HARDAWAY REVISITED:
EARLY ARCHAIC SETTLEMENT IN THE SOUTHEAST

by

Isaac Randolph Daniel, Jr.

A Dissertation submitted to the faculty of The University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Anthropology.

Chapel Hill

1994

HARDAWAY REVISITED: EARLY ARCHAIC SETTLEMENT IN THE SOUTHEAST

by

Isaac Randolph Daniel, Jr.

A Dissertation submitted to the faculty of The University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Anthropology.

Chapel Hill

1994

Approved by:

Vin P. Steponaitis Advisor

R.P. Stephen Davis Reader

Bruce Winterhalder Reader

H. Trawick Ward Reader

George R. Holcomb Reader

Albert C. Goodyear Reader

ISAAC RANDOLPH DANIEL, JR. Hardaway Revisited: Early Archaic Settlement In The Southeast (Under the direction of Vincas P. Steponaitis.)

ABSTRACT

Since the 1970s, increased attention has been focused on the identification of Early Archaic site function and settlement practices in the Southeast. But the exact function of the Hardaway site in the North Carolina Piedmont, which has significant implications for any settlement model in the region, has not yet figured prominently in any such research. The analysis of an extant but previously unanalyzed stone-tool assemblage from Hardaway combined with an intrasite spatial analysis of artifact distributions suggests that Hardaway primarily functioned as a quarry-related base camp where periodic visits were made to exploit nearby rhyolite outcrops to replenish expended toolkits.

Hardaway is placed in a regional context by tracing the movement of stone raw material--primarily a distinctive type of rhyolite from the nearby Uwharrie Mountains--across the Carolinas. The raw material study includes the results of a quarry survey designed to petrologically identify the abundant rhyolite outcrops around Hardaway. One such outcrop, from a mountain just 7 km south of the site, appears to have been the principal source of the rhyolite so common in the Hardaway assemblage. In addition, raw material variability examined in Early Archaic points from private collections in both North and South Carolina reveals the extensive use and movement of Uwharrie rhyolite and suggests that Early Holocene hunter-gatherers utilized a geographically widespread settlement range.

Taken together, the results of these analyses challenges the prevalent view of hunter-gatherer settlement was conditioned less by the availability of subsistence resources than by the limited distribution of high-quality knappable stone in the Southeast. I suggest that the overemphasis placed on plant and animal resources in reconstructing prehistoric settlement practices results from the uncritical borrowing of ethnographic data to interpret the archaeological record of the early Holocene.

Acknowledgments

I got my first glimpse of the Hardaway site assemblage during the fall of 1985, my first year at North Carolina, when Steve Davis opened the door to the "Lithics Lab" in the Research Laboratories of Anthropology (RLA). There is nothing like a few points and scrapers to excite my attention, but I was taken aback by the quantity of artifacts I saw from one site--there must have been several hundred stone tools shelved in the room. My vocalizations soon attracted the attention of Trawick Ward who came into the room from his office across the hall to see what all the commotion was about (and I'm sure still wonders how anyone can get so excited over a bunch of rocks). As I came to find out, Trawick's more subdued attitude towards the collection was the result of spending the better part of five summers excavating at Hardaway where he collected enough material to fill 292 banana boxes--and these artifacts were not even stored among the many drawers in the room we were in. In any event, Trawick and Steve gave me an overview of the history of the excavations at Hardaway as I sifted through tray after tray of artifacts. Although I don't recall much else from this first encounter with the Hardaway assemblage, I do remember coming away with the vague idea that there was probably enough data for a dissertation stored in that room. A few years later, I eventually decided to use that data to address the problem of site function at Hardaway and its implications for Early Archaic settlement in the Southeast; several years of work ensued that eventually resulted in this volume.

While conducting this research, I have been fortunate to receive considerable guidance and support which I wish to acknowledge here. A special thanks is due to

the members of my doctoral committee: Steve Davis, Al Goodyear, George Holcomb, Vin Steponaitis, Trawick Ward, and Bruce Winterhalder. As the chair of this committee, Vin Steponaitis deserves special credit. Vin arrived as director of the RLA following the untimely death of Roy Dickens, my former committee chair. Vin's eventual appointment, though, took some 18 months while I (and a handful of other graduate students) wondered about our future. My ambivalence was allayed, however, by subsequent discussions with Vin and his agreement to serve as my new advisor. Since then, he has supported my research in numerous ways, almost on a daily basis. In particular, Vin's sound advice was critical (in both senses of the term) while I wrote (and rewrote) the National Science Foundation grant eventually used to support the quarry and collections survey that were essential to placing the Hardaway site in a regional context. Likewise, his substantive and editorial comments have considerably improved an earlier draft of this manuscript.

Daily support was also provided in the RLA by Trawick Ward and Steve Davis. As mentioned previously, much of the data I have analyzed here was excavated by Trawick over 15 years ago. He and I have had innumerable conversations during my research as I attempted to vicariously understand the nature of the fieldwork at Hardaway. Trawick also took several trips with me to the Durham warehouse to help find some of those banana boxes mentioned above. I believe locating these boxes was almost as dirty a job as excavating the material the first time. Likewise, Steve aided my research by providing answers to my many computer questions, by facilitating my cataloging, and eventually replacing the material back in the collections. Steve's considerable computer skills were required to produce the photographs used here. Steve also provided detailed comments on a draft of this document. (With two former editors [Steve and Vin] of *Southeastern Archaeology* on my committee, I did not want for editorial criticism.)

Al Goodyear's work has had a fundamental influence on my research that predates my return to graduate school. In fact, Al deserves at least partial credit (or blame) towards steering me to school at Chapel Hill. During this project, Al made several trips to the RLA where we had intense discussions concerning Early Holocene archaeology. I was always inspired by the enthusiasm with which he addressed problems of typology, chronology, raw material use, and site formation. Al also identified the *pièces esquillées* I had overlooked in the assemblage.

I also appreciate the help of Bruce Winterhalder and George Holcomb who read and commented on this manuscript. Bruce also asked the important question of why Hardaway was located where it was in relation to Morrow Mountain. Why indeed?

Although not a formal member of my committee, I am especially indebted to Bob Butler whose geological expertise has been invaluable my research. Bob has devoted a considerable amount of time to this project which included numerous winter days surveying the Uwharrie Mountains for rhyolite quarries. I particularly enjoyed these trips, during which he shared his considerable knowledge of the geology of the Carolina Slate Belt.

Several other colleagues contributed in a variety of ways to the completion of this project. In particular, Joffre Coe, David Moore, and Billy Oliver provided information concerning their experiences at Hardaway. Thanks are also due to David Anderson, David Meltzer, and several anonymous reviewers who provided critical comments on an early draft of my National Science Foundation proposal. I especially appreciate the friendly but frank discussions I've been able to have with David Anderson concerning our differing views of Early Archaic settlement. Tommy Charles deserves special thanks for putting me in touch with several collectors from South Carolina. Tommy also graciously allowed me access to his collections survey data. Thanks also goes to Jim Michie for allowing me to view the Taylor assemblage. It was largely the result of our conversations concerning the unique variability of stone types in the Taylor collection that got me to thinking about Taylor's implications for Early Archaic settlement. Finally, my understanding of the Early Archaic has benefited from informal discussions with other colleagues including Mark Brooks, Steve Claggett, Joel Gunn, Larry Kimball, Mark Mathis, Alan May, Tom Padgett, Ken Robinson, Ken Sassaman, Ann Tippitt, and Tom Whyte.

The quarry research and subsequent collections survey was made possible by the assistance of several people and institutions. Foremost, financial support was provided by the National Science Foundation (BNS-8921648). Rodney Snedeker and Michael Harmon were particularly helpful in our survey of the Uwharrie National Forest. Similarly, the cooperation of the staff at Morrow Mountain State Park is appreciated. The Office of State Archaeology in Raleigh (especially Steve Claggett) also supported our survey. The survey around Asheboro was facilitated by John Arsenault, John Davis, Mike Murrow, and Bill Terrell. Estella Stansbury provided the office assistance necessary to ensure that the NSF grant was handled properly; Estella also provided me with secretarial assistance and good conversation throughout my time spent in the RLA.

The Aluminum Company of America (ALCOA), Badin works, deserves particular thanks for allowing the RLA to excavate at Hardaway and its cooperation in the quarry survey conducted during this project. In particular, ALCOA is also thanked for its continued stewardship of the Hardaway site which on November 5, 1990 was designated as a National Historic Landmark.

I am also indebted to the numerous individuals who have allowed me the opportunity to record their collections or otherwise assisted me in the collections survey: Massey Bick, Blake Boyd, Edsel Davis, Lottie Davis, Robert Dunham, Gabriel Fogel, R.V. "Whitey" Graham, Ernie Hinson, Macon Hunter, J.M. "Buck" Lawrence, Ben Lovell, Jimmy Mabe, Tammy Mabe, William Norton, Phil Perkinson, Leonard Perrit, Mitchell Powell, Doug Rader, Pressley Rankin and The Rankin Museum, David Reddick, David Rich, Reid Ringer, Rob Siewers, Sam Smitherman, Paula Story, Will Thompson, Prentiss Treadway, Bob Weaver, E. Wheeler, and Warner Williams. I can only repay the hospitality of these good folk with a simple thank you.

Over various semesters many students in the RLA helped in the artifact processing and cataloging including Jimmy Blanton, James Brown, Karen Courtney, Lauren Cuningham, Walter Davis, Dean Foster, Trevor Gunn, Chip Harris, David Hylton, Jonathon Kendall, Britt McMaster, Stephen Oljeski, Anthony Restar, Anna Shugart, and Brandy Weiss. I also appreciate the efforts of Patrick Livingood in preparing several of the maps illustrated here.

I also wish to acknowledge the financial support provided by the Research Laboratories of Anthropology and the Department of Anthropology during my period of study at UNC. In particular, I also gratefully acknowledge the On-Campus Dissertation Fellowship awarded me during the late summer and fall of 1992 by the Graduate School of The University of North Carolina at Chapel Hill that allowed me the opportunity to finish a draft of this monograph.

Finally, I am particularly indebted to my family: to my parents and sister for their continued encouragement and support in my return to graduate school; to my in-laws who believe that, somehow, this has all been worthwhile; and, most important, to my wife, Becky, whose unconditional emotional support and unquestioned financial support, has made this all possible.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF FIGURES

Figure **Page**

LIST OF FIGURES (continued)

Figure **Page**

LIST OF FIGURES (continued)

Figure **Page**

Chapter I

INTRODUCTION

During the summer of 1948, test pits placed in two sites along the Yadkin River demonstrated for the first time that stratified alluvial sites of some antiquity existed in the Carolina Piedmont (Coe 1964:8-9). There, at the Lowder's Ferry and Doerschuk sites, Joffre Coe began to make temporal sense of a "hodgepodge of projectile point types" previously known in the Piedmont from surface collections and shallow plow-zone deposits. The stratigraphy at these sites allowed Coe to distinguish a sequence of Archaic complexes that was virtually unknown elsewhere in the Southeast. Although both sites were deeply stratified, the earliest identified component was associated with the Middle Archaic period which we know today dates to less than 8,000 years ago.

It was at yet another site, also first tested that summer, that a relatively undisturbed Early Archaic sequence was found. This was the Hardaway site located just upstream from Doerschuk and Lowder's Ferry which, somewhat paradoxically, was neither as deeply stratified nor located in the floodplain of the Yadkin (Figure 1.1). Rather, it was on a hilltop high above the river. Nevertheless, the early sequence at Hardaway was eventually linked to Doerschuk and Lowder's Ferry to define completely the Archaic sequence of the Carolina Piedmont (Coe 1964:Figure 117). This sequence was eventually adopted over much of the Southeast.

In recent years increased attention has been focused on the identification of Early Archaic site function and settlement patterns in the Southeast. And yet the exact function of the Hardaway site, which has significant implications for any set-

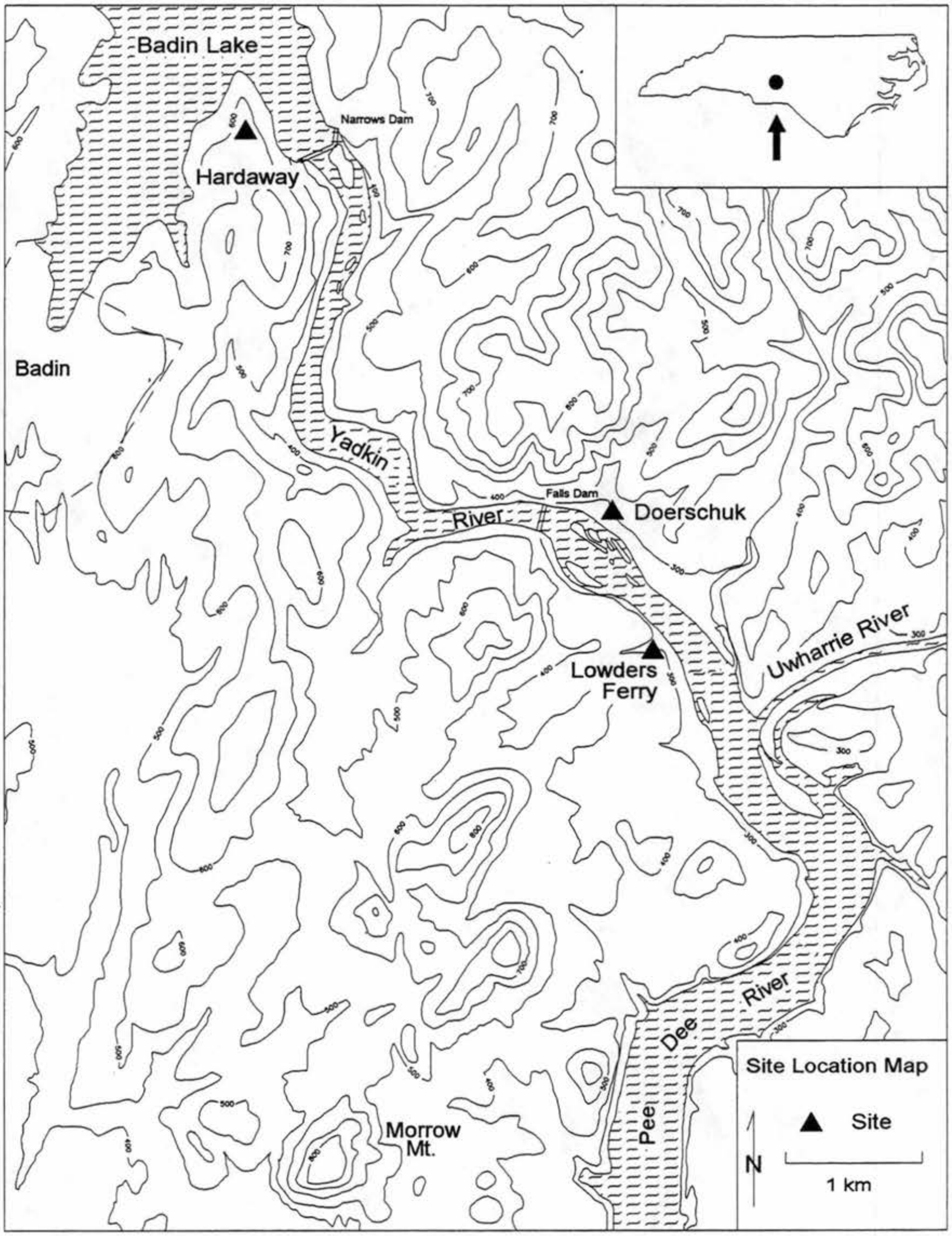


Figure 1.1. Site location map.

tlement model in the region, has not figured prominently in any such research. The data necessary to investigate this problem have been available for some years in an extant but unanalyzed collection of material from Hardaway curated by the Research Laboratories of Anthropology at The University of North Carolina at Chapel Hill. This collection forms the basis for a functional interpretations of the Hardaway site set forth here. A related aspect of this study includes a stone raw materials study incorporated with an extensive projectile-point collections survey.

