) which is poorly dated and defined. The sherds from the dated context at 44PU9 are sand and grit tempered with primarily knot and net roughened surfaces.

On the later end of the Late Prehistoric/Protohistoric period radiocarbon dated sequence are four dates (Table 9, page 67) with associated soapstone tempered Burke series ceramic artifacts. Surface treatments of these ceramics range from Pisgah-like collared and punctated rims and ladder stamped bodies, to rims with parallel rows of punctations and bold linear and curvilinear (Qualla-like) complicated stamping (Keeler 1971). Soapstone tempered ceramics are considered Protohistoric because of their late radiocarbon dates and their comparability to historic ceramics of the Catawba Indians (Dickens 1976:188, 199; Keel 1976:181).

Small, triangular projectile points, as noted above, are the dominant point form produced throughout these periods. Differences in the curvature of the blade edges and bases and (to some degree) relative sizes of these points have led to the continued use of various type names, such as Clarksville Small Triangular (Holland 1970:85), Levanna and Madison Triangular (Holland 1970:88-89, Hamilton (Ayres 1984), and Pisgah Triangular (Purrington 1983:142) for these points. However, individual variation may make it difficult to place individual specimens into one category or another. Some general trends are suggested, such as the continued reduction in size of projectile points through this period (Holland 1970:93), and the predominance of small, thick, serrated points during the Qualla phase in the upper Watauga Valley (Purrington 1983:148-149).

Diversity and increased variation continue to predominate as trends in the ceramic artifacts during the Late Prehistoric/Protohistoric period. Ceramics with shell (both gastropod and mussel), limestone, sand, grit, crushed quartz, and soapstone tempering all appear roughly contemporaneous in different subregions of the study area, and are associated with a greater variety of surface treatments.

Grayson series pottery (Holland 1970:51-58), with crushed quartz temper, a sandy paste and primarily net and knot roughened, cordmarked and plain surfaces, is one of the earliest series in this period. An early eleventh century A.D. date at 44PK15 (Gardner 1980:82) and its stratigraphic presence below sand tempered Dan River series pottery at 44GY10 (Holland 1970:58) supports its early presence in the study area. However, a single radiocarbon date, and limited stratigraphic evidence, are not sufficient to fully define the temporal associations of this pottery.

Shell tempered pottery also may appear quite early in the study area, based on an A.D. 955 $\pm$ 155 date for a burial containing five Mississippian shell tempered vessels at the Flanary site along the Clinch River in Southwest Virginia (MacCord 1979). MacCord (1979:29) feels that these vessels have Late Mississippian Dallas (Schroedl and Polhemus 1977) affinities and, indeed, other Dallas sites have been identified in Southwest Virginia (Keith Egloff, personal communication 1985). The date, however, would fit more closely with the Mississippian I (Martin Farm) or Mississippian II (Hiwassee Island) periods in the lower Little Tennessee River valley (Schroedl et al. 1986). The New River series (Evans 1955:56-59; Holland 1970:61-63), including

shell tempered fabric, cord, and knot roughened and net impressed sherds, shows many similarities to Hiwassee Island and Dallas Mississippian ceramics from the main Tennessee valley. Based on the distribution of this series along the Clinch and Powell Rivers in Southwest Virginia, Holland (1970:63) suggested that these rivers were major conduits for the movement of this series (or the people who produced it) up from the main Tennessee valley.

Four major Late Prehistoric to Protohistoric series identified in the study area are the sand tempered Dan River series (Gardner 1980; Holland 1970:49-51), limestone tempered Radford series (Holland 1970:64-67), sand and grit tempered Pisgah, Lee or Cobb Island series (Dickens 1976; Keel 1976; Holland 1970:58-61; Polhemus and Polhemus 1966) and the soapstone tempered Smyth or Burke series (Boyd 1986:60-68; Clark 1976; Holland 1970:67-69; Keeler 1971). Several radiocarbon dates exist for the Dan River series of Virginia and North Carolina (Gardner 1980:81-82), ranging from approximately A.D. 1300 to 1725. This series is distributed primarily along the Dan River drainage in the Piedmont uplands east of the Blue Ridge (Gardner 1980:55; Holland 1970:51). Some temporal variability within the Dan River series is suggested by Gardner (1980:30-41). The earlier Dan River variety of Dan River ware has coarse sand or a mixture of sand and crushed quartz as a temper, while the later Stokes variety is sand tempered only. Holland's (1970:69-73) Wythe series, also a sand tempered ware, is considered a variety of Dan River ware by Gardner (1980:68-73), which is distinct because of its western Virginia distribution. Surface treatments also show temporal trends in that cordmarking decreases in

popularity from the earlier Uwharrie (possibly Grayson) crushed quartz tempered series (Gardner 1980:39; Holland 1970:58) through the Dan River series, while smoothed and possibly cobmarked surfaces increase.

The limestone tempered Radford series also has a long temporal span, with an early (uncorrected) date of A.D. 820 $\pm$ 70 from the Crab Orchard site for a context with associated limestone tempered pottery (MacCord 1979; Riggs 1985:179) to a late (uncorrected) date of A.D. 1610 $\pm$ 55 for a semisubterranean structure (also with associated Radford series pottery) outside a palisade at the same site (Egloff and Reed 1980:132). Most dates, however, are from the fourteenth, fifteenth, and sixteenth centuries (Holland 1970:67; MacCord 1981; Calvert McIlhenny, personal communication 1986). A variety of surface treatments are noted within this series, including cord and fabric impression, knot roughening, net impression, and plain surfaces. In Holland's (1970:79-80) western ceramic area, Radford Cordmarked, Plain and Knot Roughened and Net Impressed ceramics increase through time. However, in the Holston-Upper New-Roanoke Rivers Ceramic Area (Holland 1970:77-78), his seriation shows that Radford Cordmarked and Knot Roughened and Net Impressed types increase and decrease at several points but that both decrease while Radford Plain increases at the end of the sequence. Egloff and Reed's (1980:139-140) work at the Crab Orchard site (44TZ1) also suggests that, over time, limestone tempered ceramics with cordmarked surfaces decrease while plain and cobmarked surfaces increase.

The Pisgah phase (approximately A.D. 1000 - 1500) of the Appalachian Summit region has been extensively documented, based on research

by archaeologists at the University of North Carolina at Chapel Hill at the Warren Wilson (31BN29) and Garden Creek Mound Number 1 (31HW1) sites (Dickens 1976; Keel 1976). Dickens (1970, 1976, 1980, 1984) has also utilized other survey and excavation data from the region to discuss Pisgah phase settlement patterns. This Late Prehistoric phase, whose distinctive complicated stamped ceramics have also been defined as the Cobb Island series in East Tennessee (Polhemus and Polhemus 1966) and the Lee Series in Virginia (Holland 1970:58-61), is considered ancestral to the historic Qualla Cherokee of the Appalachian Summit (Dickens 1976:200-201; Egloff 1967; Keel 1976:40-45).

Pisgah ceramics are generally tempered with fine to coarse sand or grit, and in southwestern North Carolina have several designs of rectilinear complicated stamping as a surface treatment (Dickens 1976:173-177). Rim forms are also distinctive and varied, with collared, thickened, and unmodified rims with a variety of hatchured or linear punctations noted (Dickens 1976:178-181). Dickens (1976:181) suggests that everted, thickened rims (sometimes with loop handles), and Rectilinear Design A (narrow) complicated stamping are early, while large element stamping and a predominance of collared rims in an assemblage suggests that it is later. Curvilinear complicated stamping is considered late, because of its prevalence in Qualla ceramics.

The excavation of the Brunk site (31BN151), an eleventh to twelfth century upland Pisgah site, and a comparison of its ceramics to ceramic samples from the Warren Wilson site, was conducted by Moore (1981). His analysis showed a much higher percentage of Rectilinear Design A (narrow) stamping in the Brunk site samples, and slightly

higher frequencies of thickened rims, thus supporting some of Dickens (1976) early and late style distinctions.

However, problems exist in the definitions of the Rectilinear Design A (narrow) variety by the two researchers. Dickens (1970:34) defines the narrow variety as having horizontal grooves 10 mm or less in length, while the broad variety has grooves 20 to 40 mm long. Moore (1981:115) defines the narrow variety as having grooves less than 20 mm long. Furthermore, Dickens' (1970:38) Table 3, showing measurements of the rectilinear design elements of selected sherds from Warren Wilson shows that 10 of 27 sherds measured (37%) fall into Moore's (1981) narrow variety class. Although Moore's (1981) comparison of the Brunk site material with the material from the two late Warren Wilson features supports an earlier date for 31BN151, a more consistent definition of variables and their broader comparison is needed to fully resolve the temporal distinctions within Pisgah ceramics.

Finally, it should be emphasized, again, that increased variation in ceramic surfaces and even tempers is a hallmark of the Pisgah phase. Purrington (1983:143) notes that Pisgah phase ceramics in northwestern North Carolina mainly have fabric or net impressed, cordmarked and smoothed surfaces, and crushed quartz and soapstone (see below) are common tempering agents. Pisgah sites in the upper Watauga valley are also smaller, and there are no mound centers in the area (Purrington 1983:147). Although not represented in the samples for this study, Qualla ceramics are also found in the study area (Purrington 1983) and Qualla influence is seen in the Protohistoric

sand and soapstone tempered ceramics from the study area (see below).

The last major series of the study area is the soapstone tempered Burke series (Boyd 1986:60-69; Keeler 1971) or what Holland (1970:67-69) calls the Smyth series of Southwest Virginia. Available radiocarbon dates for soapstone tempered ceramics in the fifteenth and sixteenth centuries A.D. indicate that this is a Late Prehistoric/Protohistoric series. Surface treatments for this series include complicated stamping (primarily large curvilinear stamping), burnishing and plain surfaces, along with primarily incised, punctated, and folded rims (Keeler 1971:33-36). Minor surface treatments include simple and check stamping and roughening.

The complicated stamping and rim forms and decorations suggest close affinities or influences of Pisgah, Qualla, and Lamar Late Prehistoric/Protohistoric ceramic styles (Dickens 1976; Egloff 1967; Keeler 1971:37-41). The Ward site (31WT22) along the upper Watauga River in North Carolina is noted for its soapstone tempered ceramics with Pisgah collared and punctated rims and net impressed, smoothed and plain body surfaces (Ayres 1984; Loucks 1982; Senior 1981). Similar soapstone tempered sherds have also been recovered from the Watauga Reservoir area (Boyd 1986) and sites along the Nolichucky River (McIlhany 1978). Sherds from 31MC41 in McDowell County (McDowell, Burke and Caldwell county sites are the major locations for this series) also have Pisgah-like punctated rims and large linear stamped bodies (in many cases) (Keeler 1971:40).

Keeler (1971:39-41) and other researchers (Dickens 1976:188; Keel 1976:181) have considered these ceramics the products of the

protohistoric Catawba Indians. The early historic Catawba, while using sand instead of soapstone temper, produced burnished and complicated stamped surfaces and incised rims similar to the Burke series. Burnished, sand tempered pottery in association with shell tempered wares and historic artifacts has also been observed at sites along the Nolichucky River (Earnest n.d.). These tentative associations certainly support a late date for the production of soapstone tempered ceramics, although they do not resolve questions concerning the origins of and interrelationships between several Late Prehistoric/Protohistoric ceramic series.

Summary

Forty-three radiocarbon dates, spanning the Early Archaic through Late Prehistoric/Protohistoric period have been presented, and most have been calibrated to the dendrochronologic time scale using curves developed by Damon et al. (1972, 1974) and Stuiver (1982). The artifacts associated with these dated contexts have been described, and comparisons to other artifacts and contexts have been made. Finally, temporal trends in lithic and ceramic artifact attributes suggested by previous researchers in the study area have been reviewed and, in some cases, critiqued.

Several important conclusions have resulted from this review. First, definable breaks occur between Early Woodland and Middle/Late Woodland and Late Prehistoric/Protohistoric dated contexts. Within these groups, however, dates overlap considerably, implying gradual, evolutionary change. The gap between the Middle/Late Woodland and

Late Prehistoric/Protohistoric dates is not great, and could certainly be "filled" with further dating and research on proposed Late Woodland contexts.

Second, lithic artifacts from the Early Archaic to the Protohistoric period show a general trend from various forms of stemmed projectile points (primarily atlatl darts) to unstemmed triangular points, beginning in the Early Woodland period, and culminating in the production of small triangular arrowpoints, beginning around A.D. 500. Within the triangular point group, a trend toward smaller size through time is noted.

Third, ceramic artifacts show an increasing trend toward diversity in tempers, surface treatments, and decoration through time. This culminates in an interesting (and confusing) mixture of stylistic elements on Late Prehistoric/Protohistoric ceramic artifacts.

In the following two chapters, these general trends will be investigated more fully for the sampled contexts from the study area. In Chapter IV, functional attribute variability through time will be examined in the lithic and ceramic artifacts. Chapter V will analyze stylistic variability in these contexts and artifacts--change through time in the symbolic and communicative aspects of material culture.

CHAPTER IV

FUNCTIONAL VARIATION

Introduction

This chapter analyzes attributes of artifacts from sampled contexts in the study area which are considered functional in a Darwinian sense. These attributes, singly or in combination with other attributes, provide selective advantages to the populations possessing them. Their replicative success over time, measured by their increasing frequency, demonstrates their functional efficiency. Settlement location is also a functional cultural attribute which is examined in this chapter.

Functional Variation in Ceramic Artifacts

Two attributes of ceramic artifacts which may be considered functional are ceramic vessel form and temper, or the aplastic inclusions in the fired clay. The collections examined for this study were almost exclusively collections of sherds; therefore, the functional analysis of complete vessels is not possible. However, form (to a limited degree) and its relationship to temper size and type can be analyzed jointly by comparing vessel wall thickness of rim, neck and body sherds to the types of aplastic inclusions they contain. Vessel wall thickness is a functionally significant ceramic attribute because it is related to the weight and portability of a ceramic vessel and its potential use-life.

It is hypothesized that larger-sized tempers will be components

of thicker-walled vessels. The reason for this is that thin-walled vessels with large temper inclusions would be more likely to crack or spall during firing or have shorter use-lives due to greater friability. To test this contention, sherd thickness means and approximations to confidence intervals for the means (Cochran 1977) were compared by temper type (Table 10 and Figures 13, 14 and 15). The approximations were used instead of the standard deviations because of the generally small sample sizes, and were calculated by the formula $3(s/\sqrt{n})$ and added and subtracted to the mean. These approximations were also calculated for projectile point areas (see below).

The major temper categories included crushed quartz, grit, sand, limestone, shell and soapstone. The crushed quartz category included sherds with two or more angular fragments of crushed quartz or other siliceous stone > 3 mm in maximum dimension. The grit category included sherds with two or more crushed siliceous stone or coarse sand particles between 1 and 3 mm in maximum dimension. The sand category included sherds with sand particles < 1 mm in maximum dimension. So, these three categories form a continuum from large to small siliceous stone inclusions (see definitions in Boyd 1986:19; Kimball 1985:65). Other minor temper categories (for which only body sherds were recovered) included mixed and crushed quartz/limestone tempers. Table 10 shows that the largest measured samples were body sherds although several temper categories had substantial samples of rim and neck sherds.

Even though the confidence interval approximations for the sherd thickness measurements are wide, general patterns support the

Table 10. Sherd Thickness Means and Standard Deviations by Temper Class.

Temper/Portion	n	$\bar{x}$	s	$\sqrt{n}$	$3(s/\sqrt{n})$
Quartz					
Rim	25	7.89	1.28	5.00	0.768
Neck	6	8.83	1.83	2.45	2.240
Body	520	8.51	1.68	22.80	0.221
Mixed					
Rim	-	-	-	-	-
Neck	-	-	-	-	-
Body	17	8.61	1.88	4.12	1.370
Medium Quartz/Limestone					
Rim	-	-	-	-	-
Neck	-	-	-	-	-
Body	18	8.75	0.85	4.24	0.601
Sand					
Rim	23	7.46	2.14	4.80	1.340
Neck	5	5.76	0.89	2.24	1.190
Body	309	7.10	1.76	17.58	0.300
Grit					
Rim	87	7.39	1.64	9.33	0.527
Neck	78	7.33	1.68	8.83	0.571
Body	1684	7.45	1.62	41.04	0.118
Limestone					
Rim	41	7.50	1.80	6.40	0.844
Neck	40	6.86	1.99	6.32	0.945
Body	1785	7.90	1.83	42.25	0.130
Shell					
Rim	10	8.25	2.47	3.16	2.350
Neck	11	8.15	1.18	3.32	1.070
Body	100	7.72	2.13	10.00	0.639
Soapstone					
Rim	17	7.61	1.29	4.12	0.939
Neck	16	7.58	1.20	4.00	0.900
Body	287	8.19	1.83	16.94	0.324

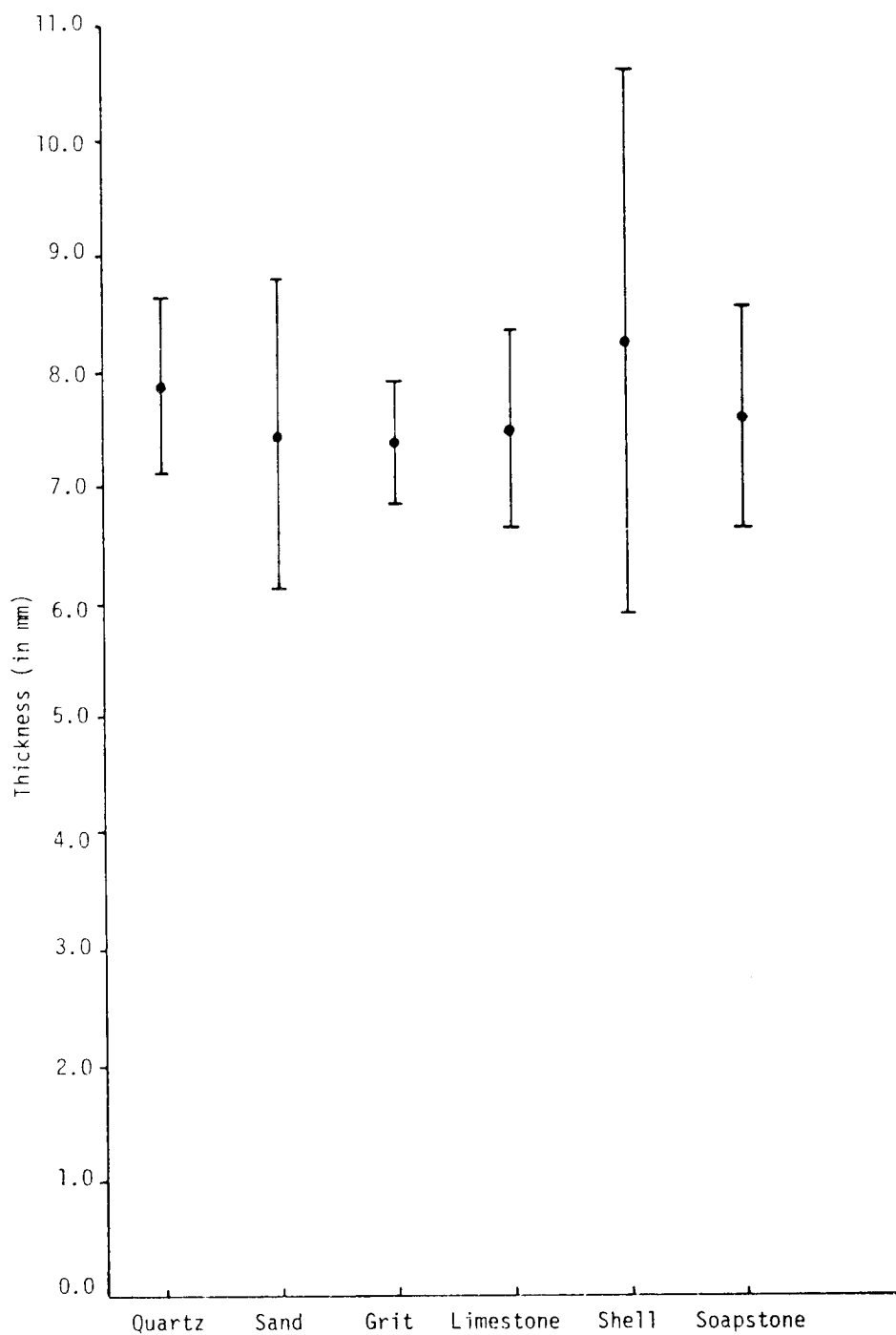


Figure 13. Rim Sherd Thickness Means and Confidence Interval Approximations by Temper Class.

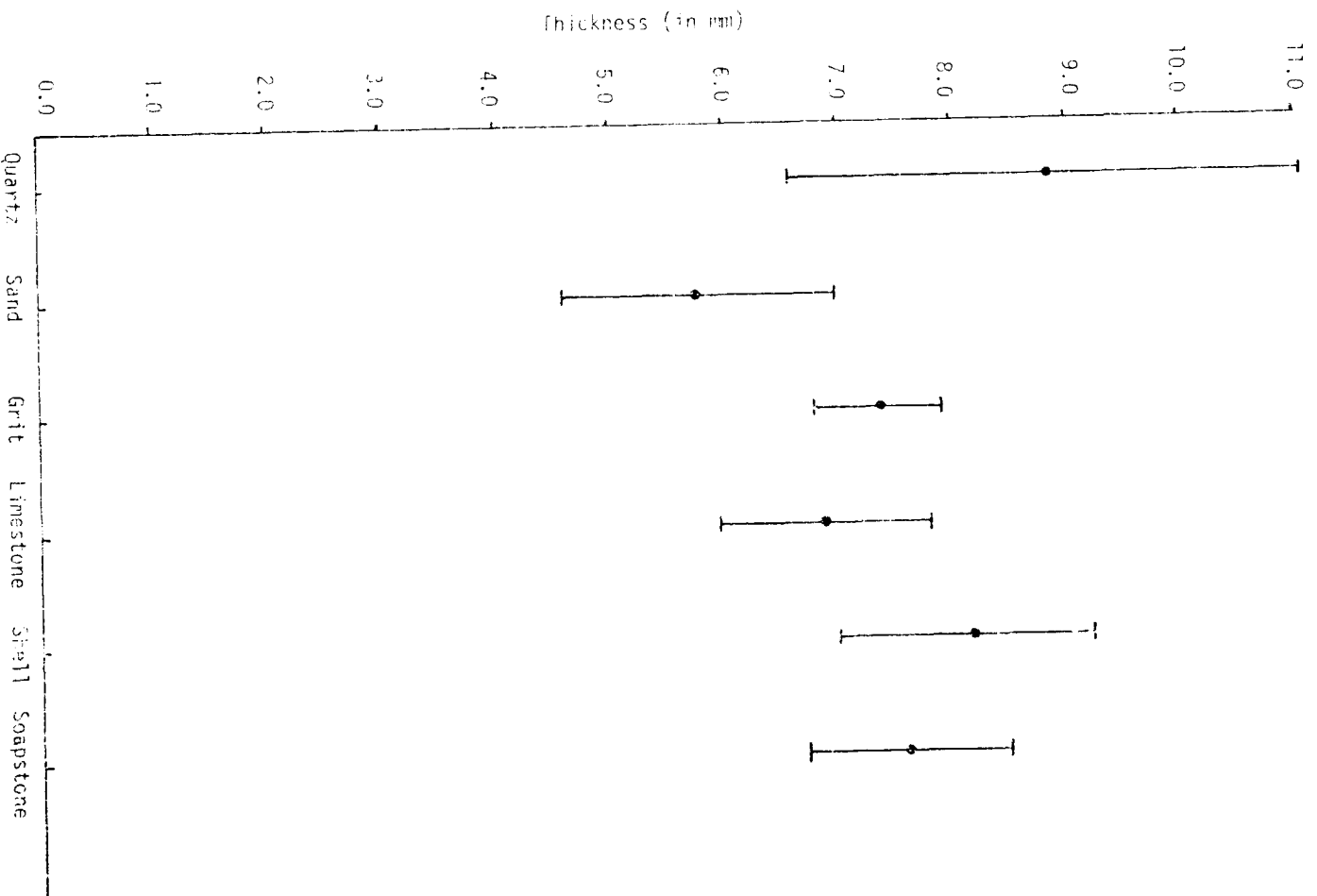


Figure 14. Neck Sherd Thickness Means and Confidence Interval
Approximations by Temper Class.