The raw-materials study includes a quarry survey designed to identify petrologically the rhyolite sources so abundant around Hardaway and to assess the probability of any of these locations being the source of the rhyolite which is so plentiful in the assemblage itself. Additionally, the presence of rhyolite and other raw materials is examined on more than 3,000 Early Archaic points primarily distributed in private collections in North and South Carolina. The collections survey addresses the geographic range of Early Archaic adaptation in the Carolinas and, when combined with the site functional analysis, allows Hardaway to be viewed from a regional perspective. The implications of both the site functional study and the collections survey address current views of Early Archaic settlement in the Southeast. In particular, the results of these analyses suggest a much different view of Early Archaic adaptations than previously proposed.

EARLY ARCHAIC IN THE SOUTHEAST

The Early Archaic period has been traditionally viewed as a time of cultural readaptation from Pleistocene to Holocene environments and by convention was set at 10,000 B.P. (e.g., Caldwell 1958; Cleland 1976; Dragoo 1976; Stoltman 1978). More recent palynological data, however, have indicated that climatic amelioration may have begun significantly earlier in the southeastern United States where early Holocene climatic and vegetational conditions appeared as early as 12,500 B.P.

(Delcourt and Delcourt 1985:19; Delcourt and Delcourt 1981:Table 3). Similarly, rather than a marked change in cultural adaptions between the preceding Paleoindian period and subsequent Early Archaic adaptations, some researchers are now stressing an "adaptive continuity" between Paleoindian and Early Archaic groups (Meltzer and Smith 1986). Consequently, the time range for the Early Archaic has been extended to as early as 10,500 B.P. and is believed to have continued until the onset of relatively modern biotic conditions at about 8,000 B.P. (e.g., Anderson and Hanson 1988, Goodyear 1982; Smith 1986; Steponaitis 1986).

The Early Archaic in the Southeast is marked by a chronological sequence of distinctive point types. This sequence begins with the lanceolate Dalton forms (ca. 10,500-9,900 B.P.) and continues with the Hardaway Side-Notched and related points such as Bolen and Taylor (ca. 10,000-9,500 B.P.), followed by Palmer Corner-Notched and Kirk Corner-Notched points (ca. 9,500-8,900 B.P.) and finally a series of bifurcate-base forms including MacCorkle, St. Albans, Lecroy, Kanawha (ca. 8,900-8,000 B.P.).

The identification of the above sequence dominated much of Archaic research from the 1950s through the 1970s. As mentioned previously some of the earliest work in establishing these sequences was done by Coe (1964) who documented a composite sequence built from excavations at the Doerschuk, Hardaway, and Gaston sites located in the North Carolina Piedmont. Subsequent work at St. Albans in West Virginia (Broyles 1971), Russell Cave in Alabama (Griffin 1974), Thunderbird and related sites in northern Virginia (Gardner 1974, 1977), and several sites in the Little Tennessee River Valley (Chapman 1973, 1975, 1976, 1978) indicated that the above sequence could be generalized over much of the Southeast. Additional work during the past decade has continued to support and refine the sequence for portions of Georgia (Anderson and Schuldenrein 1983; Tippitt and Marquardt 1984), Florida (Daniel and Wisenbaker 1987), and the Carolinas (Claggett and Cable 1982).

As mentioned previously, Archaic research since the 1970s has been concerned with identifying Early Archaic site function and settlement patterns. As part of this research, several settlement models were generated for particular river valleys. The best known examples include the "Dalton settlement hypothesis" for the Mississippi alluvial valley of northeast Arkansas and southeast Missouri (Morse 1971, 1973, 1975a, 1975b, 1976, 1977; Price and Krakker 1975; Schiffer 1975a, 1975b), the "Flint Run model" for the Shenandoah Valley of Virginia (Gardner 1977, 1983); the "riverine/interriverine model" for the Carolina Piedmont (Goodyear et al. 1979; House and Ballenger 1976; House and Wogaman 1978); and the "Little Tennessee River model" for eastern Tennessee (Chapman 1975, 1977, 1978).

These models generally included variations of a logistically based settlement system with a base camp/extractive location dichotomy of site types (cf. Binford and Binford 1966). That is, Early Archaic settlement was characterized by two site types: residential base camps and special use sites. The former site type formed the center of economic and social activities for a hunter-gatherer group and was occupied for relatively long periods of time; the latter site type was produced by subgroups of residential sites generally for the purpose of resource procurement and occupied for a shorter period of time. Primarily due to preservation factors, the categorization of site types was principally based upon the identification of "functional groups" of tool categories in an attempt to determine the nature and range of activities conducted at Early Archaic sites. But, while efforts were made to test proposed site types by empirically documenting and comparing site assemblages, little headway was made in empirically identifying the geographic ranges that comprised the proposed settlement systems.

Also during the late 1970s and early 1980s a series of very influential theoretical papers on hunter-gatherer settlement were published by Lewis Binford and

Albert Goodyear. It is fair to say that these works structured much of the subsequent research on Early Archaic settlement in the Southeast--even into the 1990s--including this study. In particular, at least four papers by Binford (1977, 1979, 1980, 1982) dealt with interpreting archaeological assemblage variability and hunter-gatherer settlement systems. In these works Binford introduced the concepts of *curated* and *expedient* technologies and outlined his middle range theory on *forager* verses *collector* settlement strategies. The terms curated and expedient refer to opposite ends of a tool use-life continuum (Binford 1977; 1979). Curated tools are made in anticipation of future use; they are carried from place to place, maintained, reused, and sometimes recycled into other tool forms. Expedient tools, in contrast, are made and used in response to an immediate need and are not maintained for future use. The significance of these two concepts lies in the realization that frequencies of any particular tool in an assemblage may not directly reflect the intensity of its use at a site.

In a similar vein to the curated-expedient continuum, Binford (1980) also introduced the terms forager and collector to describe two ends of a subsistence-settlement continuum. Foraging strategies are generally employed in more uniform environments whereby entire social groups move to resource areas. Collectors, on the otherhand, employ a "logistical" settlement strategy whereby resources are moved to consumers by special task groups. This latter settlement strategy is largely a response to regions with incongruent resource distributions or with pronounced seasonal-temperature differences.

Another notion concerning hunter-gatherer settlement introduced during this time was the idea that "exotic" stone in archaeological assemblages might act as a material signature of the geographic mobility of hunter-gatherer groups (Binford 1979). As much as any other of Binford's ideas, this notion has been heavily relied upon in recent Early Archaic settlement models.

Meanwhile, Goodyear (1979) published a paper in which he argued that the use of cryptocrystalline stone was an adaptive strategy for making both portable and flexible tools in a lifestyle characterized by high mobility. This argument was adduced to explain the predominance of high quality "exotic" stone recovered in Paleoindian assemblages; in most cases this stone was recovered hundreds of miles from its geological source. Moreover, following Binford (1979), Goodyear argued that this gathering of raw materials was a by-product of normal group movement through a region and thus reflected distances moved within hunter-gatherer settlement systems. Although this argument was applied specifically to Paleoindian groups, its influence on Early Archaic research clearly has been felt over the last decade (e.g., Anderson and Hanson 1988; Sassaman et al. 1988).

Armed with these theoretical frameworks, research in the late 1970s and early 1980s--predominantly in Georgia and the Carolinas--saw further attempts at understanding how the organization of stone tool technologies reflected settlement adaptation (e.g., Anderson and Hanson 1988; Anderson and Schuldenrein 1983; Claggett and Cable 1982; O'Steen 1983). In particular, insights were beginning to be made in the identification of Early Archaic mobility ranges through the location of quarry sources and the subsequent tracking of the archaeological distributions of their raw material.

Much of this work began in South Carolina where researchers began to macroscopically identify stone in archaeological assemblages with their possible sources. These locations included the Coastal Plain Allendale chert quarries in South Carolina and the Piedmont Morrow Mountain rhyolite quarry in North Carolina (e.g., House and Ballenger 1976:126-127; House and Wogaman 1978:53-57; Novick 1978). Investigations into chert sources in Georgia were also attempted as well (Goad 1979).

One of first systematic attempts to locate prehistoric quarries along the Coastal Plain and characterize their stone petrologically, however, was done in Florida (Upchurch et al. 1981). The results of this work was soon applied to the study of the Paleoindian period (Daniel and Wisenbaker 1987; Goodyear et al. 1983). Similar research on prehistoric quarries followed in South Carolina on the Allendale sources along the Savannah River (Goodyear and Charles 1984; Upchurch 1984). Later syntheses of excavations within the Savannah River Valley (e.g., Anderson and Hanson 1988; Anderson and Schuldenrein 1983) coupled with data on point type and raw material from large-scale collections surveys in South Carolina and Georgia (Charles 1981; 1983; 1986; Goodyear et al. 1990; Sassaman et al. 1988; Sassaman 1992) appeared to document the extensive movement of this chert across the Coastal Plain and into the Piedmont. In these discussions, archaeologists began to interpret this movement of chert as evidence of widespread mobility for Early Archaic groups in the region.

In addition to attempts at mapping the geographic extent of hunter-gatherer ranges, further work was performed to determine how settlement was organized (i.e., foragers verses collectors) within particular regions. Claggett and Cable (1982:13), for example, proposed that post-glacial warmings resulted in a shift from logistical strategies with few residential moves and greater site specialization to that of a foraging strategy with more frequent moves and less intersite variability.

Moreover, Claggett and Cable inferred that this settlement strategy should be reflected in the archaeological assemblages recovered at the Haw River site in the North Carolina Piedmont (Claggett and Cable 1982). Collector technologies, it was reasoned, should exhibit a greater degree of formalized curated tools than forager technologies (cf. Binford 1979, 1980). This postulated trend from curated to expedient technologies was believed to have been identified at Haw River, albeit earlier in the sequence (i.e., between the Hardaway-Dalton and Palmer occupations) than anticipated (Claggett and Cable 1982:761-763).

Following this line of research, Anderson and Schuldenrein (1983) saw a similar pattern in a series of Palmer/Kirk assemblages from 10 excavated sites and 88 surface-collected sites in North Carolina, South Carolina, and Georgia which "appear to be characterized by an expedient technology, with a low overall occurrence of formal, curated tools" (Anderson and Schuldenrein 1983:205). In addition, the incidence of projectile point raw material variability was examined from several assemblages as a measure of group mobility. A fairly high occurrence of artifacts made from Coastal Plain chert was seen in Piedmont sites and was argued to represent evidence of extensive movement along river drainages (Anderson and Schuldenrein 1983:201-205). Following arguments outlined above, Anderson and Schuldenrein viewed the combination of predominantly "expedient technologies" and long distance movement as "more typical of residentially mobile foraging groups" (Anderson and Schuldenrein 1983:205).

To summarize, research on Early Archaic settlement largely began during the 1970s with the pioneering Dalton studies of the Central Mississippi valley. Similar studies were also undertaken for Dalton and notched-point complexes about this time in the Shenandoah Valley of Virginia and the Little Tennessee River Valley. This work, with the possible exception of Schiffer's (1975a, 1975b) and Price and Krakker's (1975) characterizations of Dalton adaptations, portrayed Early Archaic settlement as "logistically" focused. By the early 1980s, however, the focus of research on Early Archaic settlement had shifted to Georgia and the Carolinas where models were proposed with that emphasized greater residential mobility or "foraging" adaptations.

Much of this work focused on the Savannah River Valley where a new settlement model was developed and subsequently generalized to cover the region along the South Atlantic Slope (Anderson and Hanson 1985, 1988). This model, which has subsequently become known as the Band-Macroband model, was noteworthy because it incorporated aspects of both logistical and forager based adaptations in a balanced consideration of both the biological and social needs of prehistoric hunter-gatherers. In particular, attempts were made to document empirically the geographic range of Early Archaic adaptation. The following section, therefore, provides a detailed summary of the model and its implications for the work reported here.

THE BAND-MACROBAND MODEL

Anderson and Hanson (1985, 1988) proposed a regional model of Early Archaic settlement for the South Atlantic Slope based on analyses of local and regional resource structure, theoretical arguments about the biocultural needs of hunter-gatherer populations, and evidence from the archaeological record. They suggested that individual bands foraged within the large drainage systems along the south Atlantic while forming part of a larger macroband unit necessary to maintain viable mating networks. The regional (macroband) territory included watersheds that extended from the Ocmulgee drainage in Georgia to the Neuse drainage in North Carolina. Seasonal movement occurred along drainages between the Piedmont and Coastal Plain with logistical base camps located in the Coastal Plain during the winter while foraging camps were occupied in both regions during the remaining part of the year. Furthermore, some cross-drainage movement occasionally took place at Fall Line "aggregation loci" functioning to facilitate information exchange and maintain mating networks.

This model was tested by examining artifact assemblages from seven Early Archaic components located in the Savannah River basin Anderson and Hanson (1988:272-280). Following a trend in assemblage analysis noted earlier, curated-to-expedient-tool ratios were constructed and compared among the seven assemblages as a measure of site use and group mobility. An independent measure of site use was also provided by a cluster analysis of the seven assemblages, which the author's believe supported the results of the curated-to-expedient-tool indices. That is, sites were divided into four clusters represented by a series of short verses long term base camps and specialized extractive sites.

A second aspect of Anderson and Hanson's model was concerned with mobility. Using data collected by Charles' extensive South Carolina collections survey, the stone types identified for Early Archaic points from along the Savannah River were used as a measure of group mobility (1981, 1983, 1986). Four categories of raw materials were identified (Coastal Plain chert, quartz, Slate Belt metavolcanic stone, and Ridge and Valley chert) which have mutually exclusive natural distributions within the Coastal Plain, Piedmont and Mountain regions. The sample of points was dominated by chert from the Coastal Plain and quartz presumably from the Piedmont. Frequency distributions for these two types of raw material indicated a gradual reduction in the percentage of the use of the respective raw materials along the drainage as a function of the distance from their geological source areas (Anderson and Hanson 1988:280-281). These distributions were presented as evidence for group mobility along the length of the Savannah River drainage.

In sum, while their formulation remains speculative, Anderson and Hanson have presented the most comprehensive settlement model to date incorporating biological, social, and ecological elements in its construction. In so doing, they recognized the complexity of hunter-gatherer cultural systems in archaeological analyses. Yet, while the Savannah River sites have provided a partial test for their model, the identification of site types and settlement ranges as they relate to Early Archaic adaptation remains to be demonstrated in other areas of the South Atlantic Slope.

UNRESOLVED QUESTIONS REGARDING THE BAND-MACROBAND MODEL

Although the Hardaway site has significant implications for any settlement model in the region, the data from the site have never been analyzed to address this problem. As mentioned previously, Coe's analysis of the Hardaway site focused on tool typology and cultural chronology with less emphasis on site function and settlement adaptation. Until now, the exact nature of the activities carried out at Hardaway were unclear and an evaluation of any settlement model that included the Hardaway site could not be done.

The questions concerning site function and settlement adaptation are addressed here by: (1) a functional study of the Hardaway site and, (2) a collections survey of the raw material distribution of Early Archaic points in the Carolina Piedmont and Coastal Plain.

The problem of site function is examined through a technological and morphological analysis of the tool assemblage coupled with an intrasite spatial analysis. One implication of the Band-Macroband model is that, by virtue of being located in the Piedmont, Hardaway should represent a relatively short-term summer-fall foraging camp like Rucker's Bottom along the Savannah River. In the absence of seasonality data at Hardaway (and on Early Archaic sites along the Savannah River), the identification of site function is largely based on interassemblage analyses. Therefore, using the Rucker's Bottom tool assemblage for comparison, Hardaway should exhibit a relatively low artifact density with few formalized, curated tools (Anderson and Hanson 1988:272-274). "In brief, a relatively uncomplicated toolkit centering on curated projectile points and formal bifaces, and used in conjunction with a range of expedient tools, would appear to characterize the Early Archaic assemblage at Rucker's Bottom" (Anderson and Schuldenrein 1983:192); and, if the Band-Macroband Model is correct, a similar toolkit should characterize Hardaway as well.

The second part of the present study allows Hardaway to be placed in a regional context. Since the scale of hunter-gatherer adaptations is that of a region and not a site, an artifact raw materials distribution study was conducted to address the geographic range of Early Archaic cultural systems. This phase of the study involved a collections survey to record data on point type and raw material similar to that reported by Anderson and Hanson (1988:Figure 8). Essentially, this collections survey addressed the problem of band adaptation by tracing the movement of stone raw material--primarily in the form of rhyolite--both within and across the Yadkin-Pee Dee drainage.