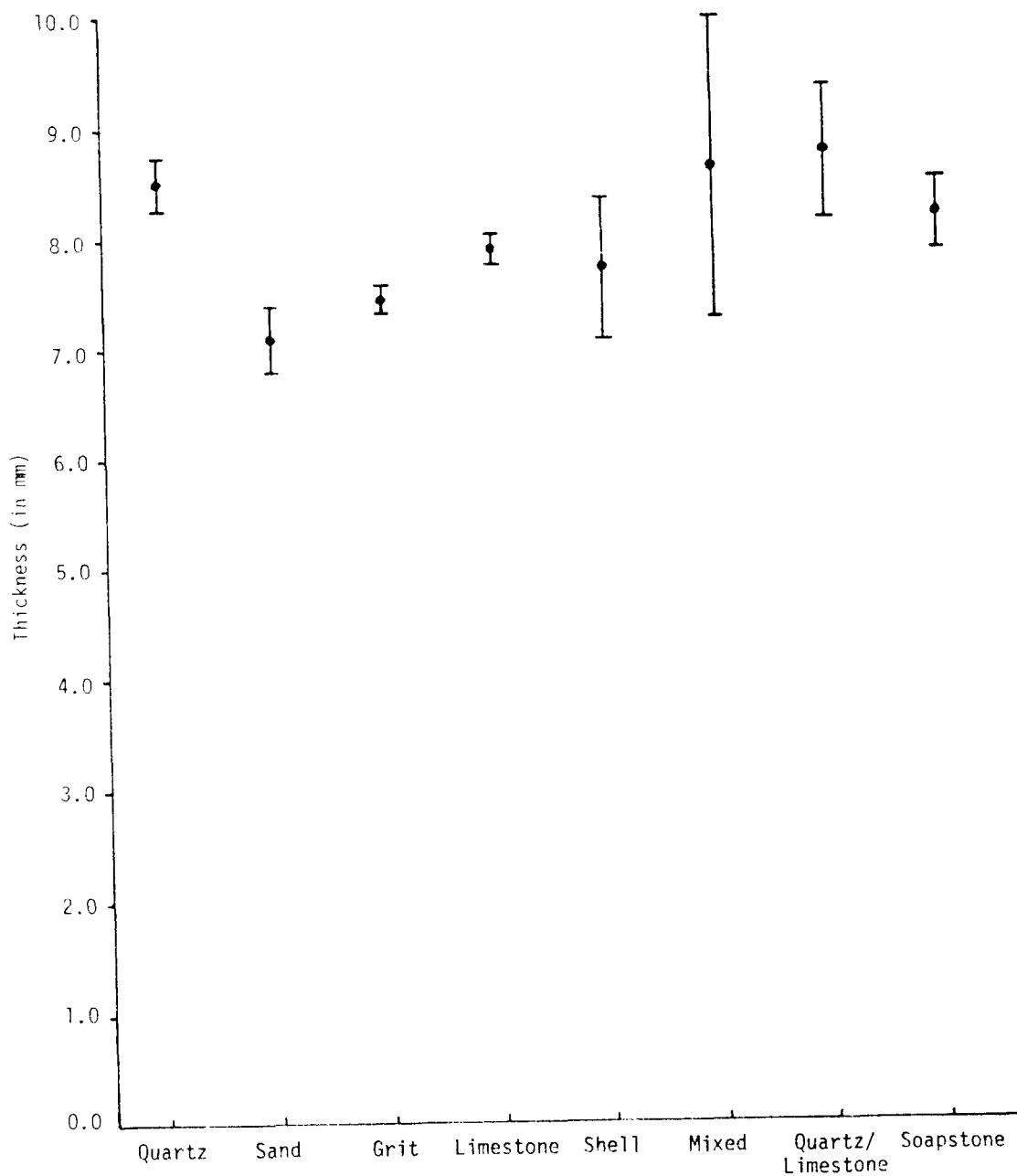


Figure 15. Body Sherd Thickness Means and Confidence Interval Approximations by Temper Class.

association of larger tempers with thicker sherds. In all cases (Figures 13, 14 and 15), sherds with crushed quartz as an aplastic inclusion are among the thickest sherds measured (it should be noted that rim sherds, because of decorative elements such as collars or appliques, are less reliable in measuring functional significance). For body sherds, mixed and crushed quartz/limestone tempered sherds are thicker, but their sample sizes were small and they also contain significant amounts of crushed quartz temper (Figure 15). On the other hand, sand tempered sherds are usually the thinnest sherds, with grit and limestone tempered sherds usually between crushed quartz and sand in thickness (Figures 14 and 15). Finally, soapstone tempered body sherds have a mean thickness higher than all other non-crushed quartz tempered sherds (Figure 15). Because use of soapstone temper is probably a trait of some Late Prehistoric/Protohistoric groups, this indicates that ceramic sherd thickness in the study area is probably not temporally sensitive. Some of the soapstone chunks are as large as 8 mm wide (Boyd and Riggs 1986:60); thus, the thicker sherd size is more likely correlated with larger temper fragments.

This situation calls into question the contention by Lafferty (1981:307) that sherd thickness is a temporally and culturally sensitive attribute differentiating Watts Bar from Swannanoa Early Woodland ceramics. By the very nature of having larger aplastic inclusions, Watts Bar crushed quartz tempered ceramics will be thicker than Swannanoa sand tempered sherds. Thus, a functional evolutionary model, showing a direct relationship between the attributes of temper size and vessel wall thickness, provides a better explanation for

variability in the latter attribute in terms of ceramic technology and production requirements. The amount of variation in temper size within these two classes and the similarities in their surface treatments also indicates that vessel wall thickness may be an arbitrary cultural division.

Functional Variation in Lithic Artifacts

As stated in Chapter II, major functional attributes for lithic artifacts include their raw material and technological attributes. The major raw material classes identified for the study area are defined in Table 11, and the technological classes are defined in Table 12. The first step in the lithic functional analysis is to examine raw material preference through time for the three major technological classes defined here.

Tables 13, 14 and 15 depict frequencies of raw materials from dated contexts for debitage, core tools and bifacial tools, respectively. For the debitage, Table 13 shows that Knox black chert and chalcedony are the most frequently represented raw materials in all Early Woodland through Late Prehistoric/Protohistoric contexts. Early Woodland features at Fudd Campbell (40CR3), however, show greater diversity in raw materials, with notable frequencies of quartzite debitage. The high frequencies of quartzite debitage in temporally later contexts at 40JN89 and 40WG17 may unfortunately be due to mixture with earlier contexts during the process of feature construction.

Table 14 shows that most cores and core tools (except for celts and similar artifacts) were also made from Knox chert or chalcedony.

Table 11. Lithic Artifact Raw Material Class Definitions.

Raw Material	Definition
Knox Black Chert	Knox black chert, Knox black banded chert, Knox light gray chert, Knox dark gray chert
Other Knox Chert	Knox light gray banded, Knox dark gray banded, Knox mottled, Knox oolitic, and Knox porcellaneous cherts, and chert residuum
Chalcedony	Shady dolomite chalcedony
Jasperoid	Yellow or red chert with chalcedony veins
Del Rio Red Jasper	Yellow or red grainy jasper
Quartzite	Quartzite and metaquartzite
Quartz	Vein quartz and quartz crystal
Rhyolite	Purple or gray banded (Mount Rogers) rhyolite
Other	Unidentifiable local and nonlocal resources, greenstone, limestone, dolomite, sandstone, schist

Table 12. Lithic Artifact Technological Class Definitions.

Technological Class	Definition
Debitage/Blades	Blades with prominent and diffuse bulbs of force, bipolar flakes, decortication flakes, bifacial thinning flakes, core rejuvenation flakes, core flakes, nonplatform bearing flakes, nodules
Cores/Core Tools	Piece esquillee, nonchert spalls, cobbles, blade cores, bipolar cores, amorphous cores
Bifacial Tools	Projectile points, projectile point preforms, bifaces

Table 13. Debitage Raw Material Frequencies for Dated Contexts.

Temporal Period	Early Archaic	Early Woodland								Middle/Late Woodland				Late Prehistoric								Protohistoric					
Context ^a	RU14 Zone J	HW45 F.44	HW44 F.20	HW44 F.22	CR3 F.34	CR3 F.21	CR3 F.1	HW44 F.19	CR3 F.24	RU14 F.19	JN90 F.1&L.2	JN89 F.2	WG17 F.43	GY10 6-24 in.	LE17 All Levels	RU14 F.23	MY8	MY11 L.4	PU9	HW44 F.1	WG17 F.45	SMS All Levels	WT22 Pz/St2	WT22 F.37	WT22 F.109	WT22 F.111	Total
Raw Material Types																											
Knox Black	-	1	14	6	148	370	234	33	86	5	65	49	22	2	3	29	-	-	-	5	59	-	139	9	-	28	1307
Knox Other	-	-	4	-	10	6	6	1	7	-	2	-	-	-	-	1	-	-	-	-	1	-	2	-	-	-	40
Chalcedony	-	-	2	2	115	160	30	6	13	-	20	188	8	-	-	-	-	-	-	-	12	-	53	4	-	19	633
Jasperoid	-	-	-	-	5	7	1	-	1	-	-	8	-	-	-	-	-	-	-	-	-	-	1	-	-	-	23
Jasper	-	-	-	-	5	3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	10
Quartzite	-	-	-	-	12	46	72	4	13	-	3	376	10	-	-	-	-	-	-	-	22	-	-	-	-	5	563
Quartz	-	-	-	-	1	2	1	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	15	1	-	-	24
Rhyolite	-	-	1	-	-	7	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
Other	-	-	2	1	1	6	1	-	1	-	7	-	12	-	-	8	-	-	-	-	4	-	4	1	-	-	48
Total	-	1	23	9	297	607	346	44	121	5	97	625	53	2	3	38	-	-	-	5	98	-	215	15	-	52	2657

^aF. = feature; L. = level; Pz = plowzone; St = stratum.

Table 14. Core and Core Tool Raw Material Frequencies for Dated Contexts.

Temporal Period	Early Archaic	Early Woodland								Middle/ Late Woodland			Late Prehistoric										Protohistoric					
Context ^a	RU14 Zone J	HW45 F.44	HW44 F.20	HW44 F.22	CR3 F.34	CR3 F.21	CR3 F.1	HW44 F.19	CR3 F.24	RU14 F.19	JN90 F.1&L.2	JN89 F.2	WG17 F.43	GY10 6-24 in.	LE17 All Levels	RU14 F.23	MY8	MY11 All Levels	PU9	HW44 F.1	WG17 F.45	SM5 All Levels	WT22 Pz/St2	WT22 F.37	WT22 F.109	WT22 F.111	Total	
Raw Material Types																												
Knox Black	-	-	1	3	2	1	2	2	-	1	1	-	1	-	7	4	-	-	-	1	2	-	1	1	-	-	-	30
Knox Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chalcedony	-	-	-	-	-	4	-	-	1	-	-	3	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	10
Jasperoid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jasper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Quartzite	-	-	1	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	1	-	2	-	-	-	-	-	-	6
Quartz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rhyolite	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	4	4	-	2	-	-	-	13
Total	-	-	3	3	2	5	2	3	1	1	1	3	5	-	7	4	1	-	1	2	8	4	1	3	-	-	-	59

^aF. = feature; L. = level; Pz = plowzone; St = stratum.

Table 15. Bifacial Tool Raw Material Frequencies for Dated Contexts.

Temporal Period	Early Archaic	Early Woodland								Middle/ Late Woodland			Late Prehistoric										Protohistoric					
	RU14	HW45	HW44	HW44	CR3	CR3	CR3	HW44	CR3	RU14	JN90	JN89	WG17	CY10	LE17	RU14	MY8	MY11		HW44	WG17		SM5	WT22	WT22	WT22	WT22	Total
Context ^a	Zone J	F.44	F.20	F.22	F.34	F.21	F.1	F.19	F.24	F.19	F.1&L.2	F.2	F.43	6-24 in.	All Levels	F.23		All Levels	PU9	F.1	F.45	All Levels	Pz/St2	F.37	F.109	F.111		
Raw Material Types																												
Knox Black	1	1	6	2	3	10	7	3	1	3	1	2	7	3	8	1	5	3	-	1	11	1	12	1	2	1	96	
Knox Other	-	-	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	5	
Chalcedony	-	-	5	1	2	3	4	-	2	-	1	4	-	3	-	-	4	-	-	-	-	1	13	-	-	-	43	
Jasperoid	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	4	-	-	-	7	
Jasper	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Quartzite	-	-	-	-	1	1	3	-	-	-	-	2	-	-	-	-	1	-	-	-	1	-	-	-	-	-	9	
Quartz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	3	1	-	-	7	
Rhyolite	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-	-	-	4	
Other	-	-	2	-	-	-	-	-	1	-	-	-	-	3	1	-	-	-	-	-	-	1	-	-	-	-	8	
Total	1	1	17	3	6	17	15	3	4	3	2	8	7	11	9	1	13	3	1	1	13	5	32	2	2	1	181	

^aF. = feature; L. = level; Pz = plowzone; St = stratum.

Bifacial tools (Table 15) were also generally produced from Knox black chert or chalcedony throughout the time periods examined, although a few tools from Early Woodland contexts at Fudd Campbell were also produced from quartzite. While no major differences in raw material use between these major technological groups was noted, nor between different temporal contexts, consistency in the use of raw materials is also important. Knox cherts are accessible from the Ordovician (Chapultepec formation) Knox Group dolomites of the Ridge and Valley Province of East Tennessee (Kimball 1985:95-96) and Southwest Virginia and also the Cambrian Honaker dolomite formation (Swingle et al. 1966). Ayres (1984) also notes the upper Cambrian Conocacheaque limestone as a source of Knox cherts. Chalcedony is accessible from the Cambrian Shady Dolomite formation of upper East Tennessee (Boyd 1986:77; Sheperd 1972:31). Both these materials are highly siliceous and therefore very easily worked to form tools. For these reasons, they were probably preferred throughout time for the production of stone tools. However, these materials occur naturally in a generally small nodular form (Kimball 1985:101-107) and are thus not suitable for the production of large stone tools. Slightly greater use of quartzite (which outcrops as large boulders or occurs as large nodules in gravel bars in the study area) in the Early Woodland contexts reflects the clearly functional need for larger raw materials in producing larger triangular projectile points.

In order to provide a broader perspective on raw material use, projectile point size, and the variation of both through time, the raw materials used to produce all the projectile points from all sampled

contexts were examined. In Table 16, diagnostic lithic artifact types are arranged in chronological order, and their frequencies for the major raw material categories are tabulated. Knox black cherts were used almost exclusively in the production of Early Archaic projectile points and preforms. Middle Archaic projectile points were made from chalcedony and quartz. While Knox chert is an important raw material in the production of Late Archaic Iddins projectile points, and continues to be relied upon from then until Protohistoric times, quartzite and rhyolite (both large tabular or nodular resources) are most often selected for the production of large Late Archaic bifaces, preforms or Savannah River or Appalachian Stemmed projectile points. Quartzite is also highly selected for the production of Camp Creek and other Early Woodland projectile points. Thus, while Knox black chert and chalcedony were probably preferred raw materials throughout time, other raw materials, such as quartzite and rhyolite, were occasionally relied upon.

To further investigate the correlation of raw material, projectile point size and time, a projectile point size (area) index for projectile point types with $n > 5$ was calculated by the formula $1/2(L \times W)$, where L =maximum length and W =maximum width (Table 17). Similar area calculations were made and compared for the raw material type groups from which the projectile points were produced (Table 18).

A plot of mean values and confidence interval approximations for projectile point types with $n > 5$ (Figure 16) shows that the largest points are the Appalachian Stemmed and Iddins projectile points for the Late Archaic period. Although confidence intervals are wide, a

Table 16. Diagnostic Lithic Artifact Types by Raw Material.

Types	Knox Black	Knox Other	Chalcedony	Jasperoid	Jasper	Quartzite	Quartz	Rhyolite	Other	Total
Clovis Preform	1	-	-	-	-	-	-	-	-	1
Preform-Early Archaic	1	-	-	-	-	-	-	-	-	1
Point Fragment-Early Archaic	3	1	-	1	-	-	-	-	1	6
Dalton	1	-	-	-	-	-	-	-	-	1
Lower Kirk	3	-	-	-	-	-	-	-	-	3
Upper Kirk	6	1	-	1	-	-	-	-	1	9
St. Albans	8	-	-	-	-	-	-	-	-	8
LeCroy	1	-	-	-	-	-	-	-	-	1
Kanawha	-	1	1	1	-	-	-	-	-	3
Point Fragment-Middle Archaic	-	-	-	-	-	2	3	1	-	7
Kirk/Stanly	-	-	-	-	-	-	-	-	1	1
Morrow Mountain I	-	-	-	-	-	-	1	-	-	1
Morrow Mountain II	1	-	-	-	-	-	-	3	-	4
Guilford	1	-	2	-	-	1	2	-	-	6
Halifax	-	-	5	-	-	-	2	-	1	8
Sykes	1	-	1	-	-	-	1	-	1	4
Small Stemmed	3	-	7	1	-	-	-	1	-	12
Preform-Late Archaic	-	1	4	-	-	32	-	5	1	43
Point Fragment-Late Archaic	-	-	3	-	-	21	1	7	2	34
Appalachian Stemmed	1	1	4	1	-	48	-	16	9	80
Iddins	23	1	4	1	-	-	-	1	2	32
Otarre	2	-	-	-	-	1	-	3	-	6
Steatite Bowl Fragment	-	-	-	-	-	-	-	-	39	39
Preform Archaic	1	-	4	-	-	-	6	1	-	12
Point Fragment-Archaic	8	-	9	-	-	-	2	2	3	24
Ebenezer	5	-	4	1	-	-	-	-	-	10
Greeneville I	-	-	7	1	-	2	-	-	-	10
Camp Creek	-	-	2	-	2	19	4	-	-	27
Greeneville II	3	-	1	-	-	3	-	1	-	8
Nolichucky	11	1	8	-	2	1	1	2	1	27
Conneestee	6	-	1	-	-	-	-	-	2	9
Bradley Spike	18	-	1	-	-	-	-	1	-	20
Preform-Woodland	14	1	12	-	1	8	-	-	1	37
Fragment-Woodland	13	-	6	-	1	8	3	-	-	31
Jack's Reef	11	-	1	-	-	-	-	-	-	12
Hamilton	43	-	16	2	-	-	-	-	1	62
Straight Base/Incurvate Blade	4	-	-	-	-	-	-	-	-	4
Incurvate Base/Straight Blade	6	-	5	-	-	-	1	-	-	12
Madison	14	-	3	-	-	-	1	-	1	19
Pentagonal	13	-	-	-	-	-	-	1	-	15
Dallas	2	-	-	-	-	-	-	-	-	2
Pisgah	8	-	6	1	-	-	2	-	1	18
Preform-Mississippian	26	-	10	1	-	-	1	1	-	39
Point Fragment-Mississippian	16	1	12	-	-	-	1	1	-	31
Total	278	9	139	13	6	146	32	47	69	739

Table 17. Projectile Point Area Means and Standard Deviations (by Nominal Point Type).

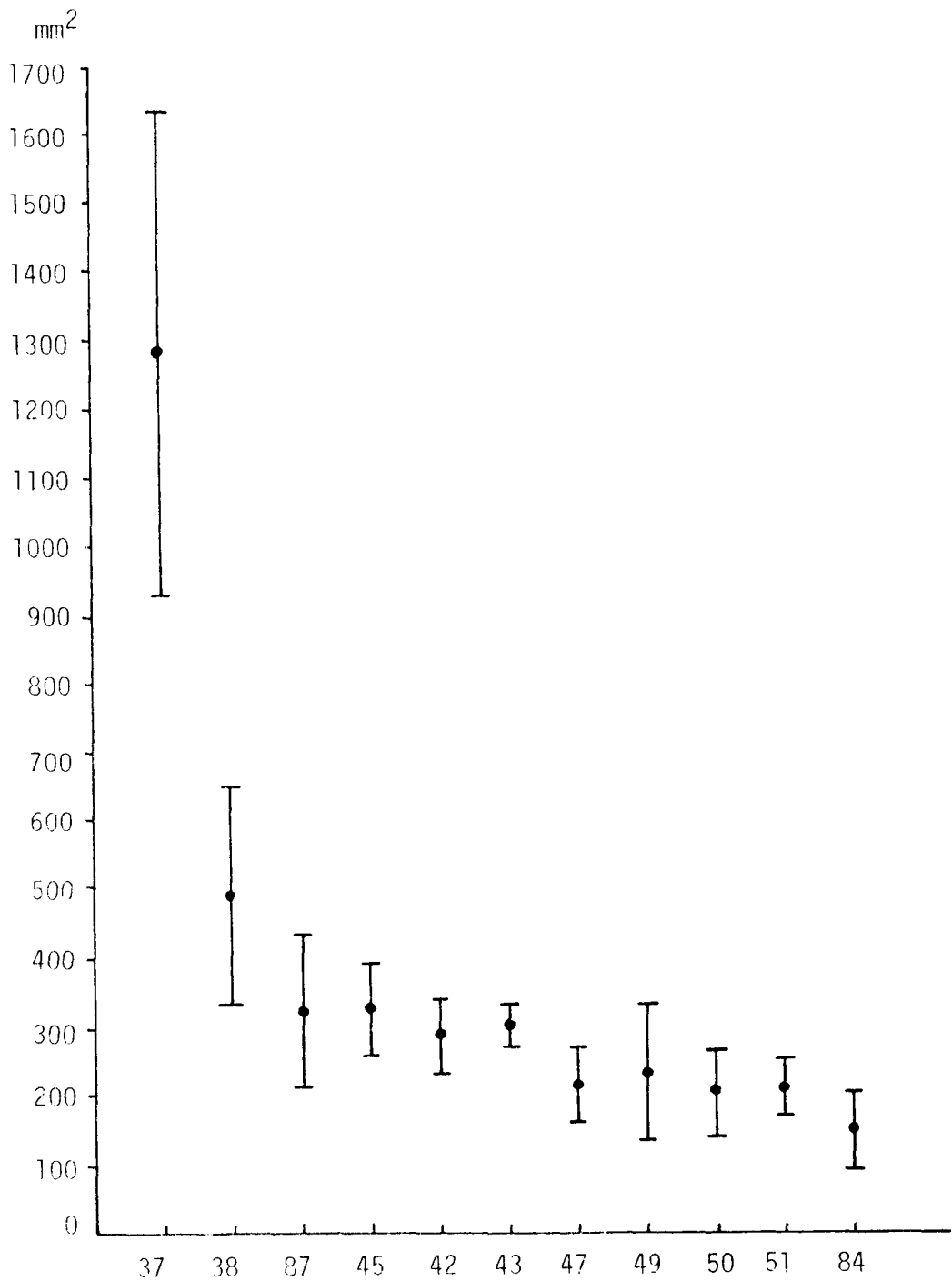
Type	n	$\bar{x}^a$	s	$\sqrt{n}$	$3(s/\sqrt{n})$
Appalachian Stemmed	13	1283.00	424.08	3.61	352.40
Iddins	11	491.00	177.81	3.32	160.67
Nolichucky	14	285.90	68.71	3.74	55.11
Ebenezer	7	323.20	96.94	2.65	109.74
Bradley Spike	10	323.60	67.42	3.16	64.00
Connestee	6	301.10	22.49	2.45	27.54
Hamilton	17	214.99	72.15	4.12	52.54
Incurvate Base/ Straight Blade	8	233.30	95.68	2.83	101.43
Madison	8	200.50	57.96	2.83	61.44
Pentagonal	10	209.20	45.44	3.16	43.14
Pisgah	7	146.96	47.34	2.65	53.59

^aMeans are in mm².