Finally, this brings us to another important aspect of the present research: the quarry survey and stone raw materials study. The identification of the metavolcanic stone types mentioned in this report was based on a raw materials study designed to systematically locate and petrologically characterize the numerous metavolcanic quarries known to be located in the Uwharrie Mountains in the vicinity of the Hardaway site. This portion of my research was a joint effort with J. Robert Butler of the Department of Geology at The University of North Carolina at Chapel Hill. This work is also reported here and provides an important baseline for future researchers interested in the identification of metavolcanic stone types recovered in archaeological sites in the Carolinas (Appendix A).

REPORT OVERVIEW

The remainder of this report presents the results of my analysis and interpretations. Chapter 2 describes the history of excavations at Hardaway, including a discussion of the stratigraphy and the sample of units analyzed in this study.

The artifact analysis is presented next. Chapter 3 provides a detailed morphological and technological examination of the Hardaway assemblage; some speculations concerning tool functions are also presented. Chapter 4 discusses how the assemblage was organized at Hardaway with respect to blank production and tool use-life. Together, these two chapters provide the basis for making inferences about site function and how an Early Archaic technology was organized with respect to settlement adaptation.

Chapter 5 presents the results of the spatial analysis of the lithic remains providing further evidence concerning site function. The results of the collections survey are used in Chapter 6 to address the question of the geographic range of adaptation of the former inhabitants of the Hardaway site.

Finally, Chapter 7 evaluates the Anderson-Hanson (1988) model in light of the results presented in the previous six chapters. The implications of these results are presented in the form of an alternative model of Early Archaic settlement along the South Atlantic Slope.

Chapter II

EXCAVATIONS AT HARDAWAY

This chapter presents the history of excavations at Hardaway, a review of the site's stratigraphy, and a discussion of the features and units selected for analysis. Because I was not present during the fieldwork, I had to familiarize myself with the excavations through the field notes, maps, and photographs on file at the Research Laboratories of Anthropology. In addition, I had numerous conversations with several participants in the actual excavations including Joffre Coe, David Moore, and Trawick Ward. These discussions were extremely beneficial in my attempts to understand the nature of the fieldwork at Hardaway. Therefore, in describing the excavations, I occasionally cite these conversations as well as information taken from field notes.

HISTORY OF EXCAVATIONS

The Hardaway site was brought to Coe's attention by Herbert M. Doerschuk, a local collector who was familiar with a number of archaeological sites in the Uwharrie area. Coe first visited Hardaway in 1937. During the summer of 1948, following 11 years of intermittent surface collecting, a single 5 ft^2 test unit was excavated in the apparent center of the site.

Subsequently, a second square was excavated in early 1951 just south of the first unit. These two squares were dug in 6 in (15 cm) levels until clay subsoil was reached. Both units revealed the presence of a thick midden densely packed with stone debris lying below a plow zone. The midden was underlain by a second thin humic soil zone just above the clay subsoil. In addition, a poorly preserved burial was encountered just below the plow zone in the 1948 excavations (Coe 1964:60).

> The number of specimens recovered from these two squares was astounding. Over 1,500 artifacts of various types were collected and catalogued. It was noted that most of the pottery occurred in the upper part of the midden and in the plowed soil, and that most of the projectile point types, previously observed at the Doerschuk Site, were also found in the upper levels. An attempt to show a meaningful relationship between those and the new types that were being found at this site, unfortunately, was unsuccessful on the basis of their segregation by artificial six-inch levels. All types seemed to occur at all levels, and if the work had stopped at this point it might have been assumed that this was another "homogeneous" site [Coe 1964:60].

Work, of course, did not stop at Hardaway, but several years went by before it resumed. Actually, the work at Hardaway was part of a larger research effort by the Research Laboratories of Anthropology to identify stratified sites in the alluvial floodplains of the Carolina Piedmont (Coe 1964:9-13). At that time the Archaic sequence of the area was virtually unknown and it was hoped that this work could help identify potential Archaic complexes. Coe (1964:8) realized that this could not be done from surface collections or the excavations of relatively shallow plow zone deposits. Therefore, it was also during the late 1940s that excavations were conducted at two other sites, Doerschuk and Lowder's Ferry, just downstream from Hardaway (Coe 1964:14-55). Here deep excavations isolated stratigraphic deposits which, when combined with the work at Hardaway, would eventually allow the identification of the early cultural sequence of the Carolina Piedmont.

The 1955-1959 Excavations

Given the success at Doerschuk and Lowder's Ferry, and recognizing the potential at Hardaway, a lease was obtained from the Carolina Aluminum Company in 1954 (now Aluminum Company of America) to conduct more extensive excavations at the latter site. The following year a grid system was established and work began in earnest (Figure 2.1). A 5 ft (1.5 m) wide trench, 50 ft (15 m) long and

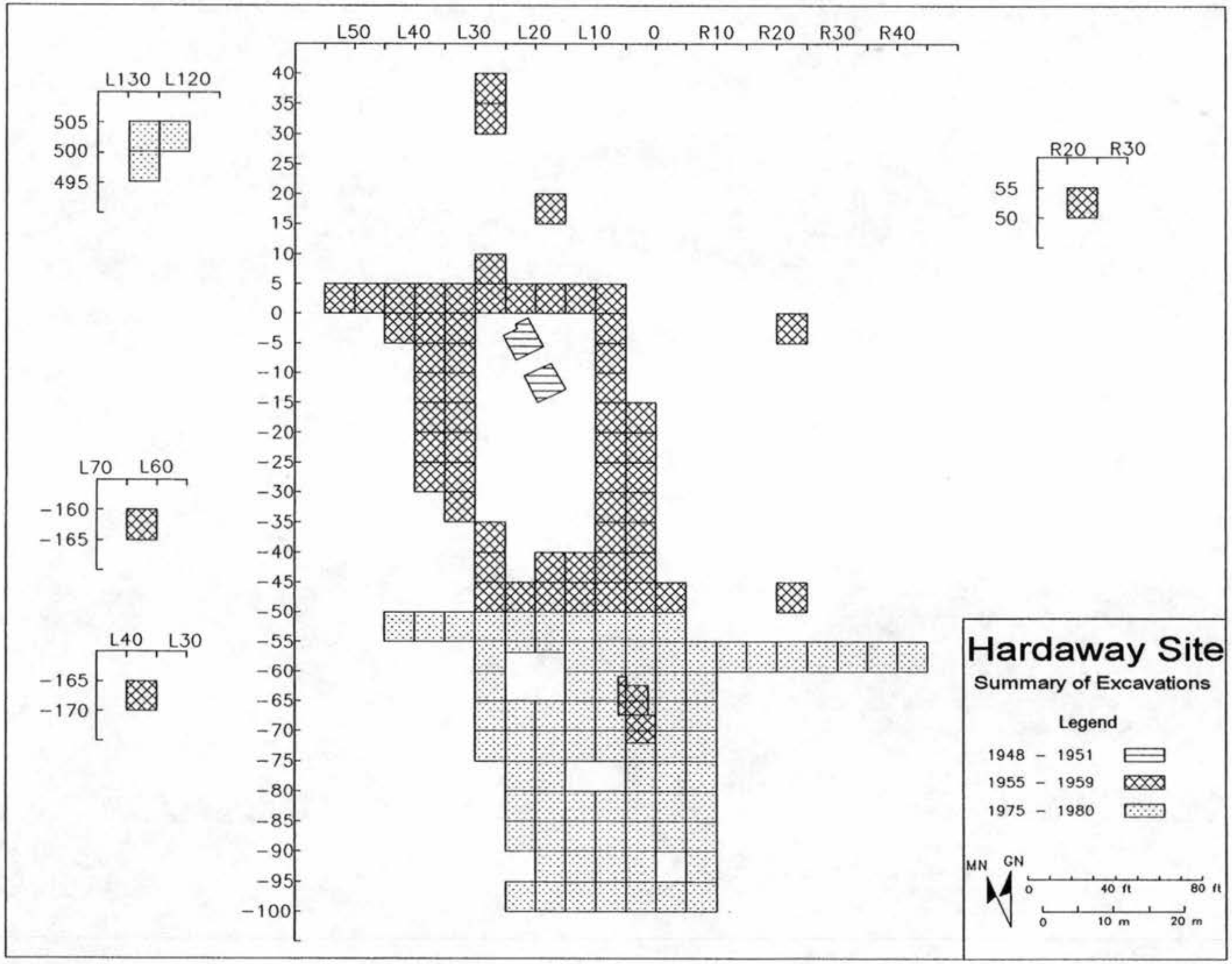


Figure 2.1. Summary of excavations at the Hardaway site.

oriented east-west was laid out just a few feet north of the earlier test units. Excavations were started in the two squares at either end of the trench. Work continued sporadically with each unit being dug in arbitrary levels and refilled after it was excavated (Figure 2.2). Over the next two years that trench and another 30 ft (9 m) trench perpendicular to it were completed. In addition, several isolated squares were dug to the north and south of the two trenches. From 1955 to 1957, 23 squares totaling 575 ft^2 (53 m^2) were excavated (Coe 1964:60).

A large amount of cultural material was recovered again. Of particular interest was the range of projectile point types. Many of these types--from Caraway Triangular to Stanly Stemmed--had been identified previously at Doerschuk and Lowder's Ferry; but several other new point types were found at Hardaway. The excavation in arbitrary levels, however, thwarted attempts to recognize any point type occurring earlier than the Middle Archaic.

> It was still impossible under those working conditions to do more than remove the soil by the same method of arbitrary levels, which, in general, continued to produce the same arbitrary results.... Thus, in light of the information that had been gained from the site by the fall of 1957, it was concluded that any further excavation by arbitrary levels and in single isolated units was a waste of time and a destruction of potential data [Coe 1964:60].

The following two seasons of excavations, primarily in the summers of 1958 and 1959, saw the excavation methods modified such that earlier point types from the Kirk through the Hardaway complexes were more clearly defined. Coe summarized the summer of 1958 as follows:

> In July, 1958, a camp was set up on the site and the area was intensively excavated for a period of six weeks. This time, however, a different and more satisfactory method of excavation was employed. A section of the former excavation from 0L35 to -20L35 was cleared, and the exposed north-south profile (fig. 49) was examined as a unit for the purpose of gaining a better understanding of the nature of those deposits (fig. 50). Zones I through IV were defined more precisely and a keener awareness of the ever-present intrusions was developed. The excavations during this period were controlled by the

Figure 2.2. Excavation in progress at the Hardaway site, 1956 (square 0L20).

Figure 2.3. Excavation in progress at the Hardaway site, 1975 (0 trench, looking south).

> natural zones and every observed intrusion was separated from the zone area. Furthermore, every concentration of rocks or stone chips was cleaned and examined as a unit, and many of these turned out to be well defined hearths that could be identified with a specific culture group [Coe 1964:61].

A similar methodology was followed in 1959. These last two summers resulted in further trench excavations that connected the two earlier trenches and formed the rough borders of a rectangle around the presumed heart of the site. In addition, three isolated squares were dug to the east of the main trenches, resulting in the excavation of 36 additional units. Assisting Coe during the 1950s excavations were several students and interested amateurs including Philip Baldwin, James Bullit, Lewis Binford, Ed Gaines, Walter Gaines, Archie Leak, David Phelps, Jewell South, and Stanly South.

Following the 1959 season, the Research Laboratories of Anthropology ceased work at the site for over fifteen years. An analysis was done on much of the above work and reported by Coe in his 1964 benchmark work *Formative Cultures of the Carolina Piedmont*. To say that the work at Hardaway stopped, however, is not entirely accurate since much time and effort was spent intermittently monitoring the site and chasing away pothunters (reports on file, Research Laboratories of Anthropology). Prior to Coe's publication there had been some potting at the site; however, after *Formative Cultures* was published this vandalism reached a near-frenzied pace.

Nevertheless, in 1975 Coe felt that although the site had been severely damaged, the lower Palmer and Hardaway zones might still remain intact. Thus, a final phase of work was carried out at the site between 1975 and 1980 (Figure 2.1). The objectives of this fieldwork were to define site limits, obtain subsistence data, and to identify potential intrasite-site activity areas. It was also hoped that this work would result in the recovery of carbon samples for the absolute dating of the early components at Hardaway (Ward 1983:63).

The 1975-1980 Excavations

Field methods during the 1970s basically followed the plan that proved successful during the 1958 and 1959 seasons. Some modifications to the excavation procedures, however, were necessary due to the new objectives of the work and the amount of site destruction.

As before, trench excavation proceeded by flat shovel skimming in 5 ft (1.5 m) squares with all soil being screened through .5 in (1.3 cm) mesh using hand sifters (Figure 2.3). Due to widespread potting, the initial step was to remove the disturbed backfill and isolate undisturbed soil. The intact deposits were subsequently troweled in order to identify any features or possible intrusions which were documented and removed separately. Intact soil zones were recorded by black-and-white and color photographs and mapped to scale prior to excavation. When possible an arbitrary division of each zone into "top" and "bottom" was also made during excavation. Since the transition between Zones 3 and 4 was often vague, it was sometimes difficult to assign context to material recovered from the interface of the two zones. Therefore, it was thought that material from the top of Zone 3 or the bottom of Zone 4 could be regarded as more representative of each zone. Excavation continued into undisturbed clay (Zone 4) usually no more than 0.3-0.4 ft (9-12 cm) at which point artifacts generally ceased to be recovered.

Each recognizable tool was three-dimensionally plotted within the undisturbed zones. The remaining cultural material was bagged and labeled according to square and zone provenience. Horizontal and vertical control were maintained by reference to the site grid and the use of a transit and stadia rod. Standardized soil samples were also taken for each zone.

When a trench was finished a continuous profile was cleaned, photographed and drawn. Additional field notes were recorded on standardized daily report, profile elevation, and feature forms. In addition, weekly summary reports were also written by the field supervisor.

The excavations began in 1975 and lasted from May 27 to August 13. Trawick Ward was field supervisor as he was for the remaining seasons at Hardaway. The field crew consisted of Neil Davis, David Moore, and Michael Trinkley with the addition of Ralph Bunn and Sam Pratt in mid-July. The site was cleared, a grid reestablished, and pot holes were mapped. Site destruction from previous years of looting was extensive, particularly within and just north of the block defined by the earlier excavations. The area to the south near the edge of the knoll, however, appeared relatively less disturbed and it was decided that excavation would begin there.

Two adjacent trenches, 5 ft (1.5 m) wide and 60 ft (18 m) long, were excavated that summer. The north end of these trenches included four reexcavated units from the 1950s fieldwork in order to examine profiles and assess potting damage prior to trench excavation.

Unfortunately, it quickly became apparent that the potting activity in this area was worse than anticipated. Virtually all of Zone 2 along both trenches was disturbed and only discontinuous pockets of intact Zone 3 were encountered. Even Zone 4 had not escaped damage. Moreover, the Zone 3 and Zone 4 interface was not always easily identified.

> Some problems have been encountered separating zone 3 from zone 4 in the squares along the L5 line. The clay here is a rather dark reddish brown color which seems to subtly blend with the purplish tan humus. You can "feel" the separation better than you can see it. There also appears to be a change in the orientation of the flakes between the two zones. Those in zone 4 tend to be more vertically aligned [Ward, field notes, July 26, 1975].

Yet, in spite of the potting activity extraordinary numbers of artifacts were still present in the disturbed soil. "Getting massive amount of material today, we filled up 5 banana boxes with 29 bags of material ... from one 5'x 5' unit we will get 8-9 banana boxes" (Ward, field notes, June 9, 1975).

Finally, five features were identified that season. Two were rock clusters identified as possible "Hardaway hearths", and one was a small pit with its origins in the Zone 2 midden. The two remaining features proved to be disturbances. A discussion of these and all remaining features from the site is presented later in this chapter.

The 1976 season at Hardaway lasted from May 17 until August 5. Moore and Pratt were again crew members with the addition of Kit Wesler and Lee Tippit. Two additional trenches, comprising 18 new units, were dug parallel to the previous summer's work. Again pothunting was extensive, although Zones 3 and 4 appeared to be relatively more intact in some squares than in the previous year's trenches.

In addition, three units were also opened about 500 ft (152 m) north of the main excavations in a wooded area downslope near the end of Hardaway point. The excavators had received reports of pot hunters digging up artifacts and large chunks of charcoal in this area. A surface inspection of the area indicated that the digging was fairly isolated; and given the alleged reports of artifacts associated with large pieces of charcoal, it was felt that some examination of the area was warranted.