Table 18. Projectile Point Area Means and Standard Deviations by Raw Material Type.

Type	n	$\bar{x}^a$	s	$\sqrt{n}$	$3(s/\sqrt{n})$
Knox Black Chert	75	269.3	108.60	8.66	37.62
Chalcedony	32	335.2	172.13	5.66	91.23
Jasperoid	6	514.5	239.62	2.45	293.41
Quartzite	12	969.0	412.85	3.46	357.96
Rhyolite	8	730.6	489.48	2.83	518.88

^aMeans are in mm².



Note: 37 = Appalachian stemmed; 38 = Iddins; 87 = Ebenezer, 45 = Bradley Spike; 42 = Nolichucky; 43 = Connestee; 47 = Hamilton; 49 = Incurvate Base/Straight Balde; 50 = Madison, 51 = Pentagonal; 84 = Pisgah.

Figure 16. Mean Areas and Approximations to Confidence Intervals for the Mean for Different Projectile Point Types.

gradual decrease in the sizes of Late Archaic - Early Woodland to Early/Middle Woodland - Late Prehistoric points can also be seen, although there is a great deal of overlap in the confidence intervals. Triangular projectile points, first produced during the Early Woodland, gradually become smaller, until the temporally latest and smallest points (Pisgah or Qualla Triangulars). Thus, projectile point size does gradually decrease over time, with the production of smaller points roughly coincident with the shift from mostly stemmed to mostly triangular forms. The technological shift from the use of spears or atlatl darts to the bow and arrow as the major hunting system is also reflected in this size change.

Finally, the size index to raw material plot for raw materials with $n > 5$ (Figure 17) clearly shows that projectile points made from quartzite have larger mean areas than those produced from Knox Black chert and chalcedony. This further shows that quartzite which was less tractable than the more siliceous cherts and chalcedonies, was selected because it was the best material in the study area for making large bifacial tools in the Late Archaic and Early Woodland periods. Otherwise, more easily worked siliceous raw materials were selected for tool production throughout time. Thus, different raw materials were functionally adaptive at different times due to projectile point size requirements. Differential raw material use is best understood through this evolutionary perspective, and not as a purely stylistic attribute of projectile point types.

The temporal patterns discussed here have also been observed by previous researchers. Keel (1976:130-131) notes that Early

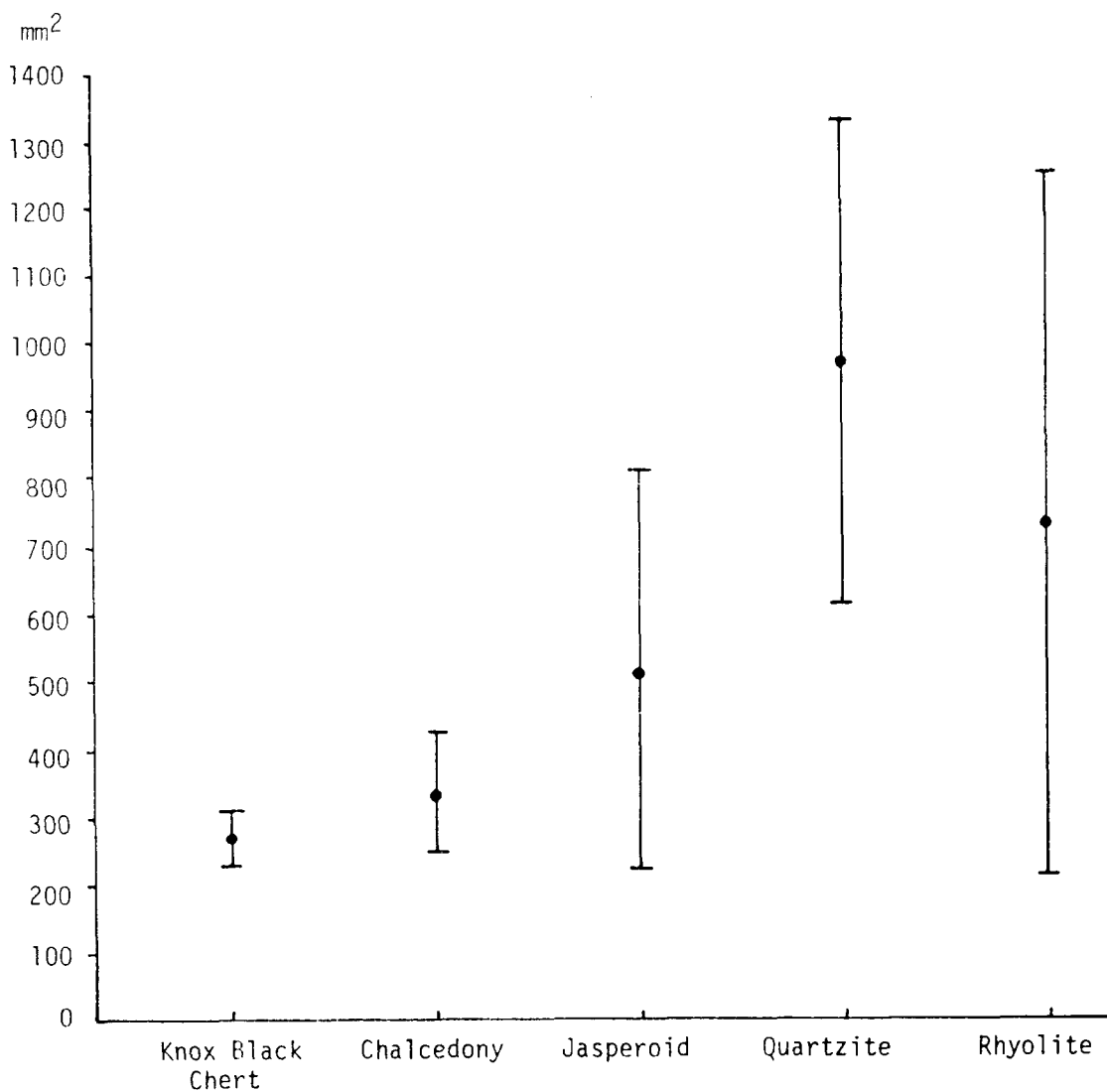


Figure 17. Mean Areas and Approximations to Confidence Intervals for the Mean for Projectile Points by Raw Material Type.

Woodland large triangular projectile points, such as Transylvania and Garden Creek Triangulars from the Garden Creek sites, are predominantly made from quartzite, while Middle Woodland through Late Prehistoric projectile points, such as Connestee and Haywood Triangulars, South Appalachian Pentagonal and small serrated points are predominantly made from chert (Keel 1976:131-134).

For the upper Watagua valley, Middle Archaic projectile points (Stanly, Morrow Mountain, Guilford) are produced primarily from local raw materials, such as quartz, although the use of nonlocal quartzite for the production of Guilford points is significant (Purrington 1983:121-130). Savannah River or Appalachian Stemmed projectile points in the upper Watagua valley are made predominantly from quartzite and rhyolite. This pattern is similar to that noted for the Watauga Reservoir area (Boyd 1986:128-129) nearby.

The survey of the Great Smoky Mountains by Bass (1977) indicates generally similar patterns of raw material use to those documented above. As in the Watauga Reservoir area, cherts are the major raw materials used for Early Archaic projectile points (these include chert, chalcedony, and jasper and are considered "exotic" raw materials) (Bass 1977:51-52). Middle Archaic through Middle Woodland points, however, are mainly produced from local raw materials--vein quartz and quartzite--with 100% of the Late Archaic Savannah River projectile points being produced from quartzite. During the Woodland period, the use of exotic cherts steadily increases, until these are almost exclusively used during the Pisgah/Cherokee period for the production of small, triangular projectile points (Bass 1977:51,

53-61). It is interesting that while the Great Smoky Mountains and Watauga Reservoir areas are similar in the local availability of quartzite and its procurement along valley floors (Bass 1977:48; Boyd 1986:77, 84), this resource, which is nonlocal to the upper Watauga valley, was still preferred during Late Archaic times (Purrington 1983:129). This is again due to the raw material size requirements of Savannah River or Appalachian Stemmed projectile points.

Finally, size differences in projectile points and debitage from different temporal periods has been addressed by Kimball (1982) for the lower Little Tennessee River valley. The size decrease from Early Woodland through Late Prehistoric triangular projectile points discussed for the study area is supported by Kimball's (1982:Tables VI:13 and 14) descriptive statistics for Woodland and Mississippian points. For Kimball's (1982:205-238) debitage temporal pattern analysis, an early-late dichotomy was significant, with Early (Early Archaic - Early Woodland) debitage of all stages significantly larger than Late (Middle Woodland - Mississippian) debitage. As Kimball (1982:225) notes, his study demonstrates "...overall morphological differences between the manufacturing by-products of atlatl dart points earlier and arrow points later."

In summary, the attributes of lithic raw material, technology, and projectile point size may be considered functionally adaptive attributes of lithic artifacts, because all these attributes affect the ease of production and efficiency of these tools in hunting and butchering activities. Size of projectile points and debitage also indirectly reflects other changes in hunting technology--the shift

from atlatl projectiles to arrows. The replicative success of smaller projectile points from the Middle Woodland to Late Prehistoric periods attests to the greater efficiency of the bow and arrow technology. The technological study also shows that less tractable raw materials (from a lithic technology perspective) may be selected when there are larger size requirements for projectile points. A functional evolutionary model ties these observed changes to concepts of natural and cultural selection--the selective advantages of certain traits enhance the reproductive success of their bearers.

Functional Variation in Site Location

One of the major goals of settlement studies is the analysis and interpretation of changing patterns of land use over time (Ammerman 1981:66; Baden 1985:134). Site locational data from surveys are the basic kinds of information used for such studies. However, there are several limitations of survey data, namely: 1) poorly refined site chronology, 2) underrepresentation of small sites, 3) poorly defined internal structure of large sites, and 4) limited information on site use (Ammerman 1981:76-77). In fact, as Ammerman (1981:77) states, "...ambiguity is a common feature of most sets of survey data." Other problems, which are being addressed by some researchers (e.g., Baden 1982) concern the nature of the surface of a site, the relation of surface to subsurface artifacts, and how geomorphological processes affect site visibility and integrity (Ammerman 1981:81-82; Whyte 1984:192-204).

Available survey data from the study area are certainly subject

to the same problems and limitations, but because site location is related to the exploitation of resources in the natural environment, it is discussed herein as a functional cultural attribute amenable to evolutionary interpretation. Few components from sites surveyed in the study area are radiocarbon dated, therefore, assignment of sites to chronological time periods is largely based on presence of traditional artifact type fossils in surface collections. This results in an overestimation of the contemporaneity of site occupations, but this is unfortunately a problem for most surveys (Ammerman 1981:77). In addition, sites without temporally diagnostic artifacts cannot be used in studies of temporal change. The Watauga Reservoir survey, for example, identified 112 sites; however, 53 (47.3%) of these sites produced no diagnostic artifacts, or could only be identified to very broad temporal periods, such as "Archaic" or "Woodland" (Boyd 1986:132-143).

Other problems occur in the comparison of site location data from different surveys. Several major physiographic provinces (Blue Ridge, Ridge and Valley, Piedmont) occur in the study area, and definitions of physiographic zones within these provinces are not strictly comparable. However, tables summarizing site distribution data for several surveys do show similar broad trends in site location changes through time.

Table 19 shows the distribution of site components by temporal period and major physiographic zone for the Watauga Reservoir survey (Boyd 1986). Because of silt covering the original land surfaces in most areas, finer determinations of terrace sequences were difficult.

Table 19. Site Location by Temporal Period for the Watauga Reservoir Sites (from Boyd 1986).

Temporal Period	Physiographic Zone						Total
	First Terrace		Older Terraces		Hillslopes		
	n	%	n	%	n	%	
Paleoindian	-	0.0	1	100.0	-	0.0	1
Early Archaic	-	0.0	12	85.7	2	14.3	14
Middle Archaic	-	0.0	10	66.7	5	33.3	15
Late Archaic	-	0.0	31	79.5	8	20.5	39
Early Woodland	-	0.0	18	81.8	4	18.2	22
Middle Woodland	-	0.0	12	75.0	4	25.0	16
Late Woodland/ Late Prehistoric	1	3.5	25	86.2	3	10.3	29
Late Prehistoric/ Protohistoric	-	0.0	11	84.6	2	15.4	13

Thus, most of the sites for all time periods are found in the Older Terrace zone. It can be noted, however, that (except for the anomalous Paleoindian and Early Archaic components) the percentages of Late Woodland through Protohistoric site components in the First and Older Terrace zones are higher than for any other time period. This may reflect functional evolutionary processes of increasing settlement location near rich, alluvial soils with increasing reliance on agricultural food production, or stochastic processes such as the burial of earlier components along floodplains (see Chapman 1975, 1977, 1978). Increased settlement location on floodplains in later time periods as a result of agricultural practices is supported by an examination of site locations and soil types, using 85 sites from Johnson County, Tennessee (see Leighty et al. 1956). Of the 16 sites located on hill slopes, 87.5% (n=14) are on eroded, stony loams or colluvial soils. A nearly inverse relationship exists for the 67 sites on older terraces, where 86.5% (n=58) sites are on fine sandy loams or silt loams, the best agricultural soils in the area (Leighty et al. 1956). One of the first terrace sites is located on cobbly alluvium while the other is located on undulating loam.

Of the 10 sites in the uplands above the Watauga Reservoir whose locations and artifact collections were examined, all were located in gaps between ridges or on benches or ridge tops with flat expanses near streams. This pattern is noted for other rugged mountain areas, such as the Mount Rogers National Recreation Area in Southwest Virginia (Piper 1977:99). Here, the importance of a level surface as a campsite outweighed its distance from water. The Watauga upland sites

were primarily lithic scatters, and were likely hunting/food processing camps, with recovered lithic artifacts representing lithic tool maintenance or production (see Piper 1977:98-99).

Site distribution data from other surveys in the study area generally support the contention that major site location shifts toward the floodplains in more recent time periods. Site locations from the New River (Table 20) and Holland (1970) (Table 21) surveys show that the trend toward increasing numbers of floodplain terrace sites begins with the Late Archaic period. While this distribution may be biased due to the burial of Early and Middle Archaic sites along river terraces from alluviation, or the greater visibility of diagnostic Late Archaic artifacts (Boyd 1986:1301; Purrington 1983:125), this pattern fits with those recognized in other areas of the southeastern United States (Hoffman and Foss 1980).

Purrington (1983) extensively reviews and compares survey data from the upper Watauga valley (Table 22) and the Great Smoky Mountains (Table 23) in terms of changes in the distribution of site components. High mobility, a broad-spectrum adaptive strategy, and intense use of the upland zones are indicated for the Early Archaic Kirk sites of the upper Watauga valley and the Great Smoky Mountains (Purrington 1983:113). Later in the Early Archaic LeCroy phase (Purrington 1983:120), a shift toward the exploitation of bottomland and valley margin lands occurs in the upper Watauga valley. The Middle Archaic in both regions represents a period of increasingly efficient use of all environmental zones and local resources in both the upper Watauga and Great Smokies (Bass 1977:109; Purrington 1983:121-125). Important

Table 20. Site Location by Temporal Period for the New River Survey Sites.

Temporal Period ^a	Physiographic Zone						Total
	Main Valley Floodplain		Uplands, Ridge Toes		Rockshelters		
	n	%	n	%	n	%	
Dalton/Hardaway	2	100.0	-	0.0	-	0.0	2
Early Archaic	8	67.0	3	25.0	1	8.0	12
Middle Archaic	14	74.0	5	26.0	-	0.0	19
Late Archaic	18	81.8	4	18.2	-	0.0	22
Early Woodland	7	100.0	-	0.0	-	0.0	7
Late Woodland/ Protohistoric	76	90.5	2	2.4	6	7.1	84

^aChronology is comparable to Hoffman and Foss (1980), with all ceramic series--Grayson, Wythe, New River, Radford and Smyth--included in the Late Woodland/Protohistoric period.

Table 21. Site Location by Temporal Period for the Southwest Virginia Survey Sites (from Holland 1970).

Temporal Period ^b	Physiographic Zone								Total
	Floodplain Sites ^a				Ridge, Bluff Site		Rock- shelter		
	T0-T1		T2+						
	n	%	n	%	n	%	n	%	
Paleoindian/ Transitional Archaic	2	28.6	2	28.6	3	42.9	-	0.0	7
Early Archaic	3	14.3	10	47.6	8	38.1	-	0.0	21
Middle Archaic	12	26.1	16	34.8	16	34.8	2	4.3	46
Late Archaic	13	33.3	15	38.5	10	25.6	1	2.6	39
Early Woodland	5	25.0	9	45.0	6	30.0	-	0.0	20
Late Woodland/ Protohistoric	60	40.3	61	40.9	25	16.8	3	2.0	149

^aT stands for Terrace.

^bChronology is comparable to Hoffman and Foss (1980).

Table 22. Site Location by Temporal Period for the Upper Watauga River Valley Sites (from Purrington 1983: Tables 3.1 and 3.2).

Temporal Period	Physiographic Zone ^a												Total
	Main Valley Fertile Bottoms		Main Valley Margins		Upland Valleys		Upland Ridges		Total Main Valleys		Total Uplands		
	n	%	n	%	n	%	n	%	n	%	n	%	
Early Archaic	9	15.0	13	21.7	18	30.0	20	33.3	22	36.7	38	63.3	60
Middle Archaic	19	19.6	21	21.6	32	33.0	25	25.8	40	41.2	57	58.8	97
Late Archaic	13	16.3	32	40.0	15	18.8	20	25.0	45	56.3	35	43.8	80
Terminal Archaic	5	20.0	8	32.0	5	20.0	7	28.0	13	52.0	12	48.0	25
Early Woodland	15	20.0	26	34.7	11	14.7	23	30.7	41	54.7	34	45.3	75
Middle Woodland	17	30.4	22	39.3	6	10.7	11	19.6	39	69.6	17	30.4	56
Pisgah	21	40.4	14	26.9	8	15.4	9	17.3	35	67.3	17	32.7	52
Qualla	12	54.5	5	22.7	3	13.6	2	9.1	17	77.3	5	22.7	22

^aMain Valley Fertile Bottoms--T-0 and natural levees of 5-7th order streams with no agricultural limitations. Main Valley Margins--agriculturally limited bottoms, valley margins (T-1, T-2, rockshelters); Upland Valleys--bottoms, margins and rockshelters in upland valleys; Upland Ridges--main valley and upland valley uplands and ridgetops.

Table 23. Site Location by Temporal Period for Sites in the Great Smoky Mountains (from Bass 1977: Table 15).

Temporal Period ^a	Physiographic Zone								Total
	Upland Zone				Valley Zone				
	Gap, Ridge		Cove, Bench		Floodplain		Upper Valley ^b		
	n	%	n	%	n	%	n	%	
Early Archaic	7	28.0	11	44.0	3	12.0	4	16.0	25
Middle Archaic	14	18.9	27	36.5	24	32.4	9	12.2	74
Late Archaic	6	10.2	12	20.3	29	49.2	12	20.3	59
Terminal Archaic/ Early Woodland	8	11.9	28	41.8	20	29.9	11	16.4	67
Middle Woodland	6	7.4	32	39.5	37	45.7	6	7.4	81
Pisgah/Cherokee	4	7.0	17	29.8	33	57.9	3	5.3	57

^aChronology is comparable to Purrington (1983).

^bUpper Valley area includes valley fringe, slopes and knolls.

differences occur between the two regions in the Late Archaic period. In the Great Smokies (Bass 1977:48, 69, 109), sites are primarily found in the main river valleys, and exposed outcrops of quartzite along these river valleys are exploited for stone resources. In the upper Watauga valley (Purrington 1983:127, 129), however, a wide range of habitats is still exploited (as in the Middle Archaic), as are possible nonlocal sources of quartzite.

For the Early Woodland Swannanoa period, in both the Smokies (Bass 1977:81) and the upper Watauga valley (Purrington 1983:133), much less intensive use of the floodplains is indicated and, in fact, an Archaic period pattern of the exploitation of a broad range of habitats continues. With the Middle Woodland Pigeon and Connestee periods, however, there is a significant increase in the intensive use of floodplain areas in both regions, although a variety of habitats is still used (Purrington 1983:136). Specialized exploitation of the uplands for hunting continues, while the distribution of ceramic sites indicates increasingly sedentary settlement on the floodplains, probably the result of agricultural intensification. This pattern continues during the Pisgah phase, and is accompanied by increasing "nucleation of communities on fertile soils in broad river valleys and the emergence of a hierarchy of communities" (Purrington 1983:147). Although decentralization of this hierarchy and a more dispersed settlement pattern are noted for the following Qualla phase, a broad-based subsistence pattern, with hunting and gathering as well as maize production, is still prevalent (Dickens 1978, 1984; Purrington 1983:150). Decentralization of Late Prehistoric/Protohistoric

societies is noted in other areas of the Southeast (Peebles 1983; Schroedl 1984), and is related to political or environmental instability. Dickens (1984) suggests that this social collapse is less severe in the Appalachian Summit region because agriculture, while increasingly important from the Middle Woodland through Late Prehistoric periods, was not a primary food resource as in areas with more extensive floodplains.

Survey data from adjoining regions in the Blue Ridge, Ridge and Valley and Appalachian Plateau physiographic provinces provide important comparative information with the surveys analyzed and discussed in detail above. First, the increased use of floodplain zones during the Late Archaic period noted in the Watauga, New River and Southwest Virginia surveys has also been seen in other parts of Virginia and Delaware (Catlin et al. 1982), and has been interpreted as an intensive concentration on the exploitation of riverine resources. This pattern also fits with increasing occupation of the main river valleys in the Great Smoky Mountains during this period (Bass 1977), although the exploitation of quartzite resources is proposed as the main reason for this shift. Some researchers (Custer 1978; Witthoft 1953) have even suggested that the Savannah River Broadspear may have served as a specialized tool for spearing fish, or for the maintenance of other fishing-related equipment. Population increase is also proposed during this period in Virginia (Catlin et al. 1982:135) as a result of this shift to a riverine focus which, in turn, was initially stimulated by a warming, drying environmental trend.

However, the distribution of Savannah River sites in the uplands

of the Blue Ridge in Virginia (Barber and Tolley 1984; Hoffman and Foss 1980) also increases over that of the earlier Archaic periods, and upland Late Archaic sites in the Blue Ridge are found in all environmental zones (hollows, saddles, ridges, upland basins, gaps, slopes, and foothills) (Barber and Tolley 1984:30; Hoffman and Foss 1980:197, 200). Hoffman and Foss (1980:194-204) call the Late Archaic - Early Woodland periods in the Blue Ridge the "period of primary forest efficiency", equating this "florescence of occupation" to Caldwell's (1958) concept of the development of an efficient, stable occupation of the woodlands of eastern North America based on hunting, gathering, and fishing. The "cause" of this expansion of occupation of the Blue Ridge is usually considered environmental; the aforementioned warming, drying trend (called the Xerothermic Interval) would have been less severe in the Blue Ridge uplands with their forests and greater rainfall (Barber and Tolley 1984:28; Hoffman and Foss 1980:203). This information weakens the argument that Savannah River points are specialized tools for a riverine adaptation, because a number of sites are also located in upland habitats.