Three 5 ft (1.5 m^2) squares were excavated adjacent to a large pothole. The stratigraphy was somewhat different than at the main excavations and the artifact deposits were definitely deeper. While artifacts only extended a few inches below the clay at the main excavations, artifacts were found over a foot below the top of the clay in at least one of the squares on the point. In fact, the pothole was 5.5 ft (1.6 m) deep, with the lowest 3.5 ft (1 m) dug through red clay. As Ward (field notes, July 30, 1976) noted: "One must only conclude that something of considerable consequence was being found in order to drive a pot hunter to dig through this much clay." Unfortunately, it could never be determined exactly what that something was.

Finally, six features were identified in 1976. Two of these (Features 40 and 41) may have had an Early Archaic association and are discussed below. The remaining four proved to be natural disturbances.

The 1977 season lasted from May 16 until August 12. The crew again consisted of Ward and Moore, with the addition of Ted Bradstreet and Steve Potter. Ward was field supervisor until June 1 when he was moved to a new project and Moore temporarily replaced him.

Two trenches were dug west of the previous summer's work--one parallel to the last trench dug the previous summer and another shorter L-shaped trench adjacent to it. Another L-shaped trench was also dug adjacent to and extending east of the 1975 work. Several features were also identified that summer, but most of these proved to be either natural disturbances or postholes.

Following the 1977 work, it was two years before excavation resumed at Hardaway. The 1979 season lasted from May 21 until July 26. An all new crew assisted Ward that season. Initially, they were Dan Clement, Gary Glover, and Mike Johnson; Dan Simpkins joined the crew near the end of June.

Two trenches were excavated that summer. They were located just south of and perpendicular to the L-shaped trench dug at the eastern edge of the knoll the previous year. An isolated square was also placed in the southeast corner of the unexcavated block bounded by the 1950s excavations. It produced an undisturbed burial in the top .5 ft (.15 m) of the unit. It apparently escaped potting by having a backdirt pile from the 1975 excavations fortuitously placed on top of it (Ward, field notes, July 21, 1979). The burial was excavated but the remainder of the unit was not finished until the next season.

The final season at Hardaway was the shortest, lasting from August 11 to August 22, 1980. It also had the smallest crew consisting of Ward, Jack Wilson, and Billy Oliver. Two adjacent squares were excavated including the completion of the unit containing the burial uncovered the previous summer.

In addition to these two squares, four small test pits were dug off the hill several hundred feet south of the main excavations and along the saddle south and east of the main excavations. Of these, one pit was in a disturbed area not visible from the surface, another proved culturally sterile, while the third contained very little cultural material. Only one pit contained any significant cultural deposits, but it presented an unclear stratigraphic profile with some temporal mixing of cultural materials (Ward, field notes, August 11-August 22, 1980). This marked the end of the Research Laboratories of Anthropology excavations at the Hardaway site (Figure 2.4).

Although a summary of this second phase of fieldwork was subsequently written by Ward (1983), up until now no detailed analysis of any of the data has been attempted. Similarly, with the exception of a master's thesis describing the technological and functional (i.e., edge angle) variability of about 500 unifacial tools recovered during the 1955-1957 excavations (Hall 1983), and a pilot study for the present research (Daniel 1986), no detailed analyses have been undertaken on the data recovered from Hardaway.

STRATIGRAPHY AND SITE FORMATION

Four natural soil zones were distinguished at Hardaway (Figure 2.5). Zone 1 was an 8-10 in (20-25 cm) deep plow zone that contained a mix of cultural material from the Middle Archaic to Historic periods, all of which were stratigraphically identified at Doerschuk and Lowder's Ferry.

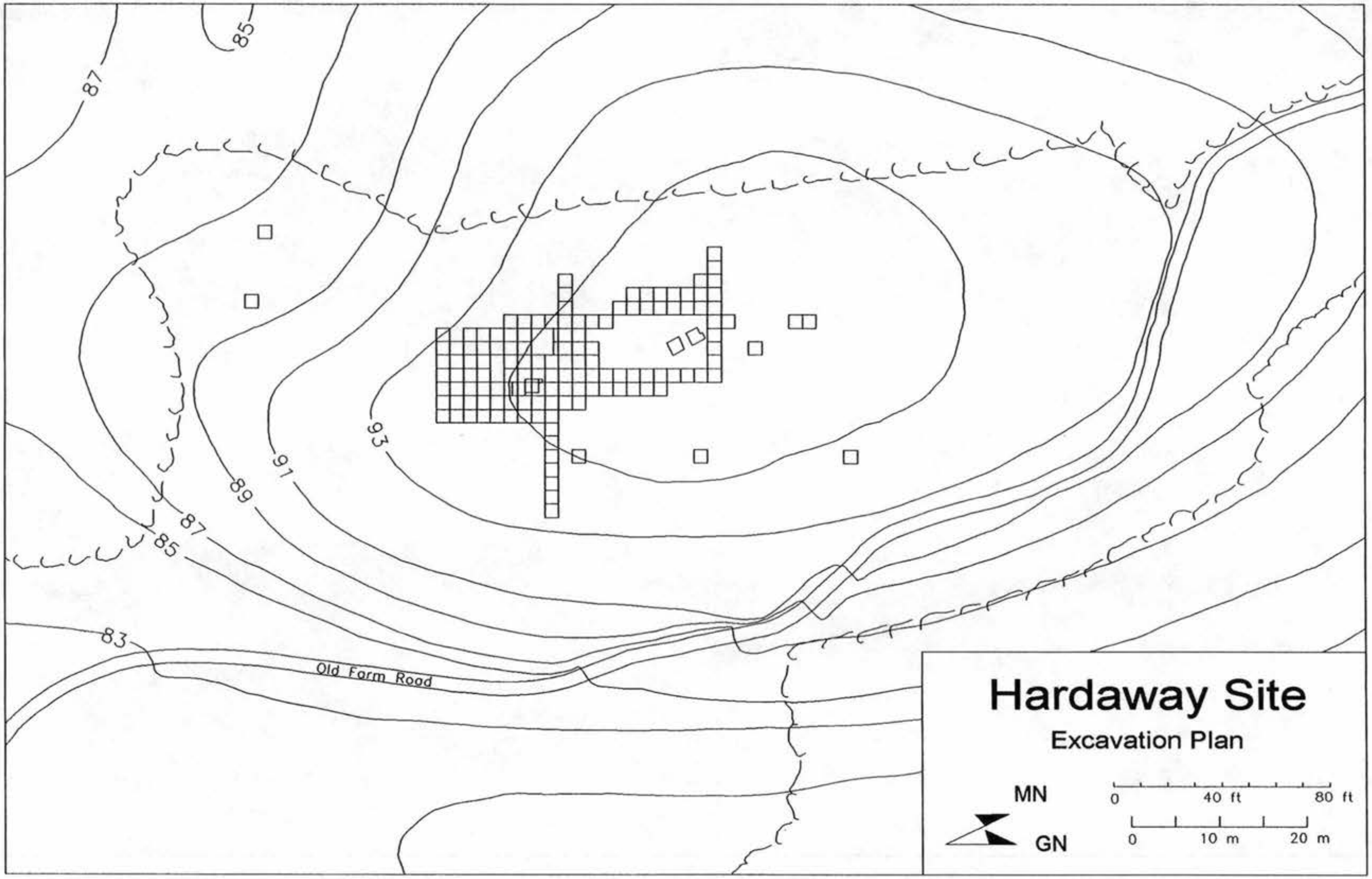


Figure 2.4. Excavation plan and topographic map of the Hardaway site (adapted from Coe 1964:Figure 48).

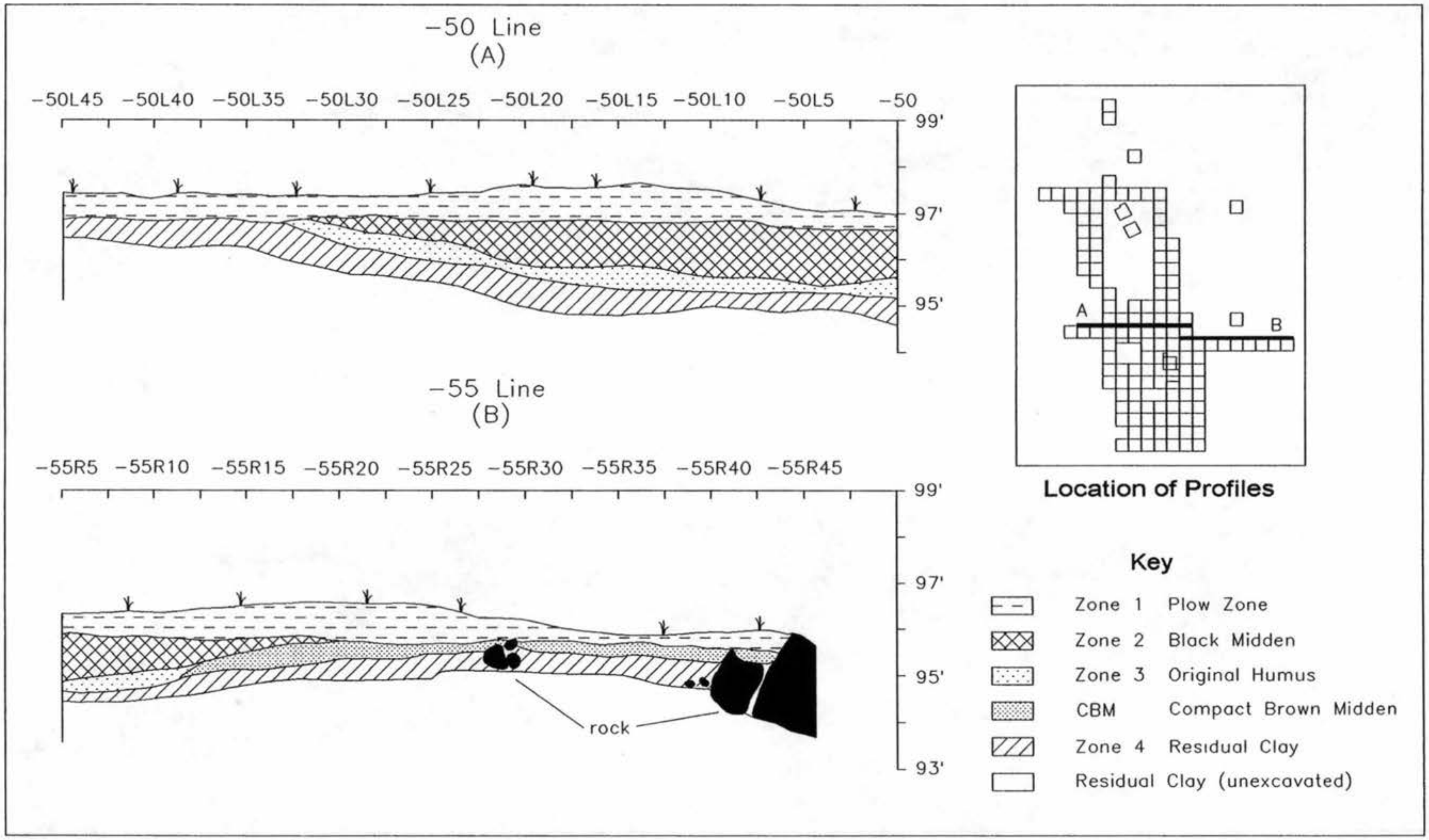


Figure 2.5. Hardaway site profiles.

The plow zone was underlain by what was described as the Kirk midden which was over a foot thick in the deepest part of the site. Coe (1964:57) notes that about 40% of the midden was stone debris with the remaining 60% being soil. This zone was associated with the Kirk complex, a related series of three point types, identified as Kirk Corner-Notched, Kirk Stemmed, and Kirk Serrated. Coe (1964:70) indicates that the Kirk-Corner Notched forms were associated primarily with the lower part of the midden, while the stemmed varieties were associated with the upper portion.

Underlying the midden was a humic zone (Zone 3) no more than 5-6 in (13-15 cm) thick, resting upon a red clay soil called Zone 4. This clay was a residual soil predominately formed from the underlying greenstone bedrock. The top portion of Zone 3 was associated with the Palmer component while the bottom portion of Zone 3 and the top of Zone 4 were associated with the Hardaway component (Coe 1964:Figure 49).

While Coe (1964:9) attributed his initial success in finding the deep deposits at Lowder's Ferry and Doerschuk to luck, his subsequent analyses of the sites' stratigraphy and his hypothesis for predicting the location of other alluvial sites along Piedmont floodplains was a geoarchaeological study ahead of its time. Yet the Hardaway site, located high on a hilltop, was formed differently since it was "not stratified in the same sense as those found in the alluvial plain" (Coe 1964:13). By this Coe meant that Doerschuk, Gaston, and Lowder's Ferry were created by floodplain deposits that contained a "series of occupational levels separated one from the other by sterile flood deposits of sand and silt" (Coe 1964:16). No such depositional history was noted for the Hardaway sequence. Rather, a picture of site formation was presented that involved varying intensities of cultural activities and natural erosion.

> There was not enough activity at this site during the Hardaway or, perhaps, an even earlier period for soil or debris to accumulate through human use. Instead, erosion continued and the hearths and other signs of their scattered camps remained exposed on the surface. During the succeeding Palmer period, there was sufficient debris brought in to reverse the normal rate of erosion and actually to build up the soil over part of the site to a depth of five to six inches. Yet this build-up took place over such a long period of time, and the general activity around the camps created such disturbances, that there never existed any sharp demarcation between the two periods. It was not until the Kirk period that any substantial accumulations of debris took place, and even this must be considered in terms of many generations and not as a single catastrophic avalanche [Coe 1964:60].

Thus, to a certain extent, Hardaway was an exception to Coe's expectation of finding stratified sites primarily in floodplains. Although Coe defined the stratigraphy and how it correlated with the archaeological sequence, the depositional origins of the soil zones at Hardaway are still not clearly understood. For this reason a closer look at the site stratigraphy is addressed here.

The soil descriptions and profile data from the 1970s excavations provide additional information that can be used to update our understanding of the Hardaway site stratigraphy. The following interpretations are based on my review of field notes, color slides of site profiles, and a cursory examination of soil samples from the Hardaway site. Furthermore, the following interpretations have benefited from discussions with Coe and Ward concerning their field observations at Hardaway and with Albert Goodyear concerning late Pleistocene and early Holocene depositional systems in the Southeast (see Goodyear 1991).

Coe (personal communication, 1991) has stated that rather than being completely rounded, the hilltop upon which the site rested was at one time basin-shaped. In fact, the slope of the Zone 4 clay subsoil in the north-south profile depicted by Coe (1964:Figure 49) hints at this. This phenomenon is more fully illustrated in the profile drawing in Figure 2.5; note that Zone 4 exhibits a basin-shaped profile across the top of the southern toe of the knoll, with the thickest deposits of Zones 2 and 3 being in the basin bottom located in the center of the block excavations. Furthermore, Zones 2 and 3 thin out along the edges of the hilltop as Zone 4 begins to level off (Figure 2.5).

In addition, Zone 3 also exhibited a slight color change along both the eastern and western edges of the excavations. The typical Zone 3 soil was a purplish to reddish-brown loamy clay which changed to a brown loamy soil that was described as a "light brown midden" along the southernmost 15 to 20 feet of profiles (Ward, field notes, June 19, 1976). At this point the excavations were nearing the edges of the knoll top and digging ceased: "We are definitely off the main portion of the site and the material is thinning out and producing a different stratigraphy" (Ward, August 7, 1975).

A somewhat similar stratigraphic change was noted along the eastern edge of the excavations (Figure 2.5). Here Zone 3 was described as a "compact brown midden" (CBM), the nature of which was a source of much consternation to the crew; although it had an undisturbed feel to it during excavation the top portion contained nails and coal (Moore, field notes, 1977). Zone 3 did resemble the CBM, but the latter stratum was darker brown and more compact in texture than Zone 3, and it contained many limonite and hematite inclusions. Furthermore, the CBM tended to become thinner and even less like Zone 3 as the trench extended further east.