Site distributional patterns for the Late Woodland (in Virginia) and Late Prehistoric or Mississippian periods (in Tennessee and North Carolina) also show similarities with the Late Prehistoric/Protohistoric survey information from the study area. Baden's (1985) analysis of changing settlement patterns through time in the lower Little Tennessee River valley of the Ridge and Valley Physiographic province of Tennessee demonstrates that by Late Archaic/Woodland I (Early Woodland) times, exploitation of the river terraces increases in

intensity. It is suggested that this is due to the expanding use of cultigens and early horticulture practices (Baden 1985:153). The Mississippian settlement pattern shows an even greater emphasis on the use of river terraces, particularly on lands with prime agricultural soils. Again, this is reflective of the more intensive cultivation of and dependence on maize. In the Shenandoah National Park portion of the Blue Ridge, Late Woodland exploitation was specialized toward hunting (Hoffman and Foss 1980:204-207). Large, palisaded Late Woodland villages along the rivers in the Ridge and Valley and Piedmont were the centers for the Late Woodland populations, and the base from which they conducted agricultural activities. In the uplands, most sites are found in hollows and, even though there is a range of site types (based on size and probable duration of occupation), all sites could be characterized as hunting camps or kill and butchering sites. Competition by males of different tribes over hunting territories was probably a major cause of increased warfare during this period (Hoffman and Foss 1980:204). Thus, although the uplands were less extensively exploited for resources than during the Archaic or earlier Woodland periods, they still served as an important, specialized resource area for the total Late Woodland period settlement system.

Summary

The analysis of functionally adaptive attributes of ceramic and lithic artifacts, and of site distribution through time, has identified several important patterns. First, larger ceramic temper size is generally correlated with larger sherd thickness, regardless of the

temporal association of the artifact. This indicates that functional attributes, such as sherd thickness, should be used with caution as a major attribute in determining the temporal or cultural affinity of individual sherds. The use of limestone and particularly shell as tempering agents, however, in many Late Prehistoric cultures produced more easily worked pastes and is associated with a "proliferation in vessel forms" (Smith 1986:54), increasing functional efficiency and replicative success.

Second, lithic artifacts from the study area show several functional patterns. Highly homogeneous and siliceous raw materials such as Knox chert and chalcedony were widely preferred as lithic raw materials because they could be easily knapped into a variety of tools. However, the replicative success of large, stemmed bifaces during the Late Archaic indicates that their makers felt this kind of tool was more functionally efficient in resource procurement, although we do not know specifically what these tools were used for. Their production required a shift to the use of less tractable, but larger, lithic resources. Beginning in the Early - Middle Woodland periods, reduction in projectile point size, and a shift to unstemmed, triangular forms begins, and projectile point size gradually decreases through time up to the Historic period.

Finally, the settlement distribution data shows generally similar trends from several areas. Early to Middle Archaic groups used a broad range of habitats, and more intensively used the upland areas. With Late Archaic - Early Woodland groups, more intensive exploitation of floodplain areas, either for fish or lithic resources, occurred.

Finally, beginning with Middle Woodland groups, and reaching its peak with Late Prehistoric/Protohistoric and Mississippian populations, progressively more intensive settlement of the floodplains occurs. Agricultural intensification in terms of maize production is usually cited as a cause for this pattern. At the same time, specialized use of the uplands for hunting becomes an important element in the total settlement-subsistence pattern.

The shift in settlement location over time to intensive occupation of the floodplains can be seen as a functional evolutionary response to increasing demands for the production of agricultural foods. Smith (1985:53-55) has outlined the process of plant domestication from wild to weedy, cultivated and, finally, domesticated plants. Weedy plant varieties are stimulated in their propagation by human disturbance of ground in and around a site. Cultivated plants may develop from the intentional propagation of economically important weeds by man. Those cultivated plants which then become domesticated are marked by phenotypic and genetic changes.

Rindos' (1984) evolutionary perspective on the origins of agriculture emphasizes similar elements in evolutionary changes in plants, but considers these only a part of the process. He (Rindos 1984:158-164) stresses that this is a coevolutionary process where human behavior which positively reinforces the process of domestication is also selected for. Cultural selectionism, then, is as important as the biological selection and evolution of plants, although morphological changes in plants provide the first step in the process (Rindos 1984:154-158).

Considering settlement location in this process, it follows that selective advantage of occupation near river floodplains is high for agricultural populations. The shifts in settlement location noted above coincide with Rindos' (1984) stages of domestication. Incidental domestication (Rindos 1984:154-158) may have begun during the Late Archaic - Early Woodland period in the study area--the initial period of intensive occupation of the floodplains (Baden 1985). Specialized domestication, wherein the coevolutionary relationship between man and plants first develops (Rindos 1984:158-164), probably occurred in the Middle and Late Woodland periods, where in some parts of the study area distinctions between floodplain and upland occupations and site use are first evident. Finally, agricultural domestication, wherein man - domesticated plant interactions reach a peak and man controls the plant in all stages of its life cycle (Rindos 1984:164-166), probably occurred in varying degrees of intensity in the Late Prehistoric and Mississippian periods. These are also the times when site occupation is most intense in the floodplain areas.

CHAPTER V

STYLISTIC VARIATION

Introduction

Stylistic variation of prehistoric artifacts has traditionally been a major area of study in archaeology. In this study, stylistic variation is considered a product of CS2--cultural selection of the second kind (Rindos 1985:73). While stylistic traits do not directly affect the Darwinian fitness of a culture and are therefore not functional as the term is defined herein, they serve as important communicative elements within and between cultures (Wobst 1977). Stylistic variation, as part of the context of a culture, influences the behavioral (or cultural) selection of traits or behaviors which more directly confer selective advantages. The replicative success of stylistic traits over time can document culture change and can be measured by monitoring the increase or decrease in diversity of traits.

In this chapter, stylistic variation in ceramic tempering agents and surface treatments are examined first by studying changes in the frequency distributions of traits over time, and by a simple measure of diversity. Although projectile points are primarily functional elements in prehistoric artifact assemblages, projectile point forms have traditionally been discussed and interpreted as stylistic traits which serve as cultural and chronological identifiers. For this reason, the replicative success of various stemmed and unstemmed projectile point forms over time is examined through the inspection of

frequency distributions, and through cluster and canonical discriminant analyses of selected metric attributes.

Temper and Surface Treatment Variation in Ceramic Artifacts

Much research has been conducted on the relationship between and interpretation of stylistic variation of ceramics and the social organization of the groups producing them (Hill 1970; Longacre 1970; Nelson 1985). Two major theories proposed to explain the relationship between ceramic style and social organization are the social interaction-learning theory and the information exchange theory (Kintigh 1985:36).

The social interaction-learning theory suggests that prehistoric behavioral interaction patterns can be inferred from stylistic similarities of ceramic artifacts, and that, in turn, social organization can be inferred from these behavioral patterns (Kintigh 1985:37-39). Even though this theory connects stylistic variation with a wide range of behavior, the two levels of inference involved make it very difficult to empirically test any predictions of this theory.

The information exchange theory proposed by Wobst (1977) interprets style as actively participating in information exchange and therefore directly representing social characteristics of a culture. Thus, "... style is considered to be a means of communication" (Kintigh 1985:37) and its variation can directly monitor group interaction and exchange. Although this view of ceramic style is more limited in its interpretation of the relationship of style and behavior than the social interaction-learning theory, the implications of the

information exchange theory are more easily tested. This is because stylistic attributes on artifacts themselves are seen as direct elements in social interaction, and their distribution can be measured empirically without recourse to two levels of inference.

Neither theory is completely contradictory (Kintigh 1985:38); however, the information exchange theory view of style as a communication device compares favorably with Rindos' (1984, 1985) views on cultural selection and the importance of communication in the selection of both functional and stylistic behavior. In light of this theory, then, the replicative success of stylistic traits also monitors behavioral (communicative) change directly. Although various ceramic tempering agents have been discussed previously as functional traits, the use of which influence ceramic vessel wall thickness and even shape, the use of different kinds of tempering agents has also traditionally been interpreted as temporally significant in the study area. This temporal variation is examined below to see if it is truly stylistic variation as well.

Temporal variation in temper classes is not clearly seen for most categories (Table 24). Crushed quartz, grit and sand inclusions are all frequent in the earliest Early Woodland pottery. The use of limestone as a tempering agent begins slightly later, but is also predominant in many Early Woodland collections examined (primarily those nearest the limestone sources of the Ridge and Valley province). All of these tempering agents continue to be used into Late Prehistoric/Protohistoric times, with varieties of quartz, grit or sand common to Pisgah, Qualla and Dan River series and limestone dominant in the

Table 24. Ceramic Temper Class Frequencies by Dated Contexts (Rim, Neck, Body Combined).

Temporal Period	Context ^a	Quartz	Mixed	Medium Quartz/ Limestone	Sand	Grit	Limestone	Shell	Soapstone	None	Total
Early Woodland	HW45 F.44	-	-	-	-	59	-	-	-	-	59
	F.40	-	-	-	-	5	2	-	-	-	7
	HW44 F.20	-	-	-	10	1	166	-	-	-	177
	F.22	-	-	-	10	1	32	-	-	-	43
	CR3 F.34	9	1	-	32	15	138	-	-	1	196
	F.21	11	11	-	80	39	116	-	-	1	258
	F.1	6	-	-	23	10	125	-	-	-	164
	HW44 F.19	-	-	-	5	5	74	-	-	-	84
	CR3 F.24	3	-	-	2	-	38	-	-	-	43
											52
Middle/Late Woodland	RU14 F.19	-	-	-	-	-	52	-	-	-	52
	F.16	-	-	-	-	-	10	1	-	-	11
	JN89 F.2	3	-	-	1	38	38	-	-	6	86
	JN90 F.1	1	-	5	-	24	1	-	-	-	31
	CK10 F.1 lower	23	-	1	10	38	19	-	-	1	92
	HW30 F.8	-	-	-	5	-	84	-	-	1	90
											150
Late Prehistoric	WG17 F.43	8	3	-	-	132	1	6	-	-	131
	CY10	125	-	-	-	6	-	-	-	-	60
	LE17	-	-	-	2	27	-	31	-	-	109
	LE14	-	-	-	18	59	-	32	-	-	92
	CK10 F.1 upper	8	-	-	45	36	2	1	-	-	6
	RU14 F.1	-	-	-	-	-	1	5	-	-	23
	F.23	-	-	-	-	1	22	-	-	-	205
	MY8	-	-	-	-	38	158	9	-	-	87
	MY11 L.4	-	-	-	-	9	76	2	-	-	60
	PU9	-	-	-	41	17	-	2	-	-	53
	HW44 F.1	-	-	-	47	-	6	-	-	-	125
	WG17 F.45	22	-	-	2	93	-	6	2	-	144
											33
											1
Protohistoric	SM5	1	-	-	1	74	4	31	33	-	14
	W553	-	-	-	-	11	2	-	1	-	52
	JN89 F.1	2	-	1	1	16	28	-	4	-	120
	WT22 F.37	63	-	-	-	50	2	-	5	-	31
	F.41	2	-	-	-	26	-	-	3	-	5
	F.46	5	-	-	-	-	-	-	9	-	9
	F.100	-	-	-	-	-	-	-	16	-	77
	F.109	3	-	-	2	56	-	-	1	-	43
	F.111	2	-	-	-	40	-	-	-	-	606
	WT22 Plowzone/ Stratum 2	32	-	-	-	484	1	-	89	-	25
	CN9 F.6	-	-	-	8	-	-	17	-	-	3620
											329
											15
											7
											345
											1410
											1198
											143
											163
											10
	Totals	329	15	7	345	1410	1198	143	163	10	3620

^aF. = feature; L. = level.

Radford series ceramics. Regional variation is seen in the use of these tempers, with crushed quartz temper slightly more common in Pisgah ceramics in the Appalachians of western North Carolina (Purrington 1983) while grit or sand tempering is common for Pisgah ceramics in other subregions of the study area.

On the other hand, the use of crushed shell and soapstone as tempering agents is limited to the Late Prehistoric and Protohistoric periods. The shell tempered New River series (Holland 1970), as well as shell tempered plain and cordmarked ceramics from 40WG17 and 40GN9 date to the same time period as shell tempered Mississippian ceramics from the East Tennessee Ridge and Valley province (Schroedl et al. 1986). The use of gastropod and, later, mussel shell as temper begins late in the Late Woodland (Late Prehistoric) period in Southwest Virginia (Egloff 1984). Available radiocarbon dates also suggest that the use of soapstone as a tempering agent is also a Late Prehistoric/Protohistoric trait seen in the Burke, Smyth and Pisgah series (Holland 1970; Keeler 1971; Purrington 1983).

Contemporaneous use of crushed quartz, sand, grit, and other tempers in vessels from similar cultural contexts and with similar surface treatments suggests that this pattern may be due not only to regional variation in the distribution of temper raw materials and clays but to regional variation in the "shared learning context" of stylistic instruction (Kintigh 1985:38), or even random variation. There is no suggestion that this variation is due to "intentional symbolization" for communication. However, the use of shell and soapstone as tempering agents late in time in the study sample

suggests that these tempers (in association with certain surface treatments) are useful time markers. The contemporaneous production of sand tempered bowls and shell tempered jars, and their simultaneous inclusion as grave offerings at 40GN9 (Howard Earnest, personal communication, 1985) also suggests intentional selection of certain tempers for symbolic/communicative purposes at this site. The inclusion of European artifacts with some of these burials indicates a Protohistoric date for this component.

These contentions are supported by an examination of the distribution of rim, neck and body surface treatments by temper (Table 25). While quartz, grit, sand and limestone tempers are associated with a variety of temporally early and late surface treatments, shell and soapstone tempers are associated with plain, incised, punctated, knot or net roughened and burnished surfaces. All of these surface treatments have been previously associated with Late Prehistoric/Protohistoric collections (Dickens 1976; Holland 1970; Keel 1976; Keeler 1971; Senior 1981).

Interesting temporal patterns may be noted when frequencies of rim, neck and body surface treatments are plotted against available dated contexts (Tables 26, 27 and 28). For rim surface treatments (Table 26), Early Woodland contexts have a predominance of plain or fabric marked surfaces with a few incised or notched lips as well. Although plain rims continue to be produced through the Late Prehistoric and Protohistoric periods, incised, punctated and hatchured (Pisgah phase) designs become more prominent later in time. For the Early Woodland ceramic sample, almost no neck sherds were recovered (Table

Table 25. Total Ceramic Surface Treatment Frequencies by Temper Class.

Surface Treatment	Quartz			Mixed			Quartz/Limestone			Sand			Grit			Limestone			Shell			Steatite			Total*	
	Rim	Neck	Body	Rim	Neck	Body	Rim	Neck	Body	Rim	Neck	Body	Rim	Neck	Body	Rim	Neck	Body	Rim	Neck	Body	Rim	Neck	Body		
Plain	7	3	82	-	-	1	-	-	4	16	3	42	18	30	478	22	14	366	6	10	37	3	4	71	1217	
Cord Marked (S-Twist)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	
Brushed	-	1	7	-	-	-	-	-	2	-	1	5	1	10	18	-	-	21	-	-	-	-	1	6	73	
Simple Stamped	-	-	-	-	-	-	-	-	-	1	-	4	-	-	7	-	-	1	-	-	-	-	-	-	13	
Check Stamped	1	1	8	-	-	-	-	-	-	-	1	6	2	3	20	-	5	37	-	-	-	-	-	-	85	
Napier Complicated Stamped	-	-	-	-	-	-	-	-	-	1	-	11	-	-	1	-	-	-	-	-	-	-	-	-	3	
Plasah Complicated Stamped	-	-	1	-	-	-	-	-	-	-	1	-	-	-	14	-	-	-	-	-	-	-	-	-	30	
Swift Creek Complicated Stamped	-	-	-	-	-	-	-	-	-	1	-	2	-	1	1	-	-	-	-	-	-	-	-	-	2	
Qualla Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	1	4	6	-	-	1	-	-	-	-	-	-	-	3	
Cob Marked	1	-	-	-	-	-	-	-	2	-	-	-	-	-	954	1	-	787	-	-	22	-	1	49	1944	
Residual	-	-	78	-	-	4	-	-	-	-	-	46	-	-	-	-	-	-	-	-	-	-	-	-	16	
Incised	2	-	2	-	-	1	-	-	-	8	-	2	11	2	6	12	6	5	-	2	1	-	1	2	63	
Punctate	6	-	-	-	-	-	-	-	1	1	-	14	3	14	7	1	-	-	1	-	6	4	2	-	60	
Filllets Applique	-	-	-	-	-	-	-	-	-	-	-	3	-	-	1	-	-	2	-	-	-	-	-	-	6	
Effigy Modeled	-	-	-	-	-	-	-	-	-	-	1	1	1	1	-	-	2	-	-	-	-	-	-	-	6	
Notched	-	-	-	-	-	-	-	-	2	-	-	4	-	-	-	-	-	-	-	-	1	1	-	-	8	
Miscellaneous	-	-	1	-	-	-	-	-	-	-	-	-	-	-	42	-	-	-	-	-	-	-	-	-	2	
Deub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42	
Rectilinear Complicated Stamped	-	-	1	-	-	-	-	-	-	1	27	1	1	10	-	-	4	-	-	-	-	-	-	-	5	50
Curvilinear Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1	-	-	-	-	-	-	-	1	
Loop Handle Fragment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Strap Handle	-	-	-	-	-	-	-	-	1	-	-	-	3	-	-	-	-	-	-	-	1	-	-	-	5	
Cordmarked	-	1	87	-	-	3	-	-	-	2	23	4	4	137	3	2	125	-	-	36	-	-	3	-	432	
Lug	-	-	-	-	-	8	-	-	-	-	2	-	1	3	-	-	-	1	-	-	-	-	-	-	15	
Fabric-Marked	-	2	55	-	-	-	-	-	2	3	1	78	1	-	40	13	4	500	-	1	-	-	-	-	700	
Fingernail Punctate	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	-	-	1	-	6	
Scraped	-	-	1	-	-	-	-	-	-	-	-	4	-	-	1	-	2	-	-	-	-	-	-	-	8	
Incised Fabric Marked	-	-	1	-	-	-	-	-	-	-	6	-	-	2	2	-	7	-	-	-	-	-	-	-	18	
Folded Rim	2	-	-	-	-	-	-	-	1	-	-	2	-	-	1	-	-	2	-	-	-	-	-	-	8	
Ring	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	
Pipe Fragment	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	3	
Unnotched Applique Strip	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	5	
Pinched	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	4	-	1	-	-	-	-	-	-	8	
Zoned Punctate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	3	
Knot Roughened	1	-	59	-	-	1	-	-	11	-	3	14	2	7	134	8	11	186	1	3	13	2	3	35	494	
Small Element Rectilinear	-	-	-	-	-	-	-	-	-	-	1	14	-	15	82	-	1	1	-	-	1	-	-	-	6	123
Complicated Stamped	-	-	2	-	-	-	-	-	-	-	1	14	-	-	-	-	1	1	-	-	-	-	-	-	-	
Large Element Rectilinear	-	-	-	-	-	-	-	-	-	-	3	19	3	9	120	-	-	4	-	-	1	-	-	-	6	180
Complicated Stamped	-	-	15	-	-	-	-	-	-	-	3	19	3	9	120	-	-	4	-	-	1	-	-	-	6	180
Diagonal Punctate	13	-	-	-	-	-	-	-	4	-	-	-	63	4	-	3	-	-	1	-	-	4	1	-	93	
Looped Net	-	-	10	-	-	-	-	-	-	-	-	-	-	2	30	1	1	31	-	-	-	-	-	-	13	88
Knotted Net	-	2	7	-	-	-	-	-	-	-	-	-	-	1	-	-	1	8	-	-	1	-	1	13	67	
Pinched Applique	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	
Wicker	1	-	4	-	-	1	-	-	-	-	-	4	-	-	-	2	2	1	155	-	-	-	-	-	170	
Smoothed	1	10	101	-	-	2	-	-	1	-	1	20	3	25	243	3	5	216	-	1	12	-	2	45	691	
Large Element Rectilinear--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	5	
Smoothed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Net Roughened	1	1	14	-	-	-	-	-	2	-	1	11	1	2	38	-	1	19	-	-	1	-	-	-	13	105
Indeterminant	2	1	32	-	-	-	-	-	-	3	-	24	2	7	142	-	5	102	-	3	-	1	25	-	349	
Brushed/Brushed Interior	-	-	4	-	-	-	-	-	-	-	-	1	2	4	4	-	1	13	-	-	-	-	-	-	4	33
Knot Roughened/Brushed Interior	-	-	8	-	-	1	-	-	-	-	-	5	2	3	17	-	1	9	1	1	7	-	-	-	4	59
Fabric-Marked/Brushed Interior	2	-	6	-	-	-	-	-	-	-	-	2	1	-	4	-	4	-	19	-	-	-	-	-	38	
Linear Stamped	-	-	10	-	-	-	-	-	-	-	1	10	-	-	54	1	2	6	-	-	-	1	1	4	91	
Cordmarked/Brushed Interior	1	3	26	-	-	-	-	-	-	-	-	9	-	-	-	-	6	-	-	-	-	-	-	-	46	46
Plain/Brushed Interior	1	1	3	-	-	-	-	-	1	-	1	3	1	6	14	1	-	9	-	-	-	-	1	4	87	
Smoothed/Brushed Interior	-	-	8	-	-	-	-	-	-	-	-	-	-	2	3	35	-	1	13	-	-	-	2	23	87	
Punctate/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-	3	
Looped Net/Brushed Interior	-	-	2	-	-	-	-	-	-	-	-	-	-	14	-	2	9	-	-	-	-	-	-	-	4	31
Knotted Net/Brushed Interior	-	-	5	-	-	-	-	-	-	-	-	-	-	1	8	-	3	-	-	-	-	-	-	-	7	20
Small Element Rectilinear/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	
Burnished	-	-	2	-	-	-	-	-	-	12	5	16	4	2	18	1	-	4	2	3	-	-	1	71	2	
Linear Punctate/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	
Indeterminate Stamped/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	
Diagonal Punctate/Brushed Interior	4	-	-	-	-	-	-	-	-	-	-	-	6	-	-	1	1	-	-	-	1	-	-	-	13	
Indeterminant Loop Handle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	
Total	47	28	643	-	-	22	-	-	25	59	29	404	160	163	2762	88	71	2674	21	24	142	21	24	355	7762	

*Single sherds with more than one vessel portion represented are counted more than once.

Table 26. Ceramic Rim Shard Surface Treatments by Dated Context.