At one point the excavators thought that it might be a layer of fill associated with the work done on the site by the Hardaway Construction Company. However, due to its compact feel during excavation, the presence of numerous artifacts, and the fact that the nails and coal occurred only in the top portion of the zone (perhaps pressed into an otherwise undisturbed zone by heavy machinery), it was concluded that it was an undisturbed zone. In fact, the excavators felt that the CBM appeared to be more like Zone 3 in artifact composition than the light brown midden along the western portion of the site. This view was reinforced by the recovery of at least two Hardaway and several Palmer/Kirk points in the CBM. The presence of modern cultural material was accounted for by natural migration downward in the soil matrix. Unfortunately, potting in the area of the trench had destroyed any horizontal transition that might have existed between Zone 3 and the CBM (Moore, July 18-July 29, 1977).

While the eastern, southern, and western extent of the four zone sequence was documented by the 1970s work, the northern limits of this stratigraphy are less well known. Some evidence suggests that it extends less than 50 ft (15 m) north of the 1950s work. For example, a profile in *Formative Cultures* suggests that the stratigraphy is rapidly thinning at unit 35L25 (Coe 1964:Figure 49). An examination of the profile of the only other unit excavated just north of the main block excavations (50R25) indicates the stratigraphy had completely changed to a plow zone over subsoil (Phelps, field notes, August 8, 1958).

Given the above, I suggest that the soil strata observed on top of the knoll at Hardaway are pedogenically modified soil horizons that subsequently formed after a "filling in" of a large depression in the residual clay. I want to emphasize, however, that the following discussion is speculative and confirmation must await specific pedologic analyses.

> Zone 2 ("midden"): Underlying the plowzone and characterized by a high density of stone debris, this soil zone was described as a loose brown loam (Ward 1975). This was probably some sort of A-horizon, possibly a leached-out humus soil.
>
> Zone 3 ("original humus"): This zone appeared as a reddish-brown to purplish loamy clay (Ward, 1975) which was probably some form of B-horizon. The reddish-brown color suggests a humus enriched soil from Zone 2 with some accumulation of iron. The zones referred to as "light brown midden" and "compact brown midden" may represent differentially modified B-horizons related to Zone 3. This is discussed further below.

Zone 4 ("residual clay"): The underlying top of the red clay (Zone 4) also appears to have been some type of argillic or weathered B-horizon. This zone eventually graded into the C-horizon clay and bedrock.

Even if the above interpretations are reasonably accurate, the exact nature of site formation on the hilltop still remains to be explained. One implication of the previous discussion, however, is that natural forces may have played a larger role in site formation than originally thought. That is, the sloping sides of the Zone 4 clay could have promoted the deposition of material in the bottom of the basin. This, in turn, would have aided stratification.

Such a process may also partially account for the occurrence of the light brown midden and compact brown midden soil zones. If Zone 3 represents a B-horizon, as suggested above, then the two zones described as a light brown midden and compact brown midden may represent differentially altered B-horizons; perhaps related to their association with a thinner overlying soil deposit outside the basin.

It should also be mentioned that the excavators noted these two zones were associated with a somewhat different Zone 4 clay than that present inside the basin. Given this, the more weathered B-horizon (top of Zone 4) may not have existed outside the depression. In fact, at the edges of the excavations, only relatively shallow deposits of plowed soil overlying clay subsoil remained; and in some cases bedrock was encountered very near the ground surface. There, only A- and C-horizons appear to have been present.

In summary, the stratigraphy exhibited at the Hardaway site may have been the result of a "filling in" of a large depression on the hilltop. Subsequently, this deposit was pedogenically modified resulting in the soil zones observed during the excavations. The origin of the depression is unknown. Perhaps the hilltop formed that way or maybe it was created by a major erosional episode. In any event, it began to "fill in" sometime between 9,500 and 10,500 years ago. This is evidenced by the presence of Hardaway and Palmer deposits that were eventually modified into

B-horizon soils. Subsequently, a much different depositional event took place resulting in a massive accumulation of stone debris. Sometime after the Middle to Late Archaic the deposition stabilized, resulting more or less in the modern landform.

The exact nature of the mechanism of deposition within the depression remains obscure. Given that stratification is more apparent within the depression than elsewhere on the hill, I have proposed that natural processes may have had a larger role in site formation than originally thought. Processes such as colluviation and/or soil creep, for example, would seem to be indicated here.

Finally, some comments should be made concerning the previously mentioned deep deposits identified in 1976 further north downslope. There the stratigraphy was different from that on the knoll. It consisted of an old plow zone underlain by a .5-.8 ft (.15-.24 m) of a reddish brown loamy clay overlying red clay. The red clay included a large amount of medium to large size rocks which rested on top of boulder size rocks in some places. As also previously noted, cultural material was found well into the clay. Although these units remain to be analyzed, it was the excavators impression that the cultural material recovered in these units was more stratigraphically mixed than on the knoll (Ward, 1976). Given the depth of the material and the location downslope a process such as colluvium is suggested here.

The significance of the Hardaway site to Southeastern archaeology cannot be overemphasized (see Smith 1986; Steponaitis 1986). Yet, despite its importance in establishing an Early Archaic projectile point chronology, the depositional history of the Hardaway site remains something of an enigma. Although the Hardaway site proved critical to forming the projectile point sequence for the Carolina Piedmont, it is often overlooked that Hardaway was not a floodplain site with well-defined alluvial deposits like the Doerschuk and Gaston sites--or most other early Holocene sites in the Southeast (e.g., Chapman 1977, Claggett and Cable 1982, Tippitt and Marquardt 1984)--although this distinction was certainly clear to Coe.

> The projectile points, ... were not neatly segregated at the Hardaway Site into relatively undisturbed zones by the rapid deposition of soil during conditions of flood as was the case at the Doerschuk Site. Instead, the deposit grew slowly, and it has been continually disturbed by one generation of people after another [Coe 1964:63].

Rather, Hardaway's location on a ridgetop and its formation there have been taken largely for granted or ignored while adopting its point chronology. Clearly, this has been because subsequent work has focused on floodplain sites--where sites have been excavated that tend to support the sequence--making understanding of formation processes on ridgetop sites like Hardaway largely moot.

An understanding of site formation at Hardaway, however, is important for two reasons. First, such a study can partially address the important question of site function at Hardaway by understanding both the cultural and natural forces affecting the density of material at the site. If this density results from high rates of refuse disposal, then Hardaway represents an intensity of occupation virtually unknown in the Piedmont. On the other hand, if the density of material is the result of erosion or site deflation then the density of material may be more the result of natural than cultural processes.

Second, an understanding of site formation may have implications for identifying other stratified upland site locations. Related to this understanding is the recent work of Goodyear (1991) concerning the geoarchaeological understanding of late Pleistocene and early Holocene depositional systems in the Southeast. In this synthesis, Goodyear (1991) has noted a pattern in the depositional contexts of certain stratified early sites in the Southeast that relates to the geological recognition of the Pleistocene-Holocene boundary.

In the floodplains of the Piedmont this boundary is marked by alluvial sands overlying a weathered and sometimes eroded clay stratum. Based upon previous geological, palynological, and climatic work, Goodyear relates the clay stratum to widespread erosional events by flooding that took place sometime during the late Pleistocene. The overlying sands are the result of subsequent floodplain buildup at the onset of the Holocene. The Pleistocene-Holocene contacts at these sites are usually modified B-horizon soil zones. If the interpretations of the soil zones presented earlier are accurate, it is interesting to note that a similar contact may exist at Hardaway. What all this may imply about recognizing a Pleistocene-Holocene stratigraphic boundary in non-alluvial Piedmont sites is still debatable; however, it is suggestive enough to warrant additional investigation.

In sum, while floodplains obviously exhibit the most potential for the presence of buried early sites in the Piedmont, the Hardaway site stands as a reminder that stratified nonalluvial sites may also exist. Although a clear picture of the depositional history of the Hardaway site remains to be done, it is worth noting that it appears to share a common trait with floodplain sites regarding a B-horizon stratigraphic marker. Therefore, further research involving soil scientists and geologists is essential in elucidating the nature of site formation at Hardaway and identifying other locations elsewhere in the Piedmont.

CULTURAL STRATIGRAPHY

Whatever the site formation processes at Hardaway were, the present analysis provides an opportunity to examine projectile point distribution by natural soil zone. (The excavation units used in this study are discussed in the following section.) As Coe (1964:57) reported, the excavation levels only roughly correlated with the natural soil zones and his interpretations of the stratigraphy were based upon his field observations of the excavation by natural zones in 1958 and 1959, and the data analyzed by arbitrary levels from the 1955-1957 seasons.

Table 2.1 lists the distribution of points analyzed by zone in this study. Of particular interest, however, is a subset of this data listed in Table 2.2. This table includes those points from the 1970s excavation which were excavated by level designations (i.e., top or bottom) within each zone. Although frequencies are not high, the results do lend further support to the stratigraphic sequence of points alluded to by the arbitrary level data (Coe 1964:Table 7). Furthermore, the data in Table 2.2 also provide empirical support for the correlation of point types with particular levels *within* each soil zone depicted by Coe (1964:Figure 49) as well as Coe's (1964:64-70) comments concerning the association of points with soil zones.

For example, while all varieties of Kirk points were present in Zone 2 (the "Kirk midden"), Coe (1964:70) indicates that Kirk Corner-Notched points were primarily associated with the lower portion of the zone. This statement is supported by Table 2.2 where the Kirk Corner-Notched point is the most common type at the bottom of Zone 2 (46%, n=6). Similarly, Palmer Corner-Notched points predominate at the top of Zone 3 (36%, n=5), followed by approximately equal frequencies of Hardaway Side-Notched points and preforms (29%, n=5, including one Taylor-like Side-Notched point), and Hardaway-Dalton points and preforms (35%, n=6) points at the bottom of Zone 3. The sequence tends to break down, however, in Zone 4 where approximately equal frequencies of both Hardaway points and Palmer points were recovered at the top of Zone 4. Finally, only a single identifiable point--a Hardaway Side-Notched point--was recovered from the bottom of Zone 4.

This data, then, should make clear a point that was alluded to earlier: Hardaway was not as clearly stratified as Doerschuk or Gaston or several other alluvial sites subsequently excavated in the Southeast and mentioned in Chapter 1. Even about 80 potsherds were recovered from Zones 3 and 4 among the units ana-

Table 2.1. Frequency Distribution of Points by Zone from Selected Units at the Hardaway Site.

Type: Subtype	Zone 2	Zone 3	CBM	Zone 4
Unidentified	213	85	11	23
Small Triangular	-	1	2	1
Yadkin	6	1	-	-
Unidentified Stemmed	11	-	5	5
Savannah River Stemmed	8	2	-	-
Morrow Mountain Stemmed	33	5	-	2
Kirk Stemmed and Serrated	26	8	-	-
Bifurcate	1	-	-	-
Kirk Corner-Notched:				
Unground excurvate base	2	2	-	-
Unground straight base	23	7	-	3
Ground excurvate base	1	7	1	1
Ground straight base	15	7	-	2
Palmer Corner-Notched	4	10	1	9
Corner-Notched Indeterminate	2	6	2	-
Side-Notched Indeterminate	1	2	-	1
Taylor Side-Notched	-	1	-	-
Hardaway Side-Notched	1	4	-	3
Hardaway Side-Notched Preform	2	1	1	1
Small Dalton	-	6	-	1
Hardaway-Dalton	3	6	1	15
Hardaway-Dalton Preform	2	8	-	10

Table 2.2. Frequency Distribution of Points by Zone and Level from Selected Units at the Hardaway Site.

Zone	Level	Small Triangular	Yadkin Triangular	Savanah River Stemmed	Morrow Mountain Stemmed	Stanly Stemmed	Kirk Corner-Notched	Palmer Corner-Notched	Small Dalton	Hardaway Side-Notched	Hardaway-Dalton	Totals
II	Bottom	-	2	-	1	1	6	1	-	-	2	13
III	Top	-	-	-	3	-	1	5	3	1	1	14
III	Bottom	1	-	1	1	-	2	3	2	4[a] (1)[b]	2 (4)	17
IV	Top	1	-	-	-	-	-	4	-	1	2 (1)	9
IV	Bottom	-	-	-	-	-	-	-	-	1	-	1

[a] Count includes one Taylor Side-Notched point.
[b] Preform counts in parentheses.

lyzed here; this was despite assiduous attempts to identify and separate disturbed contexts during the excavations. Given Hardaway's location on a hilltop and the potential for disturbance on heavily reoccupied sites, this should come as no surprise, however. In fact, despite the mixing of cultural materials one could say that Hardaway was very well stratified.

Nevertheless, I have resisted the notion that individual complexes could be separated by zone within the Early Archaic. Rather, what I have done in the following analyses is to combine Zone 3 (including CBM) Zone 4 as representative of a single Early Archaic component--albeit one representing numerous intermittent occupations over several hundred to perhaps a thousand years or more (Table 2.3). While this undoubtedly masks potential variability during this time, I view this alternative less problematic than attempting to justify the identification, for example, of a Hardaway-Dalton versus a Palmer Corner-Notched complex.

FEATURES

A total of 65 features and 5 burials were recorded during the excavations at Hardaway. None of the burials were associated with the Early Archaic component. Moreover, within the squares examined here, only eight features appear to have been associated with the early component. I have divided the features into four categories: pits, rock concentrations, postholes, and natural or modern disturbances (i.e., tree falls, root disturbances, rodent burrows, and potholes).

The most numerous cultural features identified at Hardaway were pits--usually in the form of shallow basins, circular to oval in shape, with gently sloping sides. Of the 34 features identified during the 1958 and 1959 excavations at least 25 of them were basin-shaped pits, 17 of which were interpreted to have been hearths (Coe 1964:61). They were generally 1-3 ft (.3-.9 m) in diameter and usually less than 1 ft (.3 m) deep. Pit fill included artifacts, animal bone fragments, charcoal,

Table 2.3. Frequency Distribution of Stone Tools (excluding points) by Zone from Selected Units at the Hardaway Site.

Type	CBM	Zone 3	Zone 4	Totals
Biface I	4	112	35	151
Biface II	23	296	74	393
Biface III	5	109	42	156
Indeterminate Bifaces	4	108	57	169
End Scraper Ia	3	81	47	131
End Scraper Ib	-	28	12	40
End Scraper IIa	7	49	26	82
End Scraper IIb	-	28	16	44
End Scraper III	-	4	4	8
End Scraper IV	-	10	15	25
End Scraper V	2	49	28	79
Side Scraper I	-	11	9	20
Side Scraper IIa	6	146	60	212
Side Scraper IIb	1	14	8	23
Side Scraper III	3	78	34	115
Side Scraper IV	-	12	9	21
Pointed Scrapers	-	7	2	9
Oval Scrapers	-	5	-	5
Miscellaneous Scrapers	-	13	3	16
Indeterminate Scrapers	4	125	83	212
Perforater/Drill/Graver	2	16	9	27
Denticulate	-	2	-	2
Hafted Spokeshave	-	2	-	2
"Waller knife"	1	-	-	1
Core/scraper	-	2	4	6
Chopper	1	6	3	10
Adz	-	2	-	2
Hammerstones	3	38	10	51
Hammerstones/abraders	-	2	-	2
Hammerstones/anvils	-	12	4	16
Grindingstones/anvils	-	4	7	11
Anvils	-	1	-	1
Cores	9	54	18	81
Pièces Esquillées	-	-	3	3
Engraved Stone	-	5	1	6
Indeterminate Ground Stone	-	1	-	1
Other worked stone	-	3	2	5
Unmodified cobbles\stone	1	35	1	37
Totals	79	1472	625	2175

and some were at least partially lined with rocks (Coe 1964:61,83). The vast majority of these pits had their origins in the Zone 2 midden (Coe 1964:Fig. 52) and many contained Middle to (Research Laboratories of Anthropology field notes, 1958, 1959).

The remaining pits were distinguished from shallow basins by exhibiting straighter sides and rounded to flat bottoms. Except for the absence of rocks, their contents were similar in nature to the shallow-basin hearths. The origin of these features was also in Zone 2 and they were interpreted as refuse filled pits (Research Laboratories of Anthropology field notes, 1958, 1959). Field notes for the 1958 and 1959 excavations also indicate the occurrence of an additional 10 pits which were not assigned feature numbers. These were mostly of the non-basin variety.