Temporal Period	Early Woodland									Middle/Late Woodland						Late Prehistoric									Protohistoric																
Context ^a	HW45 F.44	HW45 F.40	HW44 F.20	HW44 F.22	CR3 F.34	CR3 F.21	CR3 F.1	HW44 F.19	CR3 F.24	RU14 F.19	RU14 F.16	JN89 F.2	JN90 F.1	CK10 F.1L	HW30 F.8	WG17 F.43	CY10	LE17	LE14	CK10 F.1U	RU14 F.1	RU14 F.23	MY8 L.4	MY11 L.4	PU9	HW44 F.1	WG17 F.45	SMS	#553	JN89 F.1	WT22 F.37	WT22 F.41	WT22 F.46	WT22 F.100	WT22 F.109	WT22 F.111	WT22 Pz/St:2	GN9 F.6	Total		
Surface Treatment																																									
Plain	-	-	1	-	10	10	2	-	4	-	-	-	-	3	-	2	1	3	2	1	-	-	1	-	1	-	-	2	2	-	1	-	-	-	-	-	-	1	3	50	
Brushed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1		
Simple Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Check Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1		
Napier Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1		
Qualla Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Coc Marked	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	2		
Residual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Incised	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	4	-	-	-	-	-	-	1	2	-	-	1	-	-	1	-	-	-	-	-	-	1	1	12		
Punctate	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	2	1	2	-	2	-	-	1	1	-	-	1	-	-	-	-	-	-	-	1	-	4	-	18		
Fillet Applique	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	2	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	6		
Effigy Modeled	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Notched	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Rectilinear Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1			
Strap Handle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Cordmarked	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2		
Lug	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	2		
Fabric-Marked	-	-	-	4	3	2	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	
Incised Fabric Marked	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Folded Rim	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Pipe Fragment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Unnotched Applique Strip	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Pinched	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
Knot Roughened	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	9	
Large Element Rectilinear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2		
Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	12	5	-	1	6	4	28	-	79		
Diagonal Punctate	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	4	-	1	5	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Looped Net	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2		
Wicker	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
Smoothed	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1		
Net Roughened	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Indeterminant	-	-	1	-	-	-	-	1	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5		
Brushed/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	
Knot Roughened/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2		
Fabric-Marked/Brushed Interior	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3		
Linear Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1		
Cordmarked/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1		
Plain/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2			
Smoothed/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2		
Punctate/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Burnished	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4	
Linear Punctate/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1		
Diagonal Punctate/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2	1	5	-	10		
Total	-	-	7	5	13	14	2	1	5	2	1	4	-	9	-	14	6	7	8	13	1	-	8	4	4	-	13	8	3	1	14	5	-	2	12	6	42	8	244		

^aF. = feature; L. = level; Pz = plowzone; St = stratum.

Table 27. Ceramic Neck Sherd Surface Treatments by Dated Context.

Temporal Period	Early Woodland									Middle/Late Woodland					Late Prehistoric										Protohistoric																
Context ^a	HW45 F.44	HW45 F.40	HW44 F.20	HW44 F.22	CR3 F.34	CR3 F.21	CR3 F.1	HW44 F.13	CR3 F.24	RU14 F.19	RU14 F.16	JN89 F.2	JN90 F.1	CK10 F.1L	HW30 F.8	WG17 F.43	GY10	LE17	LE14	CK10 F.1U	RU14 F.1	RU14 F.23	MY11 MY8	MY11 L.4	PU9	HW44 F.1	WG17 F.45	CM5	W553	JN89 F.1	WT22 F.37	WT22 F.41	WT22 F.46	WT22 F.100	WT22 F.109	WT22 F.111	WT22 Pz/St2	CN9 F.6	Total		
Surface Treatment																																									
Plain	-	-	-	-	1	-	-	-	-	-	-	-	-	3	4	4	-	-	2	1	-	-	-	1	-	-	4	-	3	-	1	2	-	-	-	-	-	-	2	3	31
Brushed	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	3	-	8	
Check Stamped	-	-	-	-	-	-	-	-	-	3	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	
Pisgah Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
Qualla Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	
Cob Marked	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	1	-	-	-	-	8	
Residual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	8	
Incised	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
Punctate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	1
Effigy Modeled	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Notched	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Rectilinear Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	2	
Loop Handle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Strap Handle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cordmarked	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Lug	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3		
Fabric-Marked	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Fingernail Punctate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Unnotched Applique	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	
Pinched	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zoned Punctate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	
Knot Roughened	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	1	5	-	-	3	-	-	-	-	-	-	-	-	1	-	-	-	16
Small Element Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	9	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	12	
Large Element Complicated Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	5	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	3	-	-	-	
Diagonal Punctate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Looped Net	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Knotted Net	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Pinched Applique	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Wicker	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Smoothed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	1	-	-	-	-	-	3	-	-	-	-	9	-	-	1	2	2	8	-	-	31	
Net Roughened	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	4	
Indeterminant	-	-	-	-	-	-	-	1	-	-	-	-	-	3	-	1	-	-	-	-	-	1	-	-	-	-	1	-	1	-	-	-	-	-	-	1	1	-	-	10	
Brushed/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Knot Roughened/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Linear Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Cordmarked/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	
Plain/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	2	-	-	5
Smoothed/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctate/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Looped Net/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	
Knotted Net/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
Burnished	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Linear Punctate/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Complicated Stamped/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Diagonal Punctate/Brushed Interior	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	-	-	-	-	4	2	-	1	-	3	-	-	-	9	4	13	1	2	14	19	-	-	22	6	7	1	18	8	4	-	12	5	-	3	7	5	23	7	200		

^aF. = feature; L. = level; Pz = plowzone; St = stratum.

Temporal Period	Early Woodland									Middle/Late Woodland						Late Prehistoric										Protohistoric														
Context ^d	HW45 F.44	HW45 F.40	HW44 F.20	HW44 F.22	CR3 F.34	CR3 F.21	CR7 F.1	HW44 F.19	CR3 F.24	RU14 F.19	RU14 F.16	JN89 F.2	JN9C F.1	CK10 F.1L	HW30 F.8	WG17 F.43	GY10	LE17	LE14	CK10 F.1U	RU14 F.1	RU14 F.23	MY8	MY11 L.4	PU9	HW44 F.1	WG17 F.45	SM5	W553	JN89 F.1	WT22 F.37	WT22 F.41	WT22 F.46	WT22 F.100	WT22 F.109	WT22 F.111	WT22 Pz/St2	CN9 F.6	Total	
Surface Treatment																																								
Plain	2	-	3	1	2	3	1	4	-	6	-	6	10	8	83	8	10	5	12	6	3	-	11	4	9	-	5	11	4	11	14	1	-	-	15	2	107	10	377	
Cordmarked	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	2	1	-	2	1	1	-	30		
Brushed	-	-	1	-	1	4	-	-	-	-	-	4	-	1	-	3	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	7	
Simple Stamped	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	56	
Check Stamped	-	-	-	-	-	-	-	-	-	20	-	-	-	14	-	1	-	-	4	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	
Complicated Stamped Rectilinear (Napier)	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1		
Complicated Stamped Rectilinear (Pisgah)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	26		
Complicated Stamped Curvilinear (Swift Creek)	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4		
Complicated Stamped Curvilinear (Qualia)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Roughened/Cob Marked	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Residual Surface Incised	-	-	11	5	11	36	14	38	2	2	-	42	11	1	-	-	12	14	6	-	-	-	-	4	-	2	-	4	1	25	10	3	-	-	5	9	152	1	421	
Punctate	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	3	-	7	
Effigy Modeled	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	
Miscellaneous (Specified)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
Daub	-	-	-	-																																				

^aF. = feature; L. = level; Pz = plowzone; St = stratum.

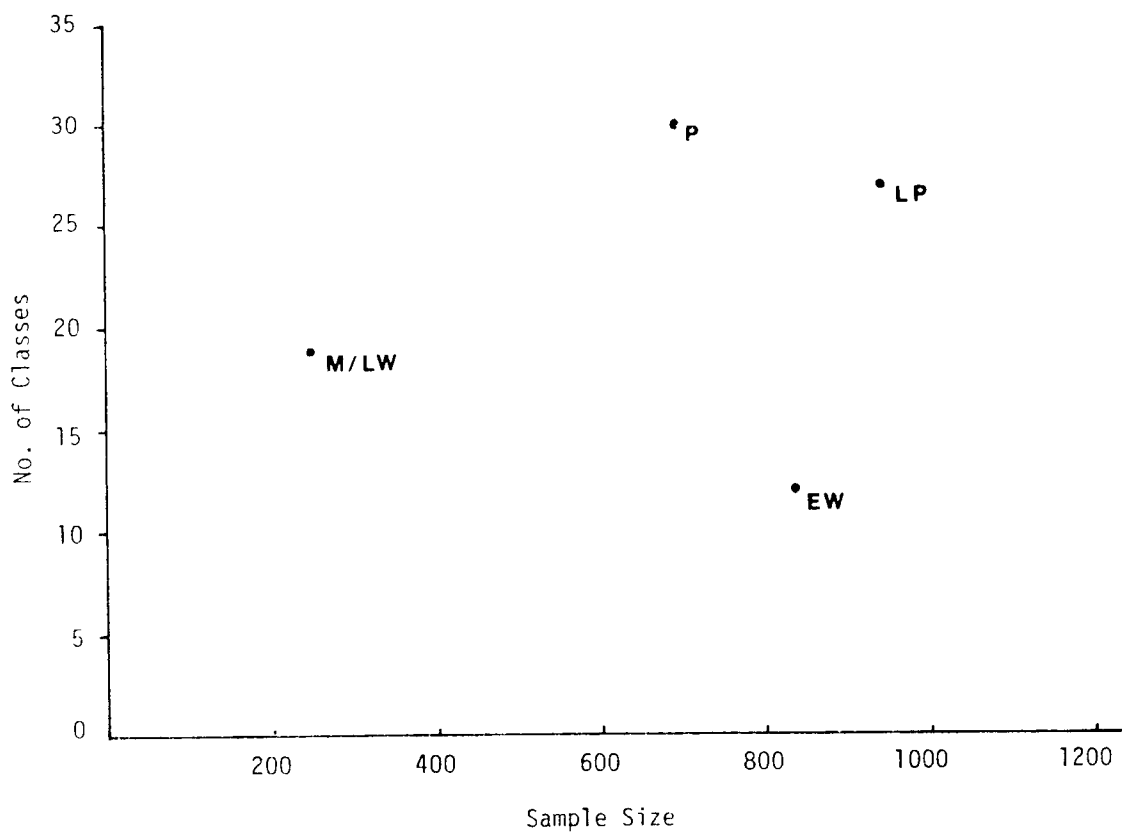
27). Conical Early Woodland vessels would rarely have any portion which could be identified as a neck fragment. With the Late Woodland through Protohistoric samples, more neck sherds are recovered, indicating changes and increased diversity in vessel forms over time. For these later contexts, plain, punctated, knot roughened, smoothed and rectilinear complicated stamped surfaces are prominent, with smoothed neck surfaces most frequently occurring in later contexts. Smoothing in this case involved purposeful obliteration of previously applied stamped or roughened surface treatments. Increasing diversity over time in rim and neck surface treatments is thus noted.

Finally, Table 28 shows significant trends in the frequencies of certain surface treatments over time on body sherds, the most highly represented class of sherds in the samples examined. Discounting the Residual and Indeterminant categories, Early Woodland ceramic surfaces are predominantly cord, fabric or wicker-marked, or their surfaces have been smoothed over after having been impressed with these patterns. Rarely, incised parallel or criss-crossed (diamond form) lines are noted over the fabric marking (Lewis and Kneberg 1957:7-8). Middle Woodland/Late Woodland body sherds show a continuation of cord-marked surfaces and smoothed surfaces, and an increase in plain surfaces. Check stamping is also prevalent at 44RU14 and 40CK10. However, fabric marking is almost nonexistent in these Middle to Late Woodland contexts. In Late Prehistoric contexts, plain, smoothed and cordmarked surfaces are still prominent, but a variety of rectilinear stamped and knot and net roughened surfaces become significant, along with an increase in interior brushing or scraping. In Protohistoric

contexts, very little cordmarking and less rectilinear complicated stamping is noted, although various types of net impression, often in association with brushed interiors, continue. Although poorly represented in the sample here, curvilinear complicated stamping and burnishing of exterior surfaces are noted in other Protohistoric contexts and reports on Protohistoric ceramic assemblages from the study area (Dickens 1976; Earnest n.d.; Keeler 1971).

It is proposed herein that in later cultures ceramic artifacts became more important as communicative elements in cultural interaction. Increased contact between Late Prehistoric and Protohistoric cultures, whether through trade, warfare, exogamous marriage or population movements would lead to the knowledge of and adoption of a variety of stylistic ceramic elements by a given culture. While ceramic decorative techniques such as incising, stamping, burnishing and punctating are intentional techniques used to present design elements and motifs with high communicative content, variation in the specific forms of the design elements and their combinations with different tempers demonstrate regional intracultural variation. They also represent selective adoption by one culture of certain designs or other stylistic traits from another culture.

Increasing diversity in stylistic attribute states in the Late Prehistoric and Protohistoric ceramic samples examined is summarized by plotting the number of surface treatment classes against the sample size for the Early Woodland, Middle to Late Woodland, Late Prehistoric and Protohistoric body sherd ceramic groups (Figure 18). The Residual, Daub, and Indeterminant attribute classes have not been included



EW = Early Woodland
M/LW = Middle to Late Woodland
LP = Late Prehistoric
P = Protohistoric

Figure 18. Surface Treatment Class Richness for Body Sherds.

in this analysis. The Cordmarked and Cordmarked (Indeterminant) classes in the Early Woodland sample have been combined into a single class, and the Ring, Pipe Fragment, Loop and Strap Handle classes for the Late Prehistoric sample are also not included. Kintigh (1984) has discussed many of the problems in measuring diversity and assessing its significance. He (Kintigh 1984:44) correctly notes that the type of plot presented here can be used to summarize diversity of classes, but suffers from problems when comparing different groups with different sample sizes. Although this is certainly a problem here with the marked difference between the Middle to Late Woodland sample size (n=247) and the other groups, the fact that the Early Woodland (n=839), and Late Prehistoric (n=937) samples are comparable in size lends support to the results of the diversity comparison of these groups.

The results of this analysis clearly demonstrate that the Late Prehistoric and Protohistoric ceramics are the most diverse in terms of their surface treatment classes, although their sample sizes vary. Their diversity is much higher than the Early Woodland ceramic group, even with the addition of incised decoration categories of parallel lines and diamonds (noted in other Early Woodland ceramic collections). The Middle to Late Woodland ceramic group appears to be intermediate in surface treatment class diversity. Because the sample size of this group is much smaller than the other groups, it is not strictly comparable to these other groups. However, the higher class diversity of this group in comparison with the larger Early Woodland sample supports its intermediate status. This data summary, then, is

consistent with a model of increasing intergroup communication and consequent ceramic diversity over time.

Finally, an examination of ceramic stylistic patterning and change over time was conducted for three excavation squares from Eastman Rockshelter (40SL34), one of the few deeply stratified sites in the study area which has been extensively excavated (Faulkner 1982; Faulkner and Dean 1982) (Table 29). Unfortunately, the site was excavated in arbitrary levels, and these levels apparently crosscut some of the natural and cultural strata. Even so, the vertical distribution of ceramic classes generally supports a pattern of limestone and sand tempered fabric and wicker-marked ceramics dominating the lower levels (these classes are comparable to the Early Woodland Long Branch and Swannanoa types discussed previously), while in the higher levels somewhat more diversity in temper and surface treatment classes is observed. Also from this site in an unsampled Level 1 context, a large soapstone tempered vessel fragment with a curvilinear complicated stamped body and incised and punctated rim and neck was recovered. The presence of this sherd, along with shell tempered plain and limestone tempered knot roughened sherds in the upper levels supports the contention that an Early Woodland through Protohistoric ceramic sequence is present at this site.

Morphological Variation in Projectile Points

Although projectile points primarily have attributes which can be considered functional in an evolutionary sense (see Chapter IV),

Table 24. Eastman Rockshelter Ceramic Temper and Surface Treatment Distributions (Rim, Neck, Body Combined).

Table 24. Eastman Rockshelter Ceramic Temper and Surface Treatments																																					
Surface Treatment ^a	Limestone Temper																	Grit								Sand				Quartz			Qtz/Ls	Shell	Total		
	1	8	10	40	42	45	65	72	76	77	79	80	82	83	84	86	87	8	26	40	42	69	77	80	83	84	1	42	45	86	42	65	86	42		1	
Square B3																		2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	11	
L.1	-	-	-	-	8	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
L.2	-	-	-	-	-	-	2	1	-	-	-	1	-	1	-	1	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	
L.3	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	
L.4	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5		
L.5	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	7	
L.6	1	-	-	1	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	7		
L.7	-	-	-	-	4	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	5		
L.8	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
L.9	-	1	-	-	2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2		
L.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-		
L.11	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Square E3																		-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	2	2		
L.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4		
L.2	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3		
L.3	1	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2		
L.4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3		
L.5	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2		
L.6	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8		
L.7	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4		
L.8	-	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8		
L.9	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5		
L.10	-	-	-	-	4	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6		
L.11	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Square G1																		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
L.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
L.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5		
L.3	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6		
L.4	2	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	6	
L.5	2	-	-	1	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3		
L.6	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7		
L.7	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3		
L.8	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5		
L.9	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22		
L.10	-	-	-	-	11	4	-	-	3	-	-	2	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	9		
L.11	-	-	-	-	6	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total	11	3	4	7	79	4	4	1	4	11	1	6	2	2	2	2	2	2	1	7	3	1	1	1	1	1	2	2	1	1	1	1	1	2	176		

^a1 = plain; 3 = brushed; 10 = check stamped; 26 = incised; 40 = cordmarked; 42 = fabric-marked; 45 = incised fabric-marked; 65 = knot roughened; 69 = small element complicated stamped; 72 = looped net; 76 = wicker; 77 = smoothed; 79 = net roughened; 80 = indeterminate; 82 = knot roughened-brushed interior; 83 = fabric-marked-brushed interior; 84 = linear stamped; 86 = plain-brushed interior; 87 = smoothed-brushed interior; L. = level.

archaeologists in the study area have viewed morphological changes in projectile points as temporally or culturally sensitive.

In order to examine possible stylistic distributions of projectile point forms over time, the frequencies of nominal projectile point types have been plotted against radiocarbon dated contexts from the study area. Table 30 shows a clear clustering of large triangular and stemmed forms with dated Early Woodland contexts, medium triangular (comparable to the Connestee type) points with Early and Middle Woodland contexts, and small triangular point types with Late Woodland through Protohistoric contexts. However, this distinction is more related to functional considerations (the adoption of the bow and arrow and the consequent replicative success of small triangular point forms) than to any stylistic variation in projectile point form. In fact, many different forms appear contemporaneous, suggesting that idiosyncratic, random, or regional variation and not intentional stylistic (communicative) patterning are major causes. It should be noted that only habitation contexts are examined, and stylistic patterning may exist in points from other contexts (i.e., mortuary). Finally, the presence of Archaic point forms in feature and surface contexts suggests mixing with earlier components.

As with the vertical distribution of ceramic artifacts at Eastman Rockshelter, the vertical distribution of projectile points recovered from another stratified site, Daugherty's Cave (44RU14) (Benthall 1986) generally supports the traditional early to late type designations (Table 31). Notched and stemmed forms are recovered from the

Table 30. Diagnostic Lithic Artifacts from Dated Contexts.

Temporal Period	Early Archaic		Early Woodland							Middle/Late Woodland				Late Prehistoric								Protohistoric					
Context ^a	RU14 Zone J	HW45 F.44	HW44 F.20	HW44 F.22	CR3 F.34	CR3 F.31	CR3 F.1	HW44 F.19	CR3 F.24	RU14 F.19	JN90 F.1&L.2	JN89 F.3	WG17 F.43	GY10 6-24 in.	LE17 All Levels	RU14 F.23	MY8	MY11 All Levels	PU9	HW44 F.1	WG17 F.45	SM5 All Levels	WT22 Pz/St2	WT22 F.37	WT22 F.109	WT22 F.111	Total
Types																											
Clovis Preform	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Preform-Early Archaic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Point Fragment-Early Archaic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dalton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lower Kirk	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Upper Kirk	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
St. Albans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LeCroy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kanawha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Point Fragment-Middle Archaic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kirk/Stanly	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Morrow Mountain I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Morrow Mountain II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Guliford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Halifax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sykes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small Stemmed	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	-	-	-	-	-	-	-	-	3
Preform-Late Archaic	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Point Fragment-Late Archaic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Appalachian Stemmed	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2
Iddins	-	-	1	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	3
Otarre	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steatite Bowl Fragment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Preform Archaic	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	3
Point Fragment-Archaic	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ebenezer	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Greeneville I	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Camp Creek	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Greeneville II	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	2
Nelchucky	-	-	6	1	-	5	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15
Connestee	-	-	3	-	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
Bradley Spike	-	-	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Preform-Woodland	-	-	1	-	1	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
Point Fragment-Woodland	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	6
Jack's Reef	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Hamilton	-	-	-	-	1	-	-	-	-	-	1	1	1	5	-	1	2	2	-	-	-	1	7	-	-	-	22
Straight Base/Incurvate Blade	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Incurvate Base/Straight Blade	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	1	-	9
Madison	-	-	-	1	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	1	3	-	-	-	8
Pentagonal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	2
Dallas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	2
Pisgah	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	-	5	-	-	-	8
Preform-Mississippian	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	5	-	1	-	2	1	2	-	1	-	14
Point Fragment-Mississippian	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	1	-	-	1	1	-	1	1	-	1	9
Total	1	1	15	3	4	14	7	2	3	1	2	3	6	10	6	1	10	3	1	1	7	4	30	1	2	1	139

^aF. = feature; L. = level; Pz = plowzone; St = stratum.

Table 31. Daughtery's Cave Diagnostic Lithic Artifacts.

Context ^a	Type																		St. Base/ In. Blade	In. Base/ St. Blade	Pentagonal	Point Fragment Mississippian	Total
	Upper Kirk	Point Fragment Early Archaic	Guilford	Sykes	Point Fragment Late Archaic	Appalachian Stemmed	Iddins	Otanne	Steatite Bowl	Point Fragment Archaic	Ebenezer	Greene- ville I	Nollichucky	Conestee	Bradley Spike	Preform Woodland	Point Fragment Woodland	Jack's Reef	Hamilton				
Square 15L5																			2				2
L.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.12	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
ZJ	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Square 15R5																	1	1	-				2
L.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	1
L.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
L.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
L.6	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2
L.9	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Square 15L10																							
L.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
L.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	3
L.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
L.7	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	2
L.8	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Square 15R10																							
L.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
L.5	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	2
L.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.8	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Square 20-0																		1					1
L.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
L.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
ZC	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
ZH	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
ZJ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Square 20R5																							
L.4	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2
L.5	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
ZD	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
ZH	-	-	1	1	-	-	3	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	6
Square 20L10																							
L.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	4
L.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.6	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
L.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.10	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
L.15	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Square 20R10																		2					3
L.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	1
L.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
L.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
L.6	-	-	-	-	-	1	-	-	3	-	-	-	-	-	-	-	1	-	-	-	-	-	5
L.9	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
L.10	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
ZD	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
ZH	-	-	-	-	1	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	3
Square 20R15																							
L.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	1
L.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ZC	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
ZD	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1

^aL. = level; Z = zone; In. = incurvate; St. = straight.

lowest levels, while progressively smaller triangular forms are found in higher levels.

In order to examine more fully the formal, and possibly stylistic, variation in projectile points, 356 complete or nearly complete points from the sampled contexts were measured in terms of selected metric attributes and other nominal attributes (raw material, stem shape, base shape). First, patterning in nominal attribute states is discussed. For stemmed projectile points (Table 32), several trends can be noted. Early Archaic points were almost exclusively produced from Knox black chert, a Ridge and Valley province lithic resource, while Middle Archaic points were produced from quartz and Late Archaic Appalachian stemmed points were produced from quartzite or rhyolite. The Early to Middle Woodland and Late Prehistoric points were mainly produced from Knox black chert. These patterns of resource use, while temporally significant in some cases, are the result of previously discussed functional considerations of lithic artifact size requirements and available raw materials and are not stylistic as defined herein.