Ten of the features excavated during the 1970s were also pits, mostly of the shallow basin type; but they were not identified as hearths (Ward, field notes 1975, 1976; Moore, field notes 1977). Rather, they appear to have been refuse filled, containing artifacts, animal bone fragments, and charcoal. It should also be noted that field records indicate the texture and color of Zone 3 soil tended to obscure features, making their identification difficult. Moreover, unlike the 1950s excavations it was not possible to trace the level of origin of the pits identified during the 1970s work due to the pothunting in the upper zones.

The remaining cultural feature categories include rock concentrations and postholes. Six rock concentrations were uncovered during the 1958 and 1959 excavations and four were interpreted as hearths. Two additional concentrations were uncovered in 1975. The nature of this feature category is discussed in more detail below. Postholes, on the other hand were not usually assigned feature numbers. Generally they were plotted and numbered sequentially within individual excavation squares. While approximately 25 postholes were identified in this fashion, four others were not identified as such until after they were excavated and had been assigned feature numbers. No obvious patterning was discernible in their distribution.

Natural or modern disturbances constitutes the final feature category. The vast majority of these were identified prior to excavation and removed separately from the surrounding zone and not assigned a feature number. However, 16 such disturbances were not identified until after excavation was complete and a feature number had been assigned.

Based on a careful examination of feature records and artifacts I have selected a group of 8 features that may be assigned tentatively to an Early Archaic association (Table 2.4). The remaining features were eliminated either because their stratigraphic origin and/or associated diagnostic artifacts post-dated the Early Archaic (as was the case with most of the 1950s features), or their stratigraphic origin was questionable and they lacked associated diagnostic artifacts (as was the case with most of the 1970s features). The discussion below involves two categories of features: pits and rock concentrations.

Pits

Feature 8. This feature was a shallow basin-shaped pit identified as a hearth (Figure 2.6). It was somewhat circular in shape measuring .27 x .23 m in size and .9 m in depth. Four rocks are depicted covering most of the surface of this pit. Profile drawings indicate that the top of the pit was located near the bottom of Zone 3 while the bottom intruded into the top of Zone 4. Material recovered from the pit fill included one biface fragment, one core fragment, lithic debitage, and charcoal. No diagnostic artifacts were associated with this pit and its assignment to an Early Archaic date was based on its stratigraphic origin.

Table 2.4. Distribution of Lithic Artifacts from Selected Features at the Hardaway Site.

Type	Fea. 8	Fea. 10	Fea. 20	Fea. 21	Fea. 35	Fea. 37	Fea. 40	Fea. 41
Palmer Corner-Notched	-	-	-	2	-	-	-	-
Kirk Corner-Notched	-	-	-	-	-	-	2	-
Side-Notched Indeterminate	-	-	-	-	-	-	1	-
Indeterminate Point	-	-	-	1	-	-	5	-
Biface I	-	-	-	-	-	-	5	-
Biface II	-	-	-	4	-	-	8	-
Biface III	1	-	-	1	-	-	7	1
Indeterminate Biface	-	-	-	-	-	-	3	1
End Scraper Ia	-	-	1	2	-	-	2	-
End Scraper Ib	-	-	-	-	-	-	-	1
End Scraper IIa	-	-	-	3	-	-	2	-
End Scraper III	-	-	-	1	-	-	-	-
Side Scraper IIa	-	-	-	2	1	-	4	2
Side Scraper IIb	-	-	-	-	-	-	1	-
Side Scraper III	-	-	-	1	-	-	6	1
Side Scraper IV	-	-	-	2	-	-	-	-
Other Scraper	-	-	1	-	-	-	-	-
Indeterminate Scraper	-	-	2	7	-	-	1	2
Graver	-	-	-	-	-	-	1	-
Chopper	-	-	-	1	-	-	1	-
Core	1	-	-	1	-	-	1	-
Pièces Esquillée	-	-	-	1	-	-	-	-
Hammerstone	-	-	-	1	-	-	1	-
Hammerstone/anvil	-	-	-	-	-	-	-	1
Grindingstone/anvil	-	-	-	-	-	-	1	-
Other worked stone	-	-	-	1	-	-	-	-
Unmodified cobble	-	-	-	-	-	-	4	-
Flake	60	-	151	241	83	15	2,692	197
Total	62	-	161	271	84	15	2,744	206

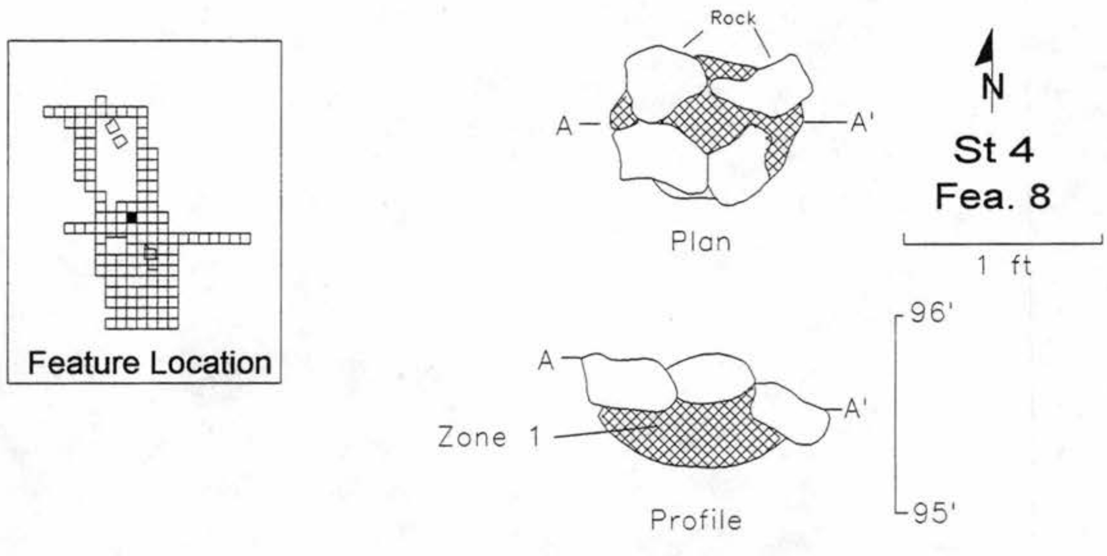


Figure 2.6. Feature 8.

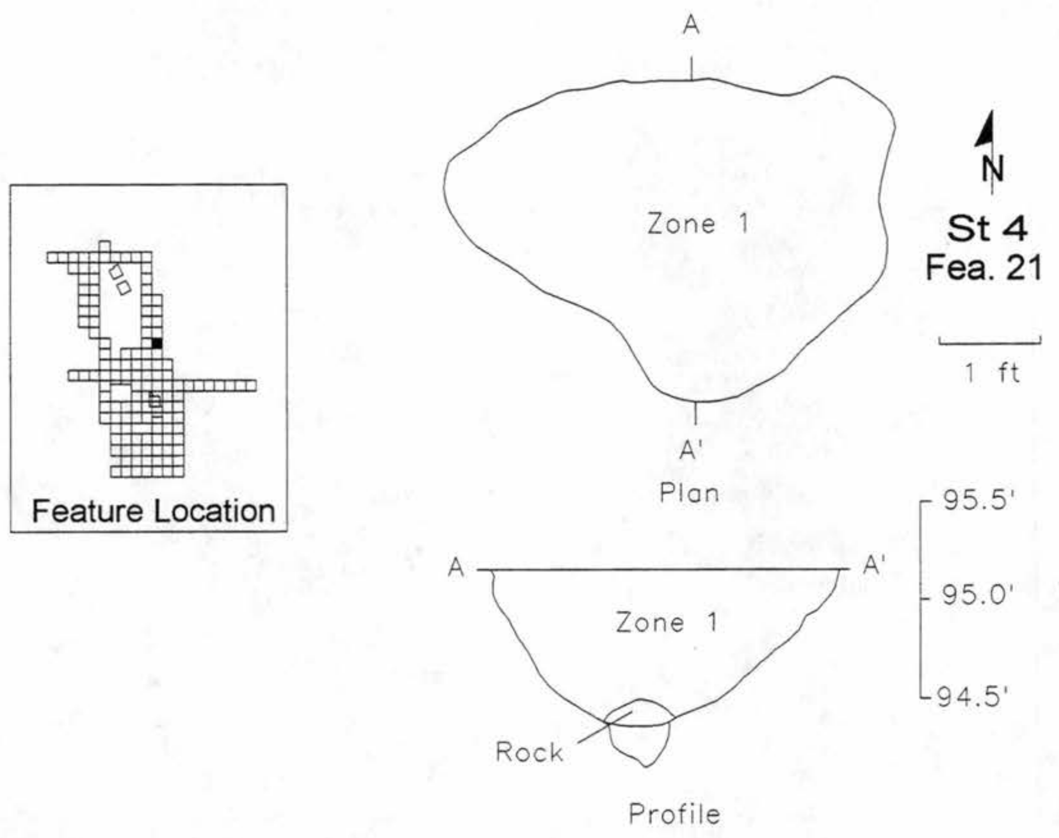


Figure 2.7. Feature 21.

Feature 21. This feature was also a basin-shaped pit interpreted to have been a hearth (Figure 2.7). It was one of the largest basin-shaped hearths recorded at Hardaway, somewhat irregularly shaped measuring 1.3 x .9 m in plan view and approximately .45 m deep. The top of the feature was noted at the interface of Zones 3 and 4 while the bottom of the feature extended well into the red clay. At the bottom of the feature and just to the west of its center, a smaller pit .22 m in diameter extended .15 m below the floor of the feature. It was covered by a large rock. Unfortunately, no further information was noted about the relationship of this smaller pit to the rest of the feature; nor was any mention made concerning the nature of the feature fill beyond noting it contained artifacts and charcoal.

Artifacts diagnostic of the Early Archaic period include two Palmer Corner-Notched points (which could not be located for analysis), and two Type I End Scrapers (Table 2.4). While field notes identified this feature as a hearth, the size and shape of this feature is more similar to features interpreted as roasting pits identified on late prehistoric sites in the Carolina Piedmont (Ward and Davis 1993).

Feature 40. This feature was observed at the top of Zone 3 as a somewhat basin-shaped pit that was difficult to define (Figure 2.8). It was .12 m in depth and about 2.5 x 1 m in extent, however, Ward (field notes, 1976) suggested that this may have been a filled-in natural depression rather than a purposely dug pit and that part of the feature may have been cut away by an adjacent trench during the 1958 excavations.

Artifacts were abundant in the feature fill including over 2,000 flakes and numerous stone tools (Table 2.4). This latter group includes primarily bifaces, end scrapers, and side scrapers. Animal bone fragments and charcoal were also recovered. The only temporally diagnostic artifacts recovered were two Kirk Corner-Notched points, but two Type I End Scrapers were also located in the feature fill. In

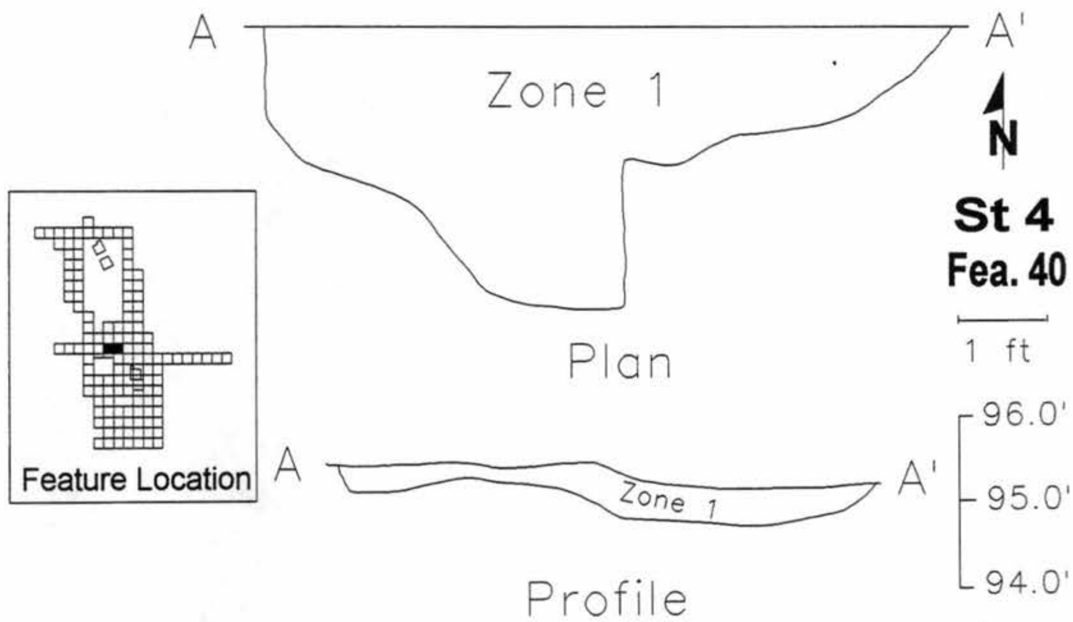


Figure 2.8. Feature 40.

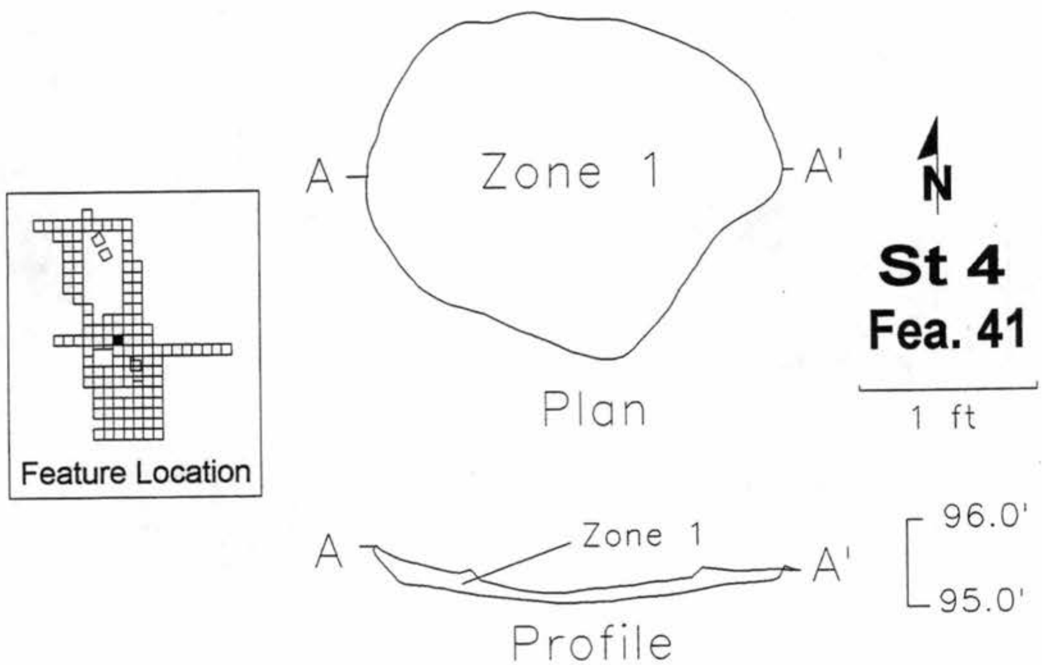


Figure 2.9. Feature 41.

addition, one unidentified side-notched point and one chipped-stone adz were also present in the fill. While the observed origin of the pit in Zone 3, the projectile points, and the Type I End Scrapers all indicate an Early Archaic association, this temporal assignment should only be regarded as tentative since its stratigraphic origin may have been obscured by the disturbed Zone 2 which overlaid it. Regarding this, one pot sherd was also recovered in the feature but it was located adjacent a large root disturbance.

Feature 41. This feature was observed as a vague mottled brown stain at the top of Zone 3 (Figure 2.9). Ward (Field Notes, 1976) noted that this feature appeared more like a lens deposit than a pit. Thus, like Feature 40, it may have represented a filled-in depression. It was roughly oval in shape, approximately .73 x .57 m in size and only .3 m in depth. It contained animal bone fragments, flakes, and several stone tools. One of the latter was a Type I End Scraper which, although not conclusive, would suggest an Early Archaic temporal association. No temporally diagnostic points were recovered from the fill.

Rock concentrations

Feature 10. Information about this feature is sketchy, but it was recorded as a single rock about .38 x .22 m in size partially embedded in the top of Zone 4 (Figure 2.10). No associated artifacts were recorded with the feature, but charcoal was noted around and under the rock and it was interpreted as a hearth. Its temporal assignment was based on its stratigraphic context.

Feature 20. This concentration of rocks and artifacts was identified as a hearth associated with the Palmer component and is pictured in *Formative Cultures* (Coe 1964:Figure 51). It was defined by a loose concentration of approximately 14 rocks at the interface of Zones 3 and 4, and covered an area about .9 x .9 ft in size

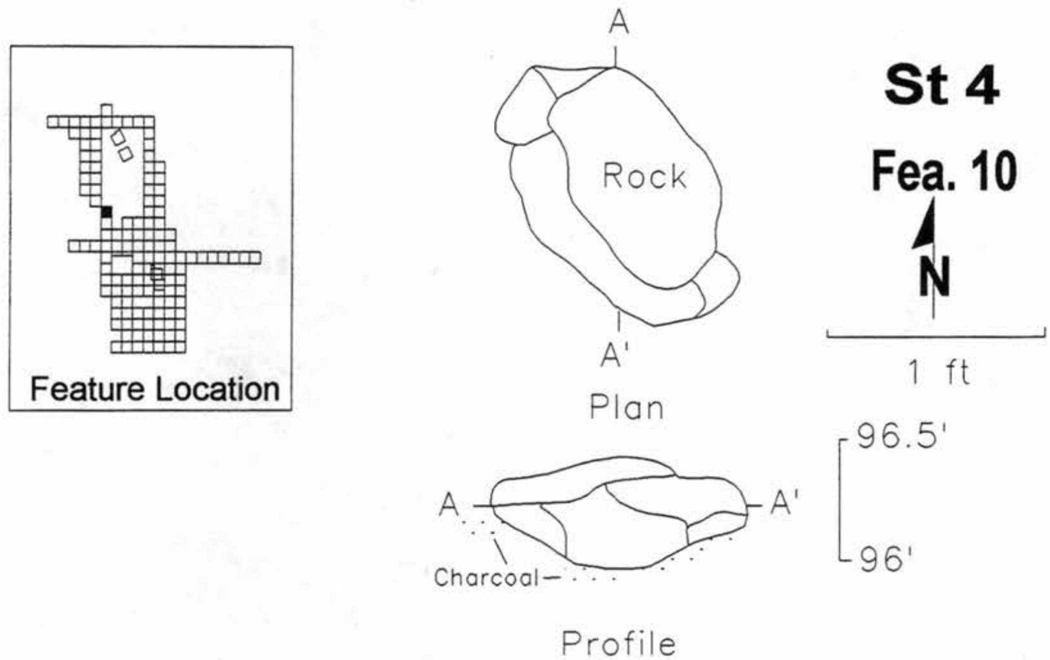


Figure 2.10. Feature 10.

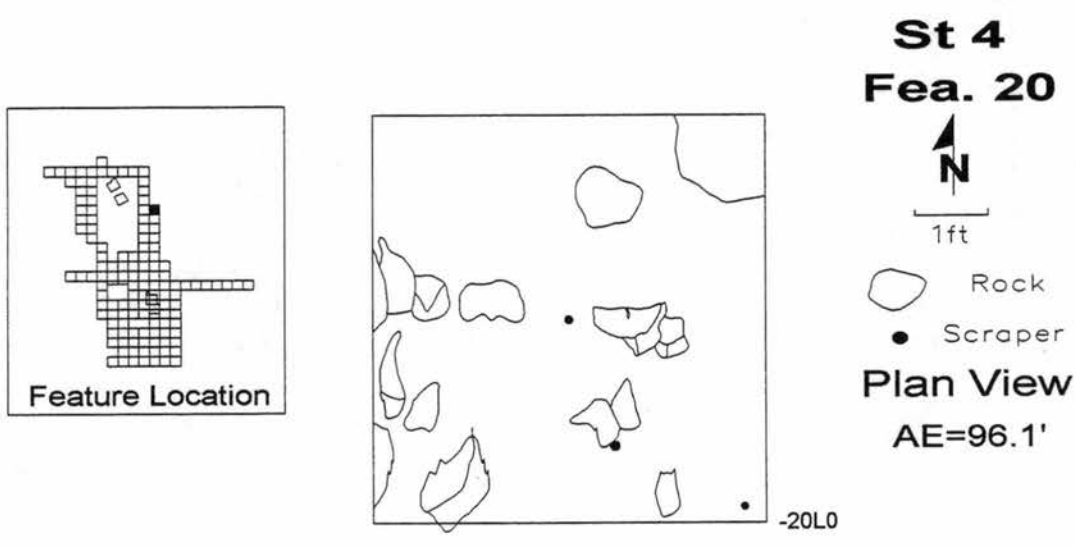


Figure 2.11. Feature 20.

(Figure 2.11). Artifacts associated with the feature included lithic debitage, animal bone fragments, charcoal, and four scrapers including a Type I End Scraper. Its placement with the Palmer component was based on its stratigraphic association as well as its end scraper association.

Feature 35. This feature was defined primarily by a loose concentration of about 10 small to medium size rocks in Zone 4 that covered an area about 1.5 x 1.2 m in size (Figure 2.12). One Side Scraper and several flakes were the only artifacts associated with the feature although charcoal and animal bone fragments were also noted. While initially thought to have been a hearth, upon excavation this feature appeared more like an accumulation of naturally occurring rock (Ward, personal communication 1992).

Feature 37. As with Feature 35 this feature was also defined by a loose concentration of rocks (Figure 2.13). Approximately 20 small rocks were clustered in an area about .8 x .5 m located in Zone 4. The only artifacts directly associated with the feature were a few flakes, although a hammerstone was noted two feet to the southeast of the rock cluster. As with Feature 35, this feature also appears to have been a natural concentration of rock rather than a hearth (Ward, personal communication 1992).

Feature Discussion.

Among the four pit features, at least two (Features 40 and 41) may simply be natural depressions that collected artifacts. Whether the artifacts deposited in these features were the result of natural or cultural processes cannot be determined. The remaining two features include one large and one small basin-shaped pit. Unfortunately, information concerning the excavation of these two features (Features 21 and 8) is scanty, but they both were identified as hearths.

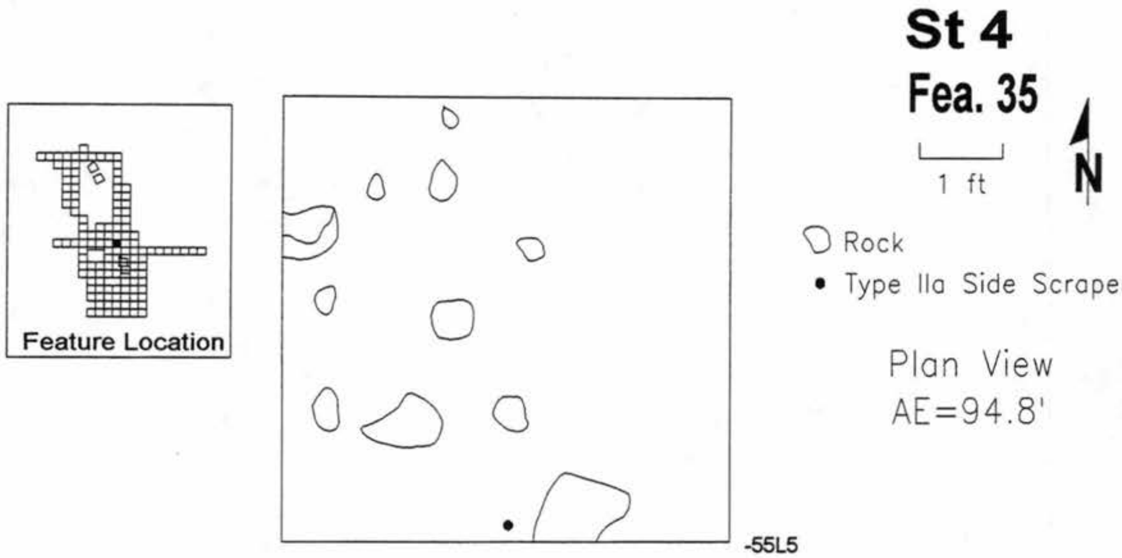


Figure 2.12. Feature 35.

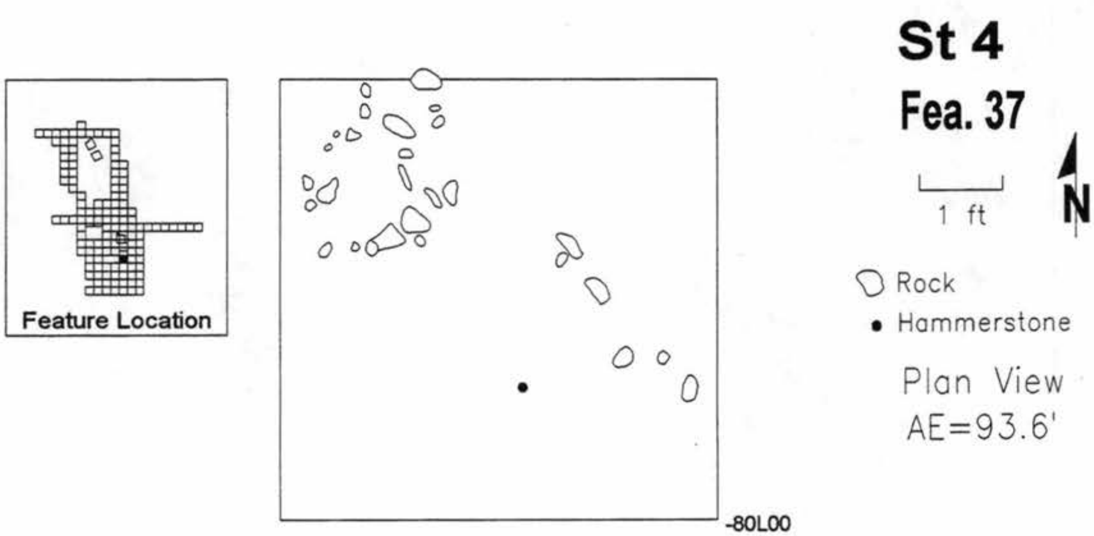


Figure 2.13. Feature 37.

Similarly, at least four other features were uncovered in the lower zones in the form of a loose concentration of rocks, artifacts, bone fragments, and charcoal. While two of these features were identified as hearts, two other similar features were interpreted as naturally occurring rock accumulations that were fortuitously associated with cultural material. In the absence of any other information concerning the two concentrations interpreted as hearths, and given that rock, charcoal, and bone fragments occurred throughout Zones 3 and 4 along with artifacts, the interpretation of Features 10 and 20 as Early Archaic hearths might be questioned.

UNITS OF ANALYSIS

A total of 80 units covering 1920 ft sq^2 (178 m^2) were chosen for analysis (Figure 2.14). Of these, 29 units were from the 1958-1959 seasons (RLA accession no. 1010) and 51 units were from the 1975-1980 excavations (RLA accession no. 2312). These unit counts include 2 squares from the 1950s work that were reexcavated during the 1970s. An emphasis was placed on analyzing lithic artifacts from contiguous units containing some amount of undisturbed Zone 3 (or CBM), and Zone 4--the Early Archaic component. All plowzone and Zone 2 artifacts from these units were excluded from analysis, as was any material identified from disturbed context. The one exception to this was the group of points from Zone 2 used to report on the stratigraphy discussed earlier in the chapter. The next chapter describes the results of the analysis of all artifacts from the Early Archaic component.

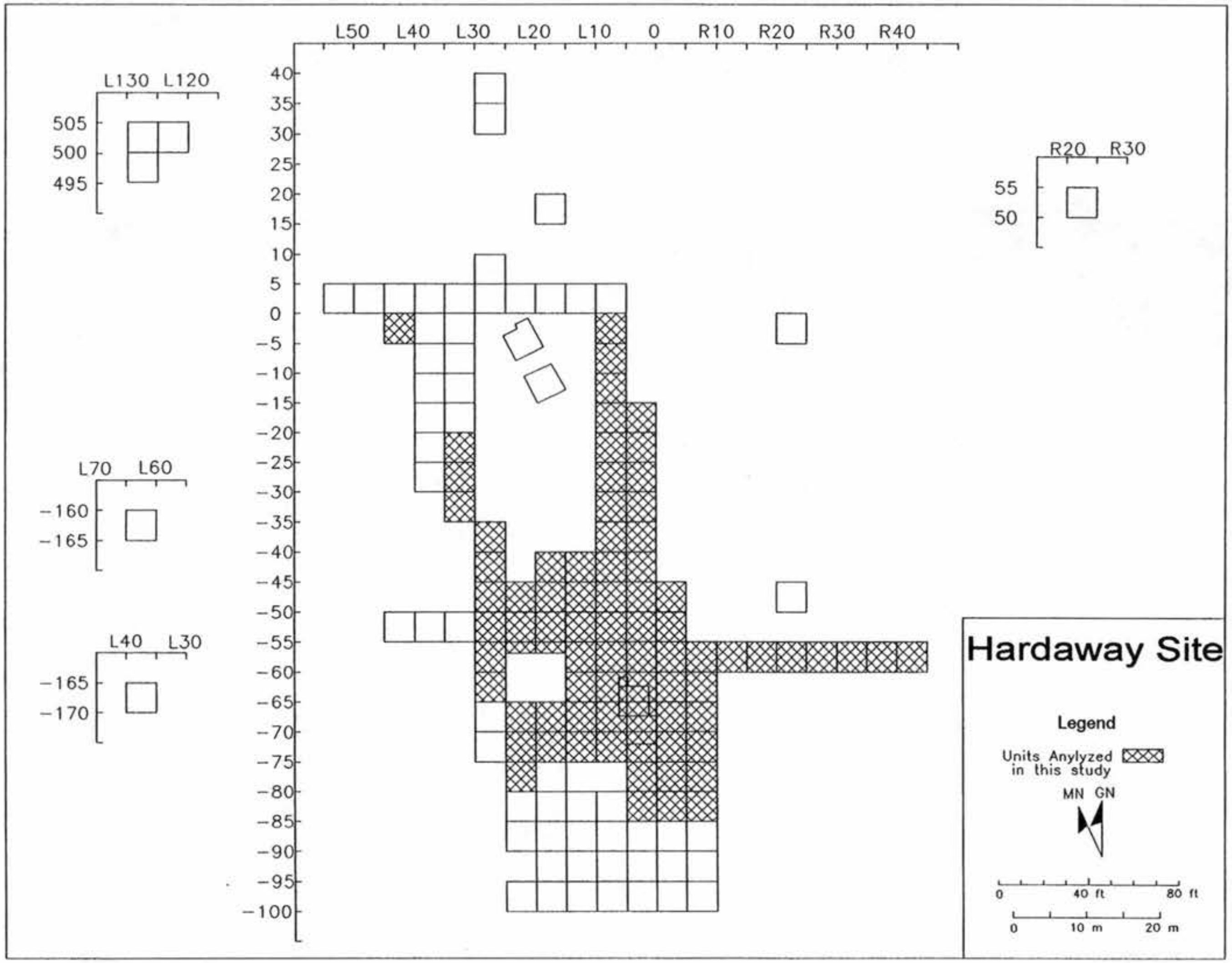


Figure 2.14. Units analyzed in this study.

Chapter III

STONE RAW MATERIALS

This chapter briefly describes the stone types found in the Hardaway assemblage; possible source locations of these raw materials are also noted. Broadly speaking, the raw materials identified here can be divided into four lithic types: metavolcanic and metasedimentary stone, chert, and quartz. The chert and quartz categories reflect current archaeologically-recognized lithic types, but the metavolcanic and metasedimentary lithic types defined here are somewhat new (cf. Novick 1978; House and Wogaman 1978:51-57).

Of particular interest is the metavolcanic stone commonly referred to as rhyolite. Rhyolite dominates the Hardaway assemblage (Chapter IV) and outcrops near the site in the Uwharrie Mountains. A quarry survey was performed in the Uwharrie's as a part of this project and approximately 30 quarries were located and sampled for petrologic analysis. This work was conducted with J. Robert Butler and is reported in Appendix A. This work also provided the basis for the identification of the metavolcanic and metasedimentary stone types summarized below. A brief discussion of the geologic setting of the Uwharrie Mountains precedes the raw material descriptions.