Other nominal attribute states, such as stem and base shape have traditionally been considered stylistic elements of projectile points. However, even though these shapes show temporal trends in their frequencies (Table 32), these changes are most likely due to changes in hafting techniques or elements over time or random or idiosyncratic variation, and not intentional stylistic modifications for communication purposes. Only in cases of inclusions of projectile points as grave offerings (see Hofman 1985) or in other ceremonial contexts can

Table 32. Selected Stemmed Projectile Point Raw Material, Stem Shape and Base Shape Variation.

Raw Material	Type																							
	Point Fragment Early Archaic	Dalton	Lower Kirk	Upper Kirk	St. Albans	Le Croy	Kanawha	Point Fragment Middle Archaic	Kirk/ Stanly	Morrow Mountain I	Morrow Mountain II	Guilford	Halifax	Sykes	Small Stemmed	Point Fragment Late Archaic	Appalachian Stemmed	Iddins	Otierre	Point Fragment Archaic	Ebenezer	Bradley Spike	Point Fragment Woodland	Jack's Reef
Knox Black	2	1	1	5	4	1	-	-	-	-	1	-	-	1	2	-	1	15	1	1	5	15	3	7
Knox Other	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
Chalcedony	-	-	-	-	-	-	1	-	-	-	-	2	4	-	6	-	4	4	1	1	2	-	-	-
Jasperoid	1	-	-	-	-	-	1	1	-	-	-	-	-	-	1	-	1	1	-	-	1	-	-	-
Jasper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Quartzite	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	39	-	1	-	-	-	-	-
Quartz	-	-	-	-	-	-	-	2	-	1	1	2	2	1	-	-	-	-	-	-	-	-	-	-
Rhyolite	1	-	-	-	-	-	-	-	-	-	3	-	-	-	1	2	12	1	2	-	-	1	-	-
Other	-	-	-	1	-	-	-	-	1	-	-	-	1	1	-	-	8	1	-	1	-	-	-	-
Total	5	1	1	6	4	1	2	3	1	1	5	5	7	3	10	3	66	23	5	3	8	16	4	7
Stem Shape ^a																								
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	3	2	64	17	3	-	1	7	1	-
2	-	-	-	-	-	-	-	2	1	-	-	-	-	-	1	-	1	1	-	1	-	1	-	-
3	1	-	-	-	-	-	-	-	-	-	-	-	1	3	4	-	-	5	-	-	-	4	1	-
4	2	1	1	6	3	-	1	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-	-
5	2	-	-	-	-	-	-	1	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	7
6	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	5	5	-	-	2	1	1	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	7	4	2	-
Base Shape ^b																								
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2	1	-	-	1	-	-	-
1	2	-	-	3	-	-	-	-	-	-	-	-	2	-	3	-	21	12	2	-	-	9	3	6
2	-	-	1	1	-	-	1	-	-	1	5	5	2	3	5	3	8	7	3	2	7	7	-	-
3	2	1	-	2	1	1	-	3	1	-	-	-	3	-	1	-	35	3	-	1	-	-	1	1
4	1	-	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^a0 = broken; 1 = straight; 2 = incurvate; 3 = corner removed; 4 = corner notched; 5 = side notched; 6 = round stem; 7 = tapered stem; 8 = no stem-triangular point.^b0 = broken; 1 = straight; 2 = excurvate; 3 = incurvate; 4 = bifurcate.

they be interpreted as having a strong communicative element. Otherwise, these projectile points should be considered artifacts with almost exclusively functional attribute states.

This is also the case for unstemmed triangular projectile points and their nominal categories (Table 33). Raw material types vary from an intensive use of quartzite and chalcedony for larger Early Woodland forms to a higher use of Knox black chert for smaller Late Prehistoric forms. Variation in base shape and overall point morphology may suggest some regional variation in the manufacture of certain forms. If so, the co-occurrence of these various forms in the same contexts may suggest intergroup contact, even though the projectile points themselves (as with the stemmed varieties discussed above) did not serve as communicative elements in the same sense as ceramic surface treatments and decorations did.

Metric attribute analysis of projectile points has provided very useful information concerning the validity of projectile point types and what these types actually represent (Hoffman 1985; Kimball 1982; Schroedl et al. 1985; Tucker 1980). One important study, which used factor and canonical correlation analyses to evaluate traditional Late Archaic/Early Woodland stemmed projectile point types from northern Mississippi and Alabama, and south-central Tennessee, was conducted by Hoffman (1985). The results of this analysis demonstrated that projectile point types, such as Ledbetter, Mulberry Creek, Cotaco Creek and Flint Creek, were actually different stages in the use-life trajectory of a single type. Thus, the normative type designations, implying cultural and temporal significance (i.e., stylistic

Table 33. Selected Triangular Projectile Point Raw Material and Base Shape Variation.

Point Type ^a	Greeneville I	Camp Creek	Greeneville II	Nolichucky	Connestee	Hamilton	St. Base/ In. Blade	In. Base/ St. Blade	Madison	Pentagonal	Dallas	Pisgah
<u>Raw Material</u>												
Knox Black	-	-	1	9	4	24	4	5	14	10	1	7
Knox Other	-	-	-	-	-	-	-	-	-	-	-	-
Chalcedony	6	3	1	5	1	17	-	5	3	-	-	5
Jasperoid	-	-	-	-	-	2	-	-	-	-	-	1
Jasper	-	2	-	1	1	-	-	-	-	-	-	-
Quartzite	2	14	3	1	-	-	-	-	-	-	-	-
Quartz	-	2	-	1	-	-	-	1	1	-	-	2
Rhyolite	-	-	1	1	-	-	-	-	-	1	-	-
Other	-	-	-	1	-	1	-	-	-	1	-	-
Total	8	21	6	19	6	44	4	11	18	12	1	15
<u>Base Shape^b</u>												
0	-	-	-	-	-	-	-	-	-	-	-	1
1	8	-	1	6	1	1	3	-	13	2	1	7
2	-	-	-	5	-	-	1	-	-	1	-	7
3	-	21	5	8	5	43	-	11	5	9	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-

^aSt. = Straight; in. = Incurvate.^b0 = broken; 1 = straight; 2 = excurvate; 3 = incurvate; 4 = bifurcate.

significance), are only functionally significant entities in a reduction sequence (Hoffman 1985:605). The use of similar multivariate techniques in the analyses presented below will evaluate the strength of the traditional projectile point types discussed in this study.

Of the 190 stemmed projectile points which were measured, 87 complete specimens were used in the principal component, cluster, and discriminant analyses. The principal component analysis simply standardized the 10 variables measured by computing component scores (based on the 10 unrotated components) for each of the 87 observations. As defined earlier, these variables included maximum length, blade width, maximum thickness, stem length, neck width, stem width, base curvature, stem angle, lateral edge 1 curvature, and lateral edge 2 curvature. The component pattern matrix and variance explained by each component are presented in Table 34. The component scores were clustered using Ward's hierarchical algorithm, as described in SAS (1985:45-73, 267-268). A plot of the cubic clustering criterion for this analysis (a statistic which helps one determine the number of clusters) (Figure 19), however, shows all negative values, which indicates that all the observations form only a single cluster. This suggests that differences between the various stemmed types were not strong enough to form and maintain distinct clusters. However, this result does not compare with the distinct patterns noted in the distribution of nominal stem and base shape attribute states described above.

Canonical discriminant analysis was performed using the component scores to see if this technique could better define distinct classes

Table 34. Principal Component Pattern Matrix for Stemmed Projectile Point Analysis.

	Component Pattern									
	1	2	3	4	5	6	7	8	9	10
Length	0.87414	0.22780	0.07686	-0.09993	0.00690	-0.33420	0.07454	-0.14533	0.17223	-0.00329
Width	0.90905	-0.07881	0.20259	-0.04323	-0.07185	-0.14929	0.18894	0.00333	-0.24760	0.00603
Thickness	0.71900	0.34719	0.06594	0.16710	-0.54582	0.11942	-0.13254	0.00423	0.02131	-0.00242
Stem Length	0.82977	-0.05545	0.29134	0.15308	0.27666	0.13610	-0.26224	-0.18214	-0.04913	0.02574
Neck Width	0.90187	-0.22469	0.21147	0.06226	0.12826	0.11511	0.05725	0.16608	0.07102	-0.14815
Stem Width	0.64321	-0.69062	-0.02787	0.24326	-0.00069	0.04058	0.08914	0.11376	0.08609	0.13937
Base Curvature	-0.29537	0.58623	0.02484	0.73397	0.11797	-0.06912	0.10254	0.02070	-0.01015	-0.00450
Stem Angle	0.07109	0.77477	0.50250	-0.29583	0.11248	0.11767	0.06494	0.12869	0.03311	0.07919
Lateral Edge 1 Curvature	0.63565	0.32273	-0.58638	-0.08212	0.07322	0.27185	0.21833	-0.11925	0.00619	0.00438
Lateral Edge 2 Curvature	0.65839	0.34734	-0.56041	-0.06549	0.13249	-0.15559	-0.22190	0.18519	-0.04365	0.01822
	Variance Explained by Each Component									
	4.952879	1.877907	1.092703	0.763525	0.445609	0.298395	0.250459	0.160354	0.109436	0.048733

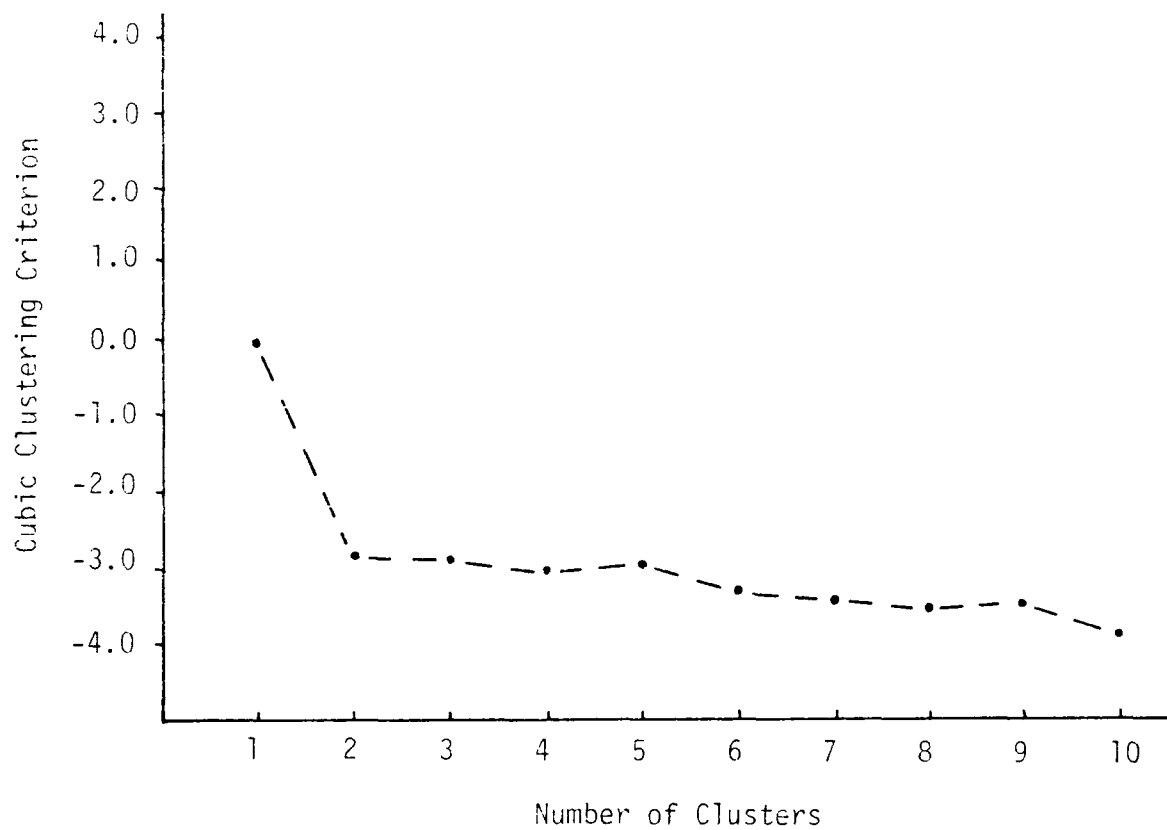


Figure 19. Cubic Clustering Criterion Plot for Stemmed Projectile Point Cluster Analysis.

of points, using time as a dependent variable. For this analysis, the different projectile point types coded were grouped by their traditional temporal period designations (Table 35). The results of the discriminant analysis using these groups (Tables 36 and 37) indicated that the groups did significantly discriminate on the basis of time. The first and second canonical variates were significant at the 0.05 level and, together, they explained 79.7% of the total variance in the sample (Table 36).

Examining the canonical structure for CAN1 and CAN2 (the first and second canonical variates) (Table 37), it can be seen that Components 1 and 2 have high positive loadings on CAN1, while Component 1 is highly negative and Component 2 is highly positive in their loadings on CAN2. Returning to the component pattern matrix (Table 34), Component 1 largely reflects size, because the variables length, width, thickness, stem length, neck width, and stem width load highly on this component. Curvature of the blade edges, which is affected by the size of the point, also has high positive loadings on this component. Component 2 has a high negative loading on stem (base) width and high positive loadings on base curvature and stem angle--attributes which describe the shape of the point stem. Thus, CAN1 of the discriminant analysis primarily discriminates on the basis of point size, while CAN2 discriminates on the basis of stem shape.

The plot of CAN2*CAN1 (Figure 20) clearly shows the patterning in the sample. The Late Archaic projectile points are discriminated along the CAN1 axis, and Early and Middle Archaic points also tend to group together along this axis. The corner notched triangular points,

Table 35. Temporal Groups for Canonical Discriminant Analysis of Stemmed Projectile Points.

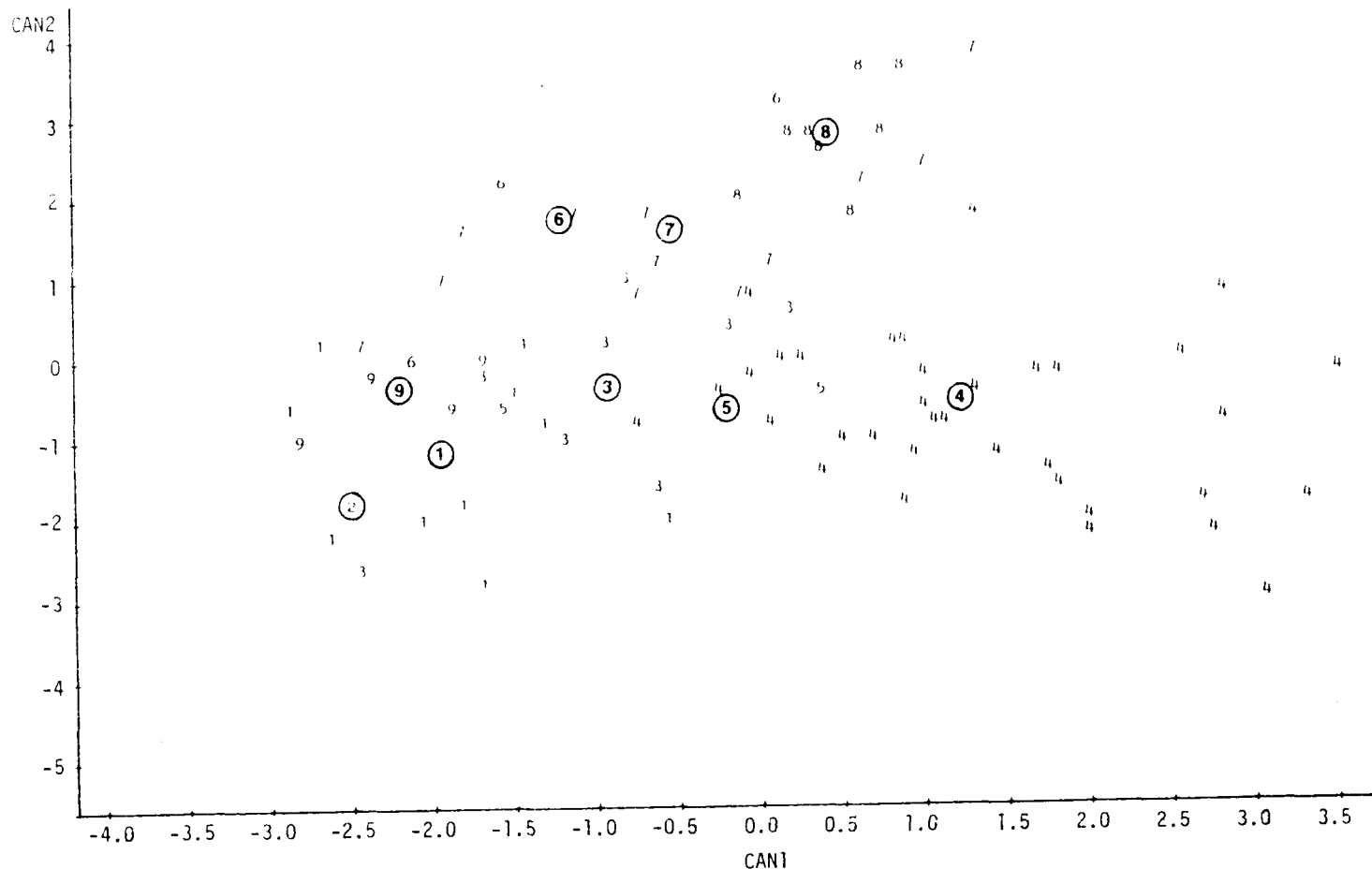
Temporal Group	Point Type
Early Archaic (1)	Lower and Upper Kirk, St. Albans and LeCroy bifurcates, Kanawha, Early Archaic point fragment
Dalton (2)	
Middle Archaic (3)	Kirk/Stansly stemmed, Morrow Mountain I and II, Guilford, Halifax, Sykes, small stemmed, Middle Archaic fragment
Late Archaic (4)	Savannah River, Iddins, Otterre, Late Archaic fragment
Archaic (5)	Undesignated Archaic point
Woodland (6)	Undesignated Woodland point
Bradley Spike (7)	
Ebenezer (8)	
Late Woodland/ Late Prehistoric (9)	Jack's Reef corner notched

Table 36. Canonical Discriminant Analysis Results for Stemmed Projectile Points by Time.

	Canonical Correlation	Adjusted Can Corr	Approximate Std Error	Variance Ratio	Canonical R-Squared	Likelihood Ratio	F Statistic	Num DF	Den DF	Prob > F
1	0.806004679	-	0.037779908	1.8542	0.649643543	0.056273454	3.2021	80	446.2	0.0000
2	0.800479330	-	0.038737074	1.7837	0.640767158	0.160617715	2.4378	63	400.35	0.0000
3	0.550175319	0.400673012	0.075192560	0.4341	0.302692881	0.447113114	1.3086	48	353.41	0.0915
4	0.482787146	0.387602700	0.082698741	0.3039	0.233083428	0.641199699	0.9720	35	305.31	0.5179
5	0.345988367	0.196720680	0.094924333	0.1360	0.119707950	0.836074903	0.5614	24	255.88	0.9534
6	0.202223605	-0.044805729	0.103423018	0.0426	0.040894387	0.949769912	0.2571	15	204.68	0.9979
7	0.089753530	-	0.106964105	0.0081	0.008055696	0.990266243	0.0919	8	150	0.9994
8	0.041130143	-	0.107650354	0.0017	0.001691689	0.998308311	0.0429	3	76	0.9881
Multivariate Test Statistics and F Approximations										
Statistic	Value		F		Num DF		Den DF		Prob > F	
Wilks' Lambda	0.05627345		3.202118		80		446.1959		6.76285E-15	
Pillai's Trace	1.996537		2.527488		80		608		2.41399E-10	
Hotelling-Lawley Trace	4.564397		3.836946		80		538		7.75281E-21	
Roy's Greatest Root	1.854236		14.09219		10		76		1.03599E-13	

Table 37. Canonical Structure of the First and Second Canonical Variates--Stemmed Projectile Points by Time.

Component	CAN1	CAN2
1	0.6800	-0.6064
2	0.5645	0.6654
3	0.3750	0.1767
4	-0.0611	-0.2889
5	0.0466	0.1370
6	0.0755	-0.0887
7	0.1047	-0.0416
8	0.0538	-0.0697
9	-0.2245	0.1896
10	0.0506	0.0751



Note: 103 OBS had missing values. 4 OBS hidden.
 1 = Early Archaic; 2 = Dalton; 3 = Middle Archaic; 4 = Late Archaic; 5 = General Archaic; 6 = Woodland; 7 = Bradley Spike; 8 = Ebenezer; 9 = Jack's Reef. Group means are circled.

Figure 20. Plot of CAN2 by CAN1--Canonical Discriminant Analysis of Stemmed Projectile Points by Time.

although produced in the Late Woodland to Late Prehistoric periods, group with the Early Archaic corner notched points because of the similarities in their shapes. Finally, the Early and Middle Woodland Ebenezer and Bradley spike types appear to loosely group together at the top of the plot. Thus, temporal variability in the stemmed projectile point sample is clearly demonstrated, based on projectile point size and stem shape. The groups observed here, however, were not "tight" enough or separate enough to be defined by the cluster analysis. Moreover, although temporal variability in stemmed projectile point form is demonstrated by this analysis, this variation is most likely due to functional changes in projectile point size and hafting requirements, and not to any type of stylistic variation.

The multivariate analysis of the triangular projectile points followed the same steps as the stemmed point analysis. Of the 166 triangular projectile points measured, 107 complete specimens were used in the analyses. The principal component pattern matrix and variance explained by each component are presented in Table 38. The plot of the cubic clustering criterion for the clustered component scores (Figure 21), as with the case of the stemmed points, shows all negative values, indicating the observations only form a single significant cluster. Canonical discriminant analysis was performed using the component scores, however, to further evaluate temporal variability. The projectile point temporal groups are defined in Table 39. The discriminant analysis showed that the first and second canonical variates were significant at the 0.05 level (Table 40). In terms of the structure of these canonical variates, Component 1 loads highly on

Table 38. Principal Component Pattern Matrix for Triangular Projectile Point Analysis.

	Component Pattern					
	1	2	3	4	5	6
Length	0.82806	-0.20475	0.40441	-0.09299	-0.31024	0.06289
Width	0.34074	-0.82300	-0.11044	0.43896	0.03424	0.02255
Thickness	0.82956	-0.11994	0.43032	-0.13403	0.30564	-0.02966
Base Curvature	0.13513	0.84490	0.33407	0.39480	-0.00015	0.02018
Lateral Edge 1 Curvature	0.84058	0.23958	-0.38574	0.01891	-0.05299	-0.28995
Lateral Edge 2 Curvature	0.77440	0.30206	-0.48441	-0.03956	0.04680	0.26581
Variance Explained by Each Component						
	2.814487	1.596131	0.855975	0.377091	0.195838	0.160479

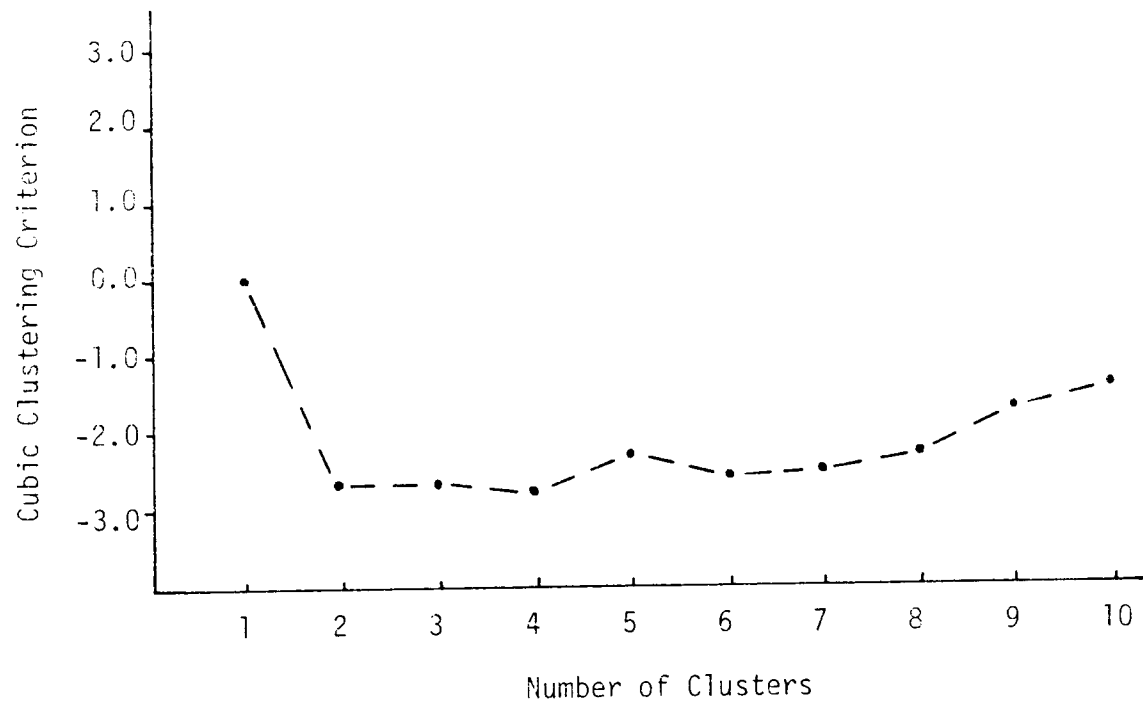


Figure 21. Cubic Clustering Criterion Plot for Triangular Projectile Point Cluster Analysis.

Table 39. Temporal Groups for Canonical Discriminant Analysis of Triangular Projectile Points.

Temporal Group	Point Type
Paleoindian (2)	Clovis preform
Early/Middle Woodland (3)	Greeneville I and II, Camp Creek, Nolichucky, Connestee
Late Prehistoric/ Protohistoric (1)	Hamilton, Madison, Pentagonal, incurvate base/straight blade, straight base/incurvate blade
Dallas (4)	
Pisgah Serrated (8)	

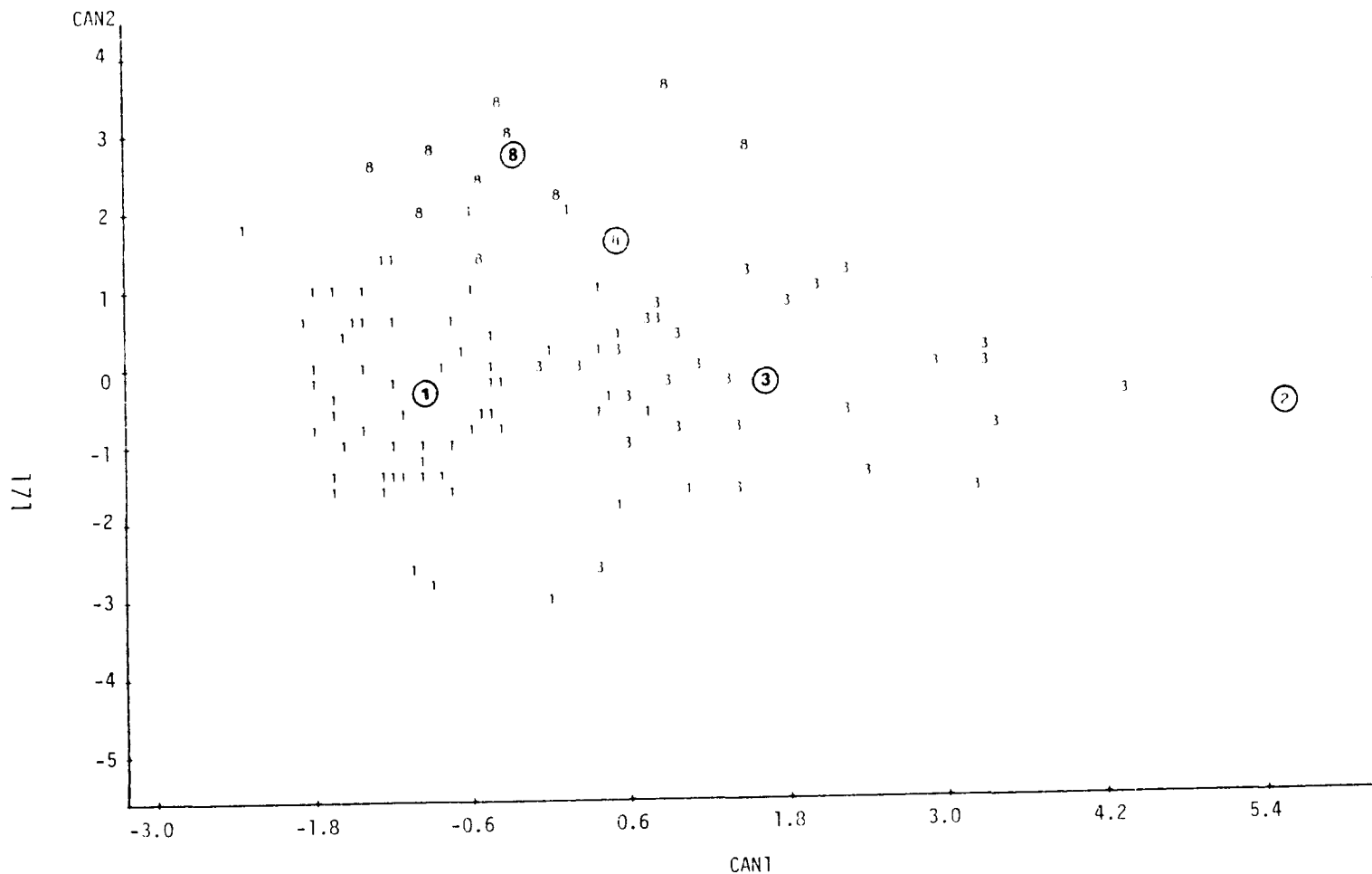
Table 40. Canonical Discriminant Analysis Results for Triangular Projectile Points by Time.

	Canonical Correlation	Adjusted Can Corr	Approximate Std Error	Variance Ratio	Canonical R-Squared	Likelihood Ratio	F Statistic	Num DF	Den DF	Prob > F
1	0.791849930	0.762445955	0.036226407	1.6812	0.627026312	0.184807916	8.8089	24	339.6	0.0000
2	0.659204790	0.625599093	0.054921266	0.7685	0.434550956	0.495498534	5.2317	15	270.94	0.0000
3	0.331191391	0.234202707	0.086474771	0.1232	0.109687737	0.876292106	1.6893	8	198	0.1029
4	0.125488882	-0.082582544	0.095599058	0.0160	0.015747459	0.984252541	0.5333	3	100	0.6605
<u>Multivariate Test Statistics and F Approximations</u>										
Statistic	Value		F		Num DF		Den DF		Prob > F	
Wilks' Lambda	0.1848079		8.808937		24		339.6026		7.45831E-24	
Pillai's Trace	1.187012		7.032929		24		400		3.37419E-19	
Hottelling-Lawley Trace	2.588861		10.30151		24		382		6.53417E-29	
Roy's Greatest Root	1.681154		28.01924		6		100		2.04716E-19	

CAN1, and Component 2 loads highly on CAN2 (Table 41). Component 1 can be interpreted as representing size and blade shape, based on high loadings for length, thickness and lateral edge curvature (Table 38). Component 2 represents base shape, with a high negative loading for point width and a high positive loading for base curvature. The plot of CAN2*CAN1 (Figure 22), as with the stemmed projectile points, clearly shows several distinct groups. The larger Early Woodland points (and the single Paleoindian preform) are discriminated from the smaller Late Woodland through Late Prehistoric/Protohistoric points along CAN1, and the similarly shaped Early Woodland, Hamilton, Madison, incurvate base/straight blade and incurvate blade/straight based triangular points are separated from the Pisgah and Dallas points (with excurvate blade edges and straight or excurvate bases) along CAN2. The analysis thus demonstrates temporal differences between smaller Late Woodland through Protohistoric arrow points and the Early Woodland points along the CAN1 axis, and the morphological variation within Late Prehistoric and Protohistoric points discussed above. The first type of variation is functional, while the second type may be related to regional or stochastic variation. The metric projectile point analyses have demonstrated significant temporal patterns in projectile point morphological change. However, stylistic variation comparable to that in ceramic artifact surface treatments is not supported. Morphological changes in projectile points can best be explained as functional changes in a Darwinian sense. The replicative success of certain morphological types in distinct periods attests to

Table 41. Canonical Structure of the First and Second Canonical Variates--Triangular Projectile Points by Time.

Component	CAN1	CAN2
1	0.9804	-0.0866
2	0.0176	0.8678
3	0.1848	0.3856
4	0.0294	-0.2791
5	-0.0415	-0.0691
6	-0.0414	-0.0897



Note: 59 OBS had missing values. 6 OBS hidden.
 1 = Late Prehistoric/Protohistoric; 2 = Paleoindian; 3 = Early/Middle Woodland; 4 = Dallas;
 8 = Pisgah Serrated. Group Means are Circled.

Figure 22. Plot of CAN2 by CAN1--Canonical Discriminant Analysis of Triangular Projectile Points by Time.

the recognition of the greater efficiency of these types in food procurement and processing activities by their manufacturers.

Summary

The analysis of stylistic variation in the study area has focused on the examination of changes in ceramic and lithic artifact attributes which may serve as intentional symbolic and communicative elements of material culture. Specifically, these attributes include ceramic aplastic temper inclusions, surface treatments and decorations, and projectile point form. All three attributes have traditionally been interpreted as stylistic, with normative lithic and ceramic types considered significant cultural, spatial and temporal markers. The definition of stylistic variation as applied in this chapter, however, is based on interpretations of style and its use in a culture by Wobst (1977) and Kintigh (1985). Attributes traditionally interpreted as stylistic in a normative sense may represent intentional communicative elements, regional variation or random variation, and it is sometimes difficult to differentiate among these sources of variation. Confusion also arises when attributes interpreted as stylistic in a normative sense are actually related to the functional efficiency (Darwinian fitness) the artifact provides its users. When style is defined as those elements not possessing "detectable selective [functional] values" (Dunnell 1978:199) this confusion is avoided.

For the artifacts examined here, stylistic variation was defined for the selective use of certain ceramic temper classes in the Late

Prehistoric and Protohistoric periods. The selection of shell, soapstone, and sand tempers for use in distinct vessel forms, in mortuary contexts, and with certain surface treatments suggests their importance as intentional communication attributes. Aside from this, most contemporaneous variation in temper selection was probably due to regional variation or random processes, and, while forming elements of "style," were not significant in intentional communication.

On the other hand, ceramic surface treatments clearly showed increasing diversity over time, and particularly in Late Prehistoric and Protohistoric contexts, were important elements in intergroup communication. The selective adoption of certain decorative elements of one culture by another through contact only increased this diversity. This pattern may explain the Late Prehistoric and Protohistoric spread of such surface treatments as large element complicated stamping and bold parallel incision over broad areas of the Southeastern United States (Russell 1975). This does not imply that Early Woodland groups, with less diverse pottery surface treatments, had no contact with one another; it does imply, however, that ceramic artifact surface treatments (and their diversity) become more important in intergroup communication over time.

Finally, formal variation in projectile points from the study sample is best interpreted as functional and not stylistic variation. This does not mean that there is no temporal variability in projectile point form in the study area; this study clearly demonstrates that projectile point form is a useful time marker. However, this formal variation is not in any sense comparable to stylistic variation in

ceramic artifact surface treatments. Except for some regional and random variation, attributes of projectile points are functional in an evolutionary sense.

CHAPTER VI

CONCLUSIONS

In the first chapter of this study, the point was emphasized that archaeological data are a unique resource for the understanding of long-term culture change. However, the recognition of this characteristic of archaeological data requires a change from the "archaeology as fossilized behavior" metaphysical paradigm under which most archaeologists operate, and the development of a unifying theory which can lead to explanations of culture change. The theory of cultural selectionism, which applies Darwinian evolutionary principles of selection from variation, fitness and replicative success to cultural phenomena, is proposed as the unifying theory for the study of culture change.

A lower order (mid-range) theory which ties empirical observations to a more general theory of cultural selection is the distinction between functional and stylistic attributes. Functional attributes "directly affect the fitness of a population" and are therefore affected by evolutionary processes (selection), but stylistic attributes do not provide direct selective advantages and are therefore affected by random or historical processes (Dunnell 1978). This concept has been modified here by suggesting that some stylistic attributes, because of their symbolic and communicative character, also undergo cultural selection and in fact provide the context for the acceptance or rejection of more functional behaviors (Rindos 1985).

These theoretical concepts have been used to direct a case study of culture change in lithic and ceramic artifacts in upper East Tennessee and the adjoining regions of western North Carolina and Southwest Virginia. The use of the function/style dichotomy concept in the analysis of prehistoric material culture from the study area has provided several organizational advantages, and has led to the development of several hypotheses relating empirical data and theory.

First, the analysis of culture change requires the chronological ordering of sampled contexts and the artifacts they contain. This has been accomplished by the calibration and comparison of 43 radiocarbon dates from the study area. Radiocarbon dates provide an objective measure of the chronological relationships of the sampled contexts. The comparison has shown that, even though there are gaps in the dated sequences which roughly correspond to traditional chronological divisions, temporal transitions between these gaps are gradual and overlapping and are compatible with a theory of cultural selectionism. The gaps themselves may be artificial, in that certain time periods (particularly the Archaic and Late Woodland periods) are poorly represented in the radiocarbon samples.

With this chronological framework, the function/style dichotomy provides an efficient means of organizing a plethora of information from 164 sites in three states into a logical and easily interpretable form. Because this dichotomy is not arbitrary but "fundamental," as Dunnell (1978) argues, its use as a model produces a clearer explanation and understanding of the analysis and the observed patterns in the data. Some of the major empirical generalizations generated

by this research concern the problems in using normative typologies in studies of culture change, the different evolutionary nature of different artifact and attribute classes, the correlation of changes in settlement location and agricultural intensification in the study area, and increasing diversity in stylistic and communicative attributes over time. Each of these points is discussed in greater detail below.

When reviewing the literature concerning prehistoric contexts and artifacts from the study area, a confusing mass of typological names is encountered for culture-historical units and lithic and ceramic artifacts. Following the traditional normative perspective on types, these names are considered to possess cultural, temporal and in some cases spatial integrity. However, these typological designations mask the variation the archaeologist certainly sees upon closer analysis of these type "clusters." Variation is the source of culturally selected behaviors which, through replicative success, lead to archaeologically recognizable culture change; therefore, variation in the data set should not be ignored. In many cases, distinct type names have been given to artifacts due to researcher bias and intuitively perceived differences rather than any real measured differences between specimens.

Even so, some means of categorizing and ordering data for purposes of discussion is necessary. It is for this reason that terms referring to broad temporal periods, such as Early Woodland, Late Prehistoric and Protohistoric, have been used herein. In no way, however, does this imply distinct breaks between these periods.

The various analyses performed on the lithic and ceramic artifacts demonstrated that the lithic attributes examined--raw material, technology, form--were primarily functional in an evolutionary sense. All these attributes relate to the efficiency of this artifact class in performing food procurement and processing tasks and to its use-life and maintenance. These characteristics directly affect the fitness of the population using these implements, and technological innovations (for example, bow and arrow technology) which improve functional efficiency are readily seen archaeologically because of the replicative success of the more efficient forms (smaller triangular arrow tips). Lithic technology, as a subtractive technology, is less amenable to purely stylistic manipulation, although "exotic" (symbolic) tool forms are noted in specialized contexts (Hofman 1985; Kimball 1982).

Ceramic artifacts, produced from a very plastic medium, are more complex. Tempering agents are functional in that they enable pots to be fired evenly, a necessity for their subsequent use as containers and cooking vessels. However, the kind of temper used shows temporal, regional and random variation in Late Prehistoric and Protohistoric series. Ceramic surface treatments are easily interpreted as stylistic attributes without a direct effect on the fitness of a population. However, surface treatments and decorations are important elements in intercultural communication and interaction when interpreted in terms of the information exchange theory (Wobst 1977). Thus, major evolutionary trends in lithic and ceramic artifacts from the study area are observed. These include the reduction in size of triangular

projectile points from Early Woodland through Protohistoric contexts, and increasing diversity in ceramic temper types and surface treatments over time.

Changes in settlement location throughout the study area appear to correlate with observed changes in site size and permanence and the recovery of remains of domesticated plants (Chapman et al. 1982; Smith 1985). Beginning with the Late Archaic period, increasingly intensive use of floodplain terraces occurs, and this may be correlated with incidental domestication of some weedy plants (Rindos 1984; Smith 1985). The increase in floodplain site location reaches its peak during the Late Prehistoric period, where permanent habitation sites are located near these fertile soils for more intensive agricultural exploitation. An important site dichotomy also is evident during later temporal periods, wherein permanent agricultural settlements are located along the rivers and streams, and contemporary hunting camps are identified in the uplands. The broad-based Archaic exploitation of a variety of resources thus shifts to more specialized patterns of exploitation in the Late Prehistoric period.

Finally, increasing diversity in ceramic surface treatments over time may be explained in terms of the information exchange theory and the increasing importance of ceramic surface treatments as stylistic and communicative elements. The selective adoption of various ceramic design elements and motifs as a result of culture contact would increase stylistic diversity as well.

Culture change is thus documented in lithic and ceramic artifacts and functional and stylistic attributes in the study area. The use of

cultural selectionism as a unifying theory and the function/style dichotomy as a lower-order theory to compare and contrast different data classes provide effective models for describing empirical variation, and can lead to explanations of the selection of certain traits or behaviors over others which are tied to a more inclusive evolutionary theory.

BIBLIOGRAPHY

BIBLIOGRAPHY

Ammerman, Albert J.

- 1981 Surveys and Archaeological Research. Annual Reviews in Anthropology 10:63-88.

Ayres, Harvard G.

- 1965 An Appraisal of the Archeological Resources of the Blue Ridge Project Grayson County, Virginia, and Alleghany and Ashe Counties, North Carolina. Smithsonian Institution River Basin Surveys, Washington, D. C.

- 1984 Stone Raw Material Resource Procurement for the Ward Site, A Proto-Cherokee Site in Northwest North Carolina. Paper presented at the 41st annual meeting of the Southeastern Archaeological Conference, Pensacola, Florida.

Baden, William W.

- 1982 The Nature of Surface Collections. In An Archeological Survey and Assessment of Aboriginal Settlement Within the Lower Little Tennessee River Valley, edited by R. P. Stephen Davis, Jr., Larry R. Kimball, and William W. Baden, pp. 105-119. Submitted to the Tennessee Valley Authority, Norris, Tennessee.

- 1985 Evidence of Changing Settlement Patterns in the Little Tennessee River Valley of East Tennessee. In Exploring Tennessee Prehistory: A Dedication to Alfred K. Guthe, edited by Thomas R. Whyte, C. Clifford Boyd, Jr., and Brett H. Riggs, pp. 135-156. Report of Investigations No. 42. Department of Anthropology, University of Tennessee, Knoxville.

Barber, Michael B., and George A. Tolley

- 1984 The Savannah River Broadsphear: A View from the Blue Ridge. In Upland Archeology in the East: Symposium 2, edited by Michael B. Barber, pp. 25-43. Cultural Resources Report No. 5. United States Department of Agriculture, U. S. Forest Sevice - Southern Region.

Bass, Quentin R., II

- 1977 Prehistoric Settlement and Subsistence Patterns in the Great Smoky Mountains. Unpublished M. A. thesis, Department of Anthropology, University of Tennessee, Knoxville.

- 1985 The Wolf Creek Site (40CK20). Ms. on file, U. S. Forest Service Office, Cherokee National Forest, Cleveland, Tennessee.

- Benthall, Joseph L.
 1986 Daugherty's Cave: A Stratified Site in Russell County, Virginia. Archaeological Society of Virginia.
- Binford, Lewis R.
 1977 General Introduction. In For Theory Building in Archaeology, edited by Lewis R. Binford, pp. 1-10. Academic Press, New York.
- 1983 Working at Archaeology. Academic Press, New York.
- Boyd, C. Clifford, Jr.
 1986 Archaeological Investigations in the Watauga Reservoir, Carter and Johnson Counties, Tennessee. Report of Investigations No. 44. Department of Anthropology, University of Tennessee, Knoxville.
- Boyd, C. Clifford, Jr., Jefferson Chapman, Brett H. Riggs, and Thomas R. Whyte
 1984 A Preliminary Report on Archaeological Investigations in the Watauga Reservoir, Northeast Tennessee. Paper presented at the 41st annual Southeastern Archaeological Conference, Pensacola, Florida.
- Boyd, C. Clifford, Jr., and Brett H. Riggs
 1986 Ceramic Artifact Analysis. In Archaeological Investigations in the Watauga Reservoir, Carter and Johnson Counties, Tennessee, by C. Clifford Boyd, Jr., pp. 15-69. Report of Investigations No. 44. Department of Anthropology, University of Tennessee, Knoxville.
- Brown, James A.
 1975 Deep-Site Excavation Strategy As a Sampling Problem. In Sampling in Archaeology, edited by James W. Mueller, pp. 155-169. The University of Arizona Press, Tucson.
- Broyles, Bettye J.
 1966 Preliminary Report: The St. Albans Site (46KA27), Kanawha County, West Virginia. The West Virginia Archaeologist 19:1-43.
- Caldwell, Joseph L.
 1958 Trend and Tradition in the Prehistory of the Eastern United States. American Anthropological Association, Memoir No. 88.

- Catlin, Mark, Jay F. Custer, and R. Michael Stewart
 1982 Late Archaic Culture Change in Virginia: A Reconsideration of Exchange, Population Growth, and Migrations. Quarterly Bulletin: Archaeological Society of Virginia 37(3):123-140.
- Chapman, Jefferson
 1973 The Icehouse Bottom Site, 40MR23. Report of Investigations No. 13. Department of Anthropology, University of Tennessee, Knoxville.
- Chapman, Jefferson
 1975 The Rose Island Site and the Bifurcate Point Tradition. Report of Investigations No. 14. Department of Anthropology, University of Tennessee, Knoxville.
- 1977 Archaic Period Research in the Little Tennessee River Valley--1975: Icehouse Bottom, Harrison Branch, Thirty Acre Island, Calloway Island. Report of Investigations No. 18. Department of Anthropology, University of Tennessee, Knoxville.
- 1978 The Bacon Farm Site and a Buried Site Reconnaissance. Report of Investigations No. 23. Department of Anthropology, University of Tennessee, Knoxville.
- 1981 The Bacon Bend and Iddins Sites: The Late Archaic Period in the Lower Little Tennessee River Valley. Report of Investigations No. 31. Department of Anthropology, University of Tennessee, Knoxville.
- Chapman, Jefferson and Bennie C. Keel
 1979 Candy Creek-Conestee Components in Eastern Tennessee and Western North Carolina and Their Relationship With Adena-Hopewell. In Hopewell Archaeology: The Chillicothe Conference, edited by David S. Brose and N'omi Greber, pp. 157-161. The Kent State University Press, Kent, Ohio.
- Chapman, Jefferson, Paul A. Delcourt, Patricia A. Cridlebaugh, Andrea B. Shea, and Hazel E. Delcourt
 1982 Man-Land Interaction: 10,000 Years of American Indian Impact on Native Ecosystems in the Lower Little Tennessee River Valley, Eastern Tennessee. Southeastern Archaeology 1(2): 115-121.
- Clark, Larry R.
 1976 An Archaeological Survey of Burke County, North Carolina. Ms. on file, Western Piedmont Community College, North Carolina.
- Clark, R. M.
 1975 A Calibration Curve for Radiocarbon Dates. Antiquity 49:251-266.

Clarke, David L.

1968 Analytical Archaeology. Methuen, London.

1973 Archaeology: The Loss of Innocence. Antiquity 47:6-18.

1977 Spatial Archaeology. Academic Press, New York.

Cochran, William G.

1977 Sampling Techniques. John Wiley and Sons, New York.

Coe, Joffre L.

1964 The Formative Cultures of the Carolina Piedmont. Transactions of the American Philosophical Society, Vol. 54(5).

Cridlebaugh, Patricia A.

1981 The Icehouse Bottom Site (40MR23): 1977 Excavations. Report of Investigations No. 35. Department of Anthropology, University of Tennessee, Knoxville.

Custer, Jay F.

1978 Broadspears and Netsinkers. Paper presented at the 1978 Middle Atlantic Archaeological Conference, Rehoboth Beach, Delaware.

Damon, P. E., A. Long, and E. I. Wallick

1972 Dendrochronologic Calibration of the Carbon-14 Time Scale. In Proceedings of the Eighth International Radiocarbon Dating Conference, Vol. 1, edited by T. A. Rafter and T. Grant Taylor, pp. 44-59. Royal Society of New Zealand, Lower Hutt, New Zealand.

Damon, P. E., C. W. Ferguson, A. Long, and E. I. Wallick

1974 Dendrochronologic Calibration of the Radiocarbon Time Scale. American Antiquity 39:350-366.

Davis, R. P. Stephen, Jr.

1980 A Preliminary Report of Probabilistic and Nonprobabilistic Archeological Sampling in Industrial Area II, Tellico Reservoir, Tennessee. Tellico Archeological Survey Report No. 2. Department of Anthropology, University of Tennessee, Knoxville.

Davis, R. P. Stephen, Jr., Larry R. Kimball, and William W. Baden (editors)

1982 An Archeological Survey and Assessment of Aboriginal Settlement Within the Lower Little Tennessee River Valley. Report Submitted to the Tennessee Valley Authority, Norris, Tennessee.

Davis, R. P. Stephen, Jr., Larry R. Kimball, William W. Baden, and Jefferson Chapman

1980 Research Design for Probabilistic Sampling Survey of the Tellico Reservoir, Tennessee. Research Proposal submitted to the Tennessee Valley Authority, Norris, Tennessee.

Dickens, Roy S., Jr.

1970 The Pisgah Culture and Its Place in the Prehistory of the Southern Appalachians. Ph.D. dissertation, Department of Anthropology, University of North Carolina, Chapel Hill.

1976 Cherokee Prehistory. University of Tennessee Press, Knoxville.

1978 Mississippian Settlement Patterns in the Appalachian Summit Area: The Pisgah and Qualla Phases. In Mississippian Settlement Patterns, edited by Bruce D. Smith, pp. 115-139. Academic Press, New York.

1980 Preliminary Report on Archaeological Investigations at the Plum Grove Site (40WG17), Washington County, Tennessee. Ms. on file, Department of Anthropology, Georgia State University, Atlanta.

1984 An Ecological-Evolutionary Approach to the Interpretation of Cherokee Cultural Development. Paper presented at the Symposium on Cherokee Prehistory, Warren Wilson College, Swannanoa, North Carolina.

Dunnell, Robert C.

1971 Systematics in Prehistory. Free Press, New York.

1978 Style and Function: A Fundamental Dichotomy. American Antiquity 43:192-202.

1980 Evolutionary Theory and Archaeology. In Advances in Archaeological Method and Theory, Vol. 3, edited by Michael B. Schiffer, pp. 38-99. Academic Press, New York.

1986 Five Decades of American Archaeology. In American Archaeology Past and Future: A Celebration of the Society for American Archaeology, edited by David J. Meltzer, Don D. Fowler, and Jeremy A. Sabloff, pp. 23-49. Smithsonian Institution Press, Washington, D.C.

Dunnell, Robert C. and William S. Dancey

1983 The Siteless Survey: A Regional Scale Data Collection Strategy. In Advances in Archaeological Method and Theory, Vol. 6, edited by Michael B. Schiffer, pp. 267-287. Academic Press, New York.

Earnest, Howard, Jr.

n.d. Preliminary Analysis of Ceramics From Ten Sites on the Nolichucky River. Ms. on file, U.S. Forest Service, Cherokee National Forest, Cleveland, Tennessee.

Egloff, Brian J.

1967 An Analysis of Ceramics From Historic Cherokee Towns. Unpublished M.A. thesis, Department of Anthropology, University of North Carolina, Chapel Hill.

Egloff, Keith

1984 Woodland Occupation Along the Clinch and Powell Rivers in Southwest Virginia: Emphasis on Ceramics. Ms. on file, Research Center for Archaeology, Yorktown, Virginia.

Egloff, Keith, and Celia Reed

1979 Crab Orchard Site: A Late Woodland Palisaded Village. Ms. on file, Research Center for Archaeology, Yorktown, Virginia.

Evans, Clifford

1955 A Ceramic Study of Virginia Archaeology. Bureau of American Ethnology Bulletin 160.

Faulkner, Charles H.

1982 Radiocarbon Dates From the Eastman Rockshelter: A Preliminary Report. Tennessee Anthropological Association Newsletter 7(6):1-3.

Faulkner, Charles H. and S. D. Dean

1982 The Eastman Rockshelter: A Deeply Stratified Site in Upper East Tennessee. Tennessee Anthropological Association Newsletter 7(1):2-7.

Gardner, Paul S.

1980 An Analysis of Dan River Ceramics From Virginia and North Carolina. Unpublished M.A. thesis, Department of Anthropology, University of North Carolina, Chapel Hill.

Geier, Clarence R.

1983 Some Thoughts on the Taxonomic and Temporal Implications of Late Woodland Triangular Projectile Points From Sites in the Ridge and Valley Province of Virginia. Quarterly Bulletin: Archaeological Society of Virginia 38(4):197-233.

Graham, J. B., and Lawrence S. Alexander

1976 Phase II Intensive Survey of the Phipps Bend Generating Plant Site, Hawkins County, Tennessee. Report Submitted to the Tennessee Valley Authority, Chattanooga.

Hair, Joseph F., Jr., Rolph E. Anderson, Ronald L. Tatham, and Bernie J. Grablowski

1979 Multivariate Data Analysis: With Readings. Petroleum Publishing Company, Tulsa, Oklahoma.

Hall, Charles L., Daniel S. Amick, William B. Turner, and Jack L. Hofman

1985 Columbia Archaeological Project Archaic Period Radiocarbon Dates. In Exploring Tennessee Prehistory: A Dedication to Alfred K. Guthe, edited by Thomas R. Whyte, C. Clifford Boyd, Jr., and Brett H. Riggs, pp. 61-79. Report of Investigations No. 42. Department of Anthropology, University of Tennessee, Knoxville.

Hempel, Carl G.

1966 Philosophy of Natural Science. Prentice-Hall, Englewood Cliffs, New Jersey.

Hill, James N.

1970 Broken K Pueblo: Prehistoric Social Organization in the American Southwest. Anthropological Papers of the University of Arizona 18. University of Arizona Press, Tucson.

Hodder, Ian

1981 Introduction: Towards a Mature Archaeology. In Pattern of the Past: Studies in Honour of David Clarke, edited by Ian Hodder, Glynn Isaac and Norman Hammond, pp. 1-13. Cambridge University Press, London.

Hoffman, C. Marshall

1985 Projectile Point Maintenance and Typology: Assessment with Factor Analysis and Canonical Correlation. In For Concordance in Archaeological Analysis: Bridging Data Structure, Quantitative Technique and Theory, edited by Christopher Carr, pp. 566-613. Westport Publishers, Inc., Kansas City, Missouri.

Hoffman, Michael A., and Robert W. Foss

1980 Blue Ridge Prehistory: A General Perspective. Quarterly Bulletin: Archaeological Society of Virginia 34(4):185-210.

Hofman, Jack L.

1985 Middle Archaic Ritual and Shell Midden Archaeology: Considering the Significance of Cremations. In Exploring Tennessee Prehistory: A Dedication to Alfred K. Guthe, edited by Thomas R. Whyte, C. Clifford Boyd, Jr., and Brett H. Riggs, pp. 1-21. Report of Investigations No. 42. Department of Anthropology, University of Tennessee, Knoxville.

Holland, C. G.

1970 An Archaeological Survey of Southwest Virginia. Smithsonian Contributions to Anthropology, No. 12. Smithsonian Institution, Washington, D. C.

Keel, Bennie C.

1976 Cherokee Archaeology. University of Tennessee Press, Knoxville.

Keeler, Robert W.

1971 An Archaeological Survey of the Upper Catawba River Valley. Honor's thesis, Department of Anthropology, University of North Carolina, Chapel Hill.

Kim, Jae-On

1975 Factor Analysis. In SPSS: Statistical Package for the Social Sciences, by N. H. Nie, C. H. Hull, J. G. Jenkins, K. Steinbrenner, and D. H. Bent, pp. 468-514. McGraw-Hill, New York.

Kimball, Larry R.

1982 Lithic Artifact Analysis. In An Archaeological Survey and Assessment of Aboriginal Settlement Within the Lower Little Tennessee River Valley, edited by R. P. Stephen Davis, Jr., Larry R. Kimball, and William W. Baden, pp. 120-252. Submitted to the Tennessee Valley Authority, Norris, Tennessee.

Kimball, Larry R. (editor)

1985 The 1977 Archaeological Survey: An Overall Assessment of the Archaeological Resources of the Tellico Reservoir. Report of Investigations No. 40. Department of Anthropology, University of Tennessee, Knoxville.

Kimball, Larry R., and William W. Baden

1985 Quantitative Model of Woodland and Mississippian Ceramic Assemblages for the Identification of Surface Collections. In The 1977 Archaeological Survey: An Overall Assessment of the Archaeological Resources of Tellico Reservoir, edited by Larry R. Kimball, pp. 121-274. Report of Investigations No. 40. University of Tennessee, Knoxville.

Kintigh, Keith W.

1984 Measuring Archaeological Diversity By Comparison With Simulated Assemblages. American Antiquity 49:44-54.

1985 Social Structure, the Structure of Style, and Stylistic Patterns in Cibola Pottery. In Decoding Prehistoric Ceramics, edited by Ben A. Nelson, pp. 35-74. Southern Illinois University Press, Carbondale and Edwardsville.

Kline, Gerald W.

1982 Preliminary Report: Archaeological Investigations at the Fudd Campbell Site (40CR3), TDOT State Route 67 Relocation and Improvement Project, Carter County, Tennessee. Report submitted to the Tennessee Department of Transportation, Nashville.

Kneberg, Madeline

1956 Some Important Projectile Point Types Found in the Tennessee Area. Tennessee Archaeologist 12:17-28.

1957 Chipped Stone Artifacts of the Tennessee Valley Area. Tennessee Archaeologist 13:55-56.

1961 Four Southeastern Limestone Tempered Pottery Complexes. Newsletter of the Southeastern Archaeological Conference 7(2):3-14.

Kuhn, Thomas S.

1970 The Structure of Scientific Revolutions. University of Chicago Press, Chicago.

Lafferty, Robert H., III

1981 The Phipps Bend Archaeological Project. Research Series No. 4, Office of Archaeological Research, University of Alabama, Birmingham.

Leighty, Ralph G., F. R. Austin, Clifton Jenkins, and Foster Rudolph

1956 Soil Survey of Johnson County, Tennessee. United States Department of Agriculture, Soil Conservation Service.

Leonard, Robert D., and George T. Jones

1985 Elements of An Inclusive Evolutionary Model For Archaeology. Ms. on file, Southern Illinois University at Carbondale.

Lewis, T. M. N. and Madeline Kneberg

n.d. The Chickamauga Basin Report. M.S. on file, Frank H. McClung Museum, University of Tennessee, Knoxville.

1941 The Prehistory of the Chickamauga Basin in Tennessee: A Preview. Tennessee Anthropology Papers, No. 1.

1946 Hiwassee Island. University of Tennessee Press, Knoxville.

1951 Early Projectile Point Forms, and Examples From Tennessee. Tennessee Archaeologist 7:6-19.

1957 The Camp Creek Site. Tennessee Archaeologist 13:1-48.

Longacre, William A.

1970 Archaeology as Anthropology: A Case Study.

Anthropological Papers of the University of Arizona 17.
University of Arizona Press, Tucson.

Loucks, L. Jill

1982 General Report on 1982 Excavations at the Ward Site (31WT22), Watauga County, North Carolina. Ms. on file, Department of Anthropology, Appalachian State University, Boone, North Carolina.

MacCord, Howard A., Sr.

1979 The Flanary Site, Scott County, Virginia. Quarterly Bulletin: Archaeological Society of Virginia 34(1):1-32.

1981 The Sullins Site (44WG12), Washington County, Virginia. Quarterly Bulletin: Archaeological Society of Virginia 36(3 and 4):94-121.

MacDonald, George F.

1968 Debert: A Paleo-Indian Site in Central Nova Scotia. Anthropological Papers No. 16. National Museum of Canada, Ottawa.

1983 Eastern North America. In Early Man in the New World, edited by Richard Shutler, Jr., pp. 97-108. Sage Publications, Inc., Beverly Hills, California.

Mayr, Ernst

1963 Animal Species and Evolution. Harvard University Press, Cambridge.

McIlhenny, Calvert, W. III

1978 An Archaeological Survey of the Middle Nolichucky River Basin. Unpublished M.A. thesis, Department of Anthropology, University of Tennessee, Knoxville.

1983 Phase III Archaeological Investigations of Site 44RU44 at the Proposed Fox Meadow Apartment Project (HUD-VA-29-9) in Lebanon, Russell County, Virginia. Bartlett and Associates Geological Consultants, Abingdon, Virginia.

Meltzer, David J.

1979 Paradigms and the Nature of Change in American Archaeology. American Antiquity 44:644-657.

Milligan, G. W., and Cooper, M. C.

1985 An Examination of Procedures for Determining the Number of Clusters in a Data Set. Psychometrika 50:159-179.

Moore, David G.

- 1981 A Comparison of Two Pisgah Ceramic Assemblages. Unpublished M. A. thesis, Department of Anthropology, University of North Carolina, Chapel Hill.

Nelson, Ben A. (editor)

- 1985 Decoding Prehistoric Ceramics. Southern Illinois University Press, Carbondale and Edwardsville.

Peebles, Christopher S.

- 1978 Determinants of Settlement Size and Location in the Moundville Phase. In Mississippian Settlement Patterns, edited by Bruce D. Smith, pp. 369-416. Academic Press, New York.

- 1983 Paradise Lost, Strayed and Stolen: Prehistoric Social Devolution in the Southeast. Paper prepared for the Southern Anthropological Society Meeting, Baton Rouge, Louisiana.

Piper, Harry M.

- 1977 Prehistoric Settlement-Subsistence Patterns in the Mount Rogers National Recreation Area, Virginia. Unpublished M.A. thesis, Department of Anthropology, University of South Florida, Tampa.

Polhemus, Richard R.

- 1985 The Search for Tanasqui (Abstract). Southeastern Archaeological Conference Bulletin 28:36.

Polhemus, Richard R., and James H. Polhemus

- 1966 The McCollough Bend Site. Tennessee Archaeologist 22:13-24.

Price, Heather

- 1983 The Courtland Place Site: Analysis of the Prehistoric Lithic Artifacts. Ms. on file, U.S. Forest Service, Cherokee National Forest, Cleveland, Tennessee.

Purrington, Burton L.

- 1982 Continuity and Change in Late Prehistoric Settlement Patterns in an Appalachian North Carolina Locality: Some Preliminary Interpretations. Tennessee Anthropologist 7:51-61.

- 1983 Ancient Mountaineers: An Overview of the Prehistoric Archaeology of North Carolina's Western Mountain Region. In The Prehistory of North Carolina: An Archaeological Symposium, edited by Mark A. Mathis and Jeffrey J. Crow, pp. 83-160. North Carolina Division of Archives and History, Raleigh.

- Purrington, Burton L. and Mary Lee Douthit
 1976 Soils and Site Distribution in the Upper Watauga Valley, North Carolina: A Preliminary Report. Paper presented at the 6th Middle Atlantic Archeology Conference, Front Royal, Virginia.
- Rabb, Mark L., and Albert C. Goodyear
 1984 Middle-Range Theory in Archaeology: A Critical Review of Origins and Applications. American Antiquity 49:255-268
- Renfrew, Colin, and R. M. Clark
 1974 Problems of the Radiocarbon Calendar and Its Calibration. Archaeometry 16:5-18.
- Riggs, Brett H.
 1985 Dated Contexts from Watauga Reservoir: Cultural Chronology Building for Northeast Tennessee. In Exploring Tennessee Prehistory: A Dedication to Alfred K. Guthe, edited by Thomas R. Whyte, C. Clifford Boyd, Jr., and Brett H. Riggs, pp. 169-184. Report of Investigations No. 42. Department of Anthropology, University of Tennessee, Knoxville.
- Rindos, David
 1980 Symbiosis, Instability and the Origins and Spread of Agriculture: A New Model. Current Anthropology 21: 751-772.
 1984 The Origins of Agriculture: An Evolutionary Perspective. Academic Press, New York.
 1985 Darwinian Selection, Symbolic Variation, and the Evolution of Culture. Current Anthropology 26: 65-88.
- Robertson, Linda B., and Ben P. Robertson
 1978 The New River Survey: A Preliminary Report. North Carolina Archeological Council and Archeology Branch, Division of Archives and History, North Carolina Department of Cultural Resources, Raleigh.
- Russell, Margaret Clayton
 1975 Lamar and the Creeks: An Old Controversy Revisited. Early Georgia 3(1): 53-67.
- Salmon, Merilee H.
 1982 Philosophy and Archaeology. Academic Press, New York.
- Sarle, W. S.
 1983 The Cubic Clustering Criterion. SAS Technical Report A-108. SAS Institute, Inc., Cary, North Carolina.

SAS Institute, Inc.

1982 SAS User's Guide: Statistics, 1982 Edition.
SAS Institute, Inc., Cary, North Carolina.

SAS Institute, Inc.

1985 SAS User's Guide: Statistics, Version 5 Edition.
SAS Institute, Inc., Cary, North Carolina.

Schroedl, Gerald F.

1978 The Leuty and McDonald Site Mounds. Report of
Investigations No. 22. Department of Anthropology,
University of Tennessee, Knoxville.

1984 Toward an Explanation of Cherokee Origins in East
Tennessee. Paper presented at the Symposium on
Cherokee Prehistory, Warren Wilson College, Swannanoa,
North Carolina.

Schroedl, Gerald F., C. Clifford Boyd, Jr., and R. P. Stephen
Davis, Jr.

1986 Explaining Mississippian Origins in East Tennessee.
In Mississippian Emergence: The Evolution of Ranked
Agricultural Societies in the Eastern Woodlands,
edited by Bruce D. Smith. Smithsonian Institution Press,
Washington D. C.

Schroedl, Gerald F., R. P. Stephen Davis, Jr., and C. Clifford
Boyd, Jr.

1985 Archaeological Contexts and Assemblages at Martin
Farm. Report of Investigations No. 39. Department of
Anthropology, University of Tennessee, Knoxville.

Schroedl, Gerald F. and Richard Polhemus

1977 A Summary and Preliminary Interpretation of Archae-
ological Investigations at the Toqua Site (40MR6).
Report Submitted to the National Park Service.

Senior, Christopher D.

1981 A Preliminary Analysis of Pisgah Phase Ceramics
from the Ward Site, Northwestern North Carolina.
Submitted to the North Carolina Division of Archives and
History, Department of Cultural Resources, Raleigh.

Sheperd, Walter

1972 Flint: Its Origin, Properties and Uses. Faber
and Faber, London.

Smith, Bruce D.

1985 The Role of Chenopodium as a Domesticated in the Pre-
Maize Garden Systems of the Eastern United States. Southeastern
Archaeologist 4:51-72.

Smith, Bruce D.

1986 The Archaeology of the Southeastern United States: From Dalton to de Soto, 10,500 - 500 B. P. In Advances in World Archaeology, vol. 5, edited by F. Wendorf and A. E. Close, pp. 1-92. Academic Press, Orlando.

Smith, Marvin T.

n. d. European Artifacts from the Plum Grove Site, 40WG17. Ms. on file, Department of Anthropology, University of North Carolina, Chapel Hill.

Spencer, Herbert

1880 First Principles. D. McKay, Philadelphia.

Steponaitis, Vincas P.

1978 Location Theory and Complex Chiefdoms: A Mississippian Example. In Mississippian Settlement Patterns, edited by Bruce D. Smith, pp. 417-453. Academic Press, New York.

Stoltman, James B.

1978 Temporal Models in Prehistory: An Example from Eastern North America. Current Anthropology 19:703-728.

Stuiver, Minze

1982 A High-Precision Calibration of the AD Radiocarbon Time Scale. Radiocarbon 24:1-26.

Suess, H. E.

1970 Bristlecone Pine Calibration of the Radiocarbon Time Scale from 5400 B. C. to the Present. In Radiocarbon Variations and Absolute Chronology, edited by I. U. Olsson, pp. 303-312. John Wiley and Sons, New York.

Sutton, S. R.

1982 Thermoluminescence Dating of Heated Rock from the Eastman Rockshelter, Tennessee. Tennessee Anthropological Association Newsletter 7(6): 4-6.

Swingle, G. D., R. A. Miller, E. T. Luther, W. D. Hardeman, D. S. Fullerton, C. R. Sykes, and R. K. Garman

1966 Geological Map of Tennessee: East-Central Sheet. Division of Geology, Tennessee Department of Conservation, Nashville.

Thomas, David H.

1975 Nonsite Sampling in Archaeology: Up the Creek Without a Site? In Sampling in Archaeology, edited by James W. Mueller, pp. 61-81. The University of Arizona Press, Tucson.

1979 Archaeology. Holt, Rinehart and Winston, New York.

Tucker, Gordon C., Jr.

1980 Quantitative Affirmation of Intuitive Typology. Tebiwa 22:i-11.

Walthall, John A.

1980 Prehistoric Indians of the Southeast. University of Alabama Press, University, Alabama.

Whyte, Thomas R.

1984 The Watauga Impact: 35 Years of Lacustrine Influence on Archaeological Sites in Northeast Tennessee. In Upland Archeology in the East: Symposium 2, edited by Michael B. Barber, pp. 192-204. Cultural Resources Report No. 5. United States Department of Agriculture, U. S. Forest Service - Southern Region.

Witthoft, J.

1953 Broadspear Points and the Transitional Period Cultures. Pennsylvania Archaeologist 23(1):4-31.

Wobst, H. Martin

1977 Stylistic Behavior and Information Exchange. In For the Director: Research Essays in Honor of James B. Griffin, edited by Charles E. Cleland, pp. 317-342. University of Michigan, Museum of Anthropology, Anthropological Papers 61.

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He has participated in and supervised numerous archaeological field projects in Middle and East Tennessee. His major research interests include lithic technology, prehistory of upper East Tennessee, and archaeological method and theory. He has served as Visiting Assistant Professor for the Center for Appalachian Studies and Services at East Tennessee State University in 1986 and has accepted a tenure-track teaching position in the Department of Sociology/Anthropology at Radford University in Virginia for the 1986 fall term. He is a member of Phi Kappa Phi, Sigma Xi, the Tennessee Anthropological Association, Southeastern Archaeological Conference, and the Society for American Archaeology. He is married to the former Donna C. Markland of Johnson City, Tennessee.