GEOLOGIC BACKGROUND

The Carolina Slate Belt is made up of metavolcanic and metasedimentary rocks extending approximately 600 km from Virginia to Georgia; it has a maximum width of about 140 km in central North Carolina (Butler and Secor 1991:66). The rocks were formed as a result of the eruptions of a chain of volcanic islands surrounded by shallow seas during the Precambrian period. The lava, ash, and sediment deposited by these eruptions were later metamorphosed, folded, and faulted, exposing them to eventual erosion that forms the present land surface of the Uwharrie Mountains.

Although the Uwharries are called mountains, they are actually inselbergs, being the erosional remnants of an ancient and higher Miocene peneplain (Kesel 1974). By the start of the Pliocene epoch, streams flowing east across the Piedmont from the newly formed Continental Divide had altered the nearly level surface of the peneplain exposing the more resistant rock as elevations. Thus, while the rocks comprising the Uwharries are several hundred million years old, the erosion that created them is actually relatively young geologically speaking.

Topography

Today, the Uwharries consist of a loosely defined, narrow chain of mountains approximately 46 km long between Badin and Asheboro in Stanly, Montgomery, and Randolph counties. As identified on USGS topographic maps, the northern end of this chain borders the eastern edge of the Uwharrie River and a major tributary, Caraway Creek, near Asheboro in Randolph County. The mountain range then crosses the Uwharrie River and, bordering the river's western edge in Montgomery County, eventually terminates near Badin in Stanly County at the river's confluence with the Yadkin. The Uwharries tend to range from 150-300 m in elevation and have hilly peaks, narrow ridge crests, and steep slopes; and they make up significant portions of both the Uwharrie National Forest and Morrow Mountain State Park (Figure 3.1)

Geology

The Albemarle-Asheboro area forms one of the best known geologic regions of the Carolina Slate Belt (e.g., Butler 1991; Butler and Secor 1991, Conley 1962;

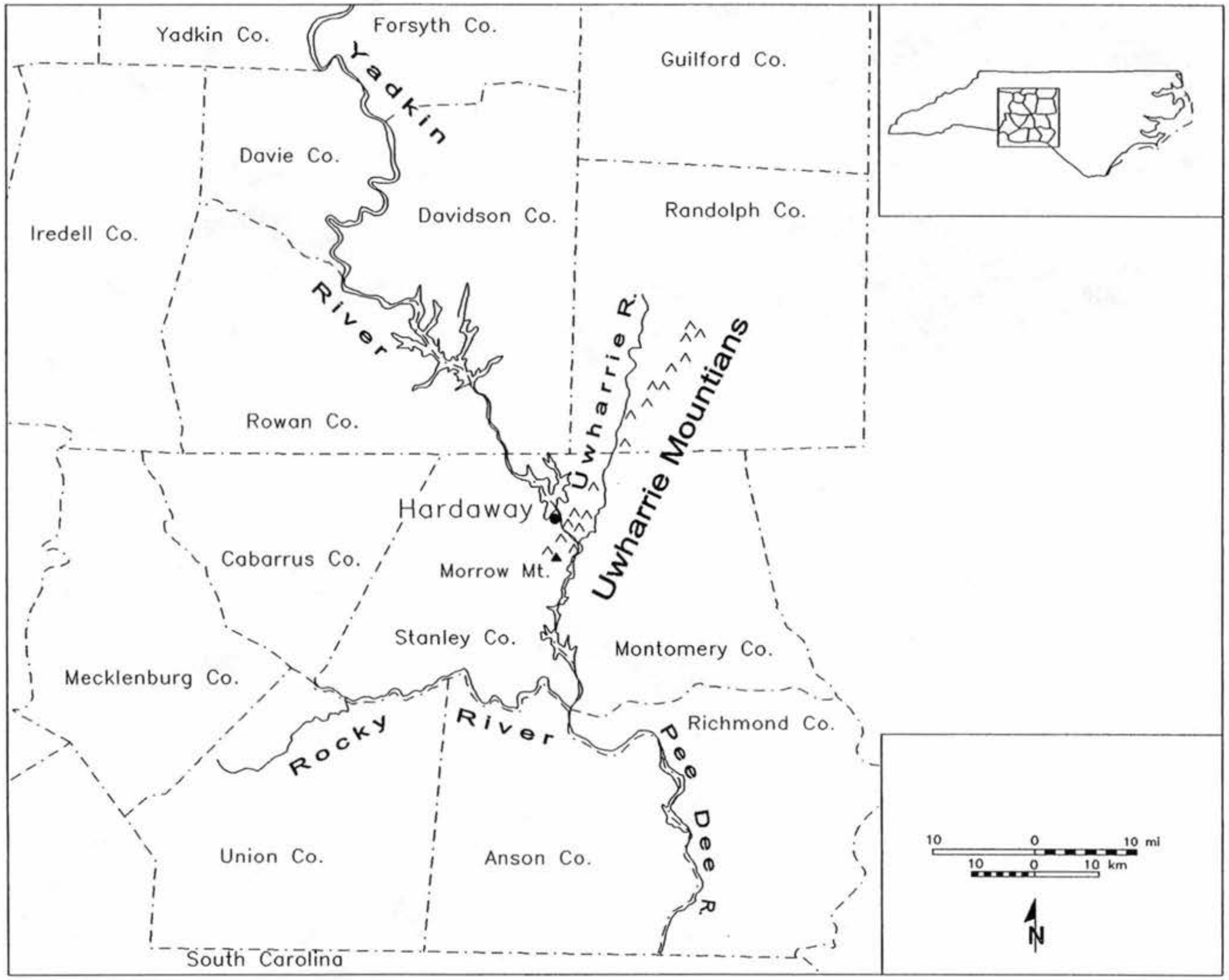


Figure 3.1. Location of Uwharrie Mountains.

Harris and Glover 1988; Milton 1974; Seiders 1981). Three geologic formations comprise the Uwharries: the Uwharrie, Tillery, and Cid Formations (Butler and Secor 1991:Figure 4-5) (Figure 3.2).

The exact age and geologic relationship of some these formations have been the subject of recent debate (J. Robert Butler, personal communication 1992), but they can be generally described as follows. The Uwharrie Formation, which is the oldest of the three, makes up the northern half of the Uwharries. It is a complex arrangement of felsic metavolcanic rocks with lesser amounts of mafic tuffs and layered beds of reworked volcanic debris. (Butler and Secor 1991:67-69).

The Tillery and Cid formations roughly divide the southern half of the mountain chain. The Tillery consists of laminated to thinly bedded metamudstone and argillite. The Cid Formation (at the southern most end of the chain), is also predominantly a metasedimentary sequence, although it does contain locally abundant metavolcanic rocks (Butler and Secor 1991:67-69).

While volcanic units constitute only a minor portion of both the Tillery and Cid Formations, one such unit is of particular archaeological significance. This unit is Morrow Mountain Rhyolite which is present at a contact between the Tillery and Cid Formations to the south and west of Hardaway (Conley 1962:Plate 1). While the rhyolite unit it has been assigned tentatively to the upper Tillery Formation, its exact status with respect to either the Tillery or the Cid Formation is still unresolved (Harris and Glover 1988; Milton 1984). Be that as it may, it forms the erosionally resistant mountain tops around Hardaway which were extensively mined prehistorically for raw material.

It should be noted that the term Morrow Mountain Rhyolite is used to describe a lithologic unit covering several mountains around Hardaway and is not restricted to Morrow Mountain itself (Conley 1962:Plate 1). Specifically, it is used to represent a series of mixed lava flows originating from several vents which produced

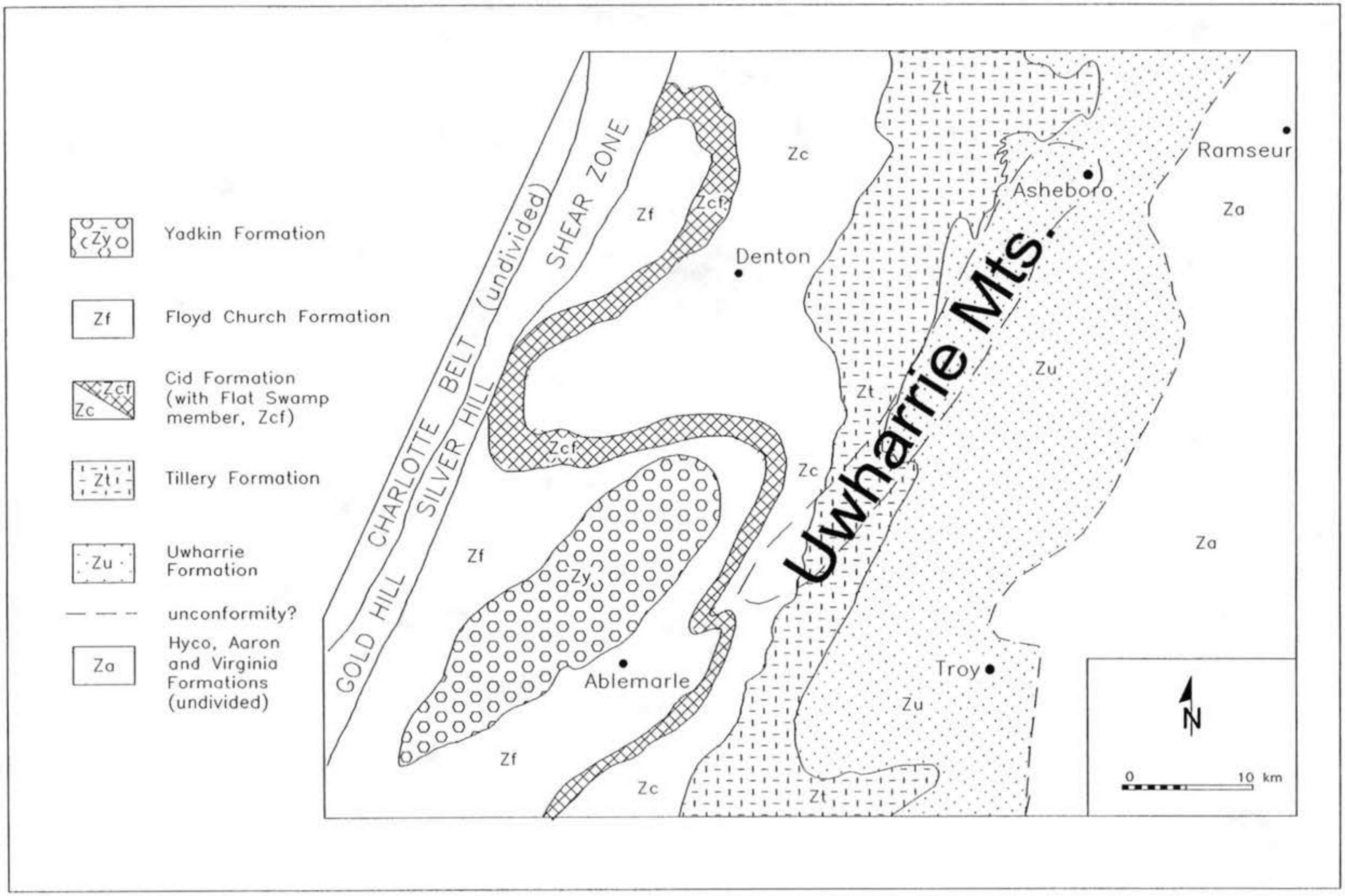


Figure 3.2. Uwharrie Mountain's geology (adapted from Butler and Secor 1971:Figure 4.5)

an almost sheet-like deposit in the area. The relatively rapid cooling of this lava and the low grade metamorphism of the region has produced the rhyolite's good-to-excellent conchoidal fracture (Butler 1991; Conley 1962:15). More accurately it should be called metarhyolite, but the term rhyolite is retained here for the sake of simplicity.

The Hardaway site itself lies on Badin Greenstone, a significant lithologic unit within the lower Cid Formation, which is adjacent to and occasionally in contact with the Morrow Mountain Rhyolite unit (Conley 1962:Plate 1). As is the case with the rhyolite, this greenstone unit forms the erosionally resistant tops of other mountains in the vicinity. The final lithologic unit of importance in the area is argillite which is part of the Tillery Formation. Argillite underlies both the greenstone and rhyolite and forms the stream valleys for the Uwharrie and Pee Dee Rivers (Conley 1962).

STONE TYPES

Four broad classes of stone types were identified in the Hardaway assemblage: metavolcanic stone, metasedimentary stone, chert, and quartz. A more detailed discussion of the metavolcanic (i.e., rhyolite) types identified during this project is presented in Appendix A.

Metavolcanic Stone

The Carolina Piedmont contains a wide variety of metamorphosed igneous rock. Among those types identified in the Hardaway assemblage are rhyolitic flows, rhyolitic tuffs, and greenstone. Although not seen in the Hardaway assemblage, rhyolitic breccia was present in the collections survey. The most important of these raw materials, however, were certain rhyolitic flows and tuffs derived from quarries located in the Uwharrie Mountains (Appendix A). Collectively, the rhyolite from these quarries is referred to as Uwharrie rhyolite.

Aphyric rhyolite. This rock is a rhyolitic flow that is distinguished by its dark gray color and homogeneous fine-grained texture. Its most distinctive characteristic, however, is flow-banding which is most pronounced on weathered specimens. The primary source of this material is a large impressive quarry on Morrow Mountain located just 8 km south of Hardaway. This rhyolite dominates the Hardaway assemblage (Chapter IV) and is almost certainly the "flow banded rhyolite" previously described by Novick (1978:427).

Porphyritic rhyolite. Three types of porphyritic rhyolites are recognized based upon the presence of certain phenocrysts: (1) plagioclase porphyritic, (2) quartz porphyritic, and (3) plagioclase-quartz porphyritic. These phenocrysts are disseminated in a fine-grained to sugary textured groundmass that is light to dark gray in color. Flowbanding is less pronounced, if present at all, among this group. Quarries of this rhyolite group are abundant within a radius of a few kilometers around Hardaway and can be associated with specific mountains.

With respect to previously existing raw material the category "felsic tuff" (Novick 1978) used by many South Carolina archaeologists corresponds to the plagioclase porphyritic rhyolite mentioned above. Similarly, the category "porphyritic rhyolite" corresponds to the plagioclase-porphyritic rhyolite described here (see Novick 1978:427-428 for descriptions of "felsic tuff" and "porphyritic rhyolite"). These determinations are based on my conversations with several South Carolina archaeologists and my examination of the raw material type collection at the South Carolina Institute of Archaeology and Anthropology.

Rhyolitic tuff. The term tuff refers to an alternative form of volcanic deposition. Volcanic eruptions can expel material as magma, as in the case of rhyolitic flows mentioned above, or as ash and dust as in the case of rhyolitic tuffs. The tuffs seen in this study, both in artifacts and at quarries, are variable in color and texture.

This variability includes various shades of green to light gray and both fine and somewhat coarse-grained stone. The heterogeneous nature of these tuffs suggest they came from several source locations. While some examples resemble rhyolitic tuff sources identified in the northern Uwharries (see Appendix A), others do not. However, these other sources probably lie within in the Carolina Slate Belt.

Rhyolitic Breccia. Although no examples of this raw material were noted in the Hardaway assemblage, a few breccia points were noted in the collections survey (Appendix E). This is a coarse-grained rock composed of relatively large (i.e., a few mm in diameter), angular, and broken rock fragments that are cemented together in a finer-grained matrix.

No volcanic breccia quarries were observed in Uwharries, although outcrops of this stone were observed in our survey (Appendix A). We did locate one such quarry, however, in Chatham County about 74 km northeast of Hardaway. activity.

Greenstone. As mentioned previously, greenstone is another significant lithologic unit around Hardaway (Conley 1962). It is a dark-green, compact rock that is somewhat coarse grained. Greenstone is found in the Hardaway assemblage primarily in the form of hammerstones and anvils (Chapter IV). Its virtual absence in the flaked-stone assemblage and is probably explained by its hard, dense nature and relatively poor fracture qualities in comparison to the rhyolite.

Metasedimentary Stone

In contrast to the quantities of metavolcanic rock noted in the Hardaway assemblage, relatively minor frequencies of only two types of metasedimentary stone were observed: argillite and a green metasiltstone.

Argillite. Argillite is another major lithologic unit around the Hardaway site, underlying both the greenstone and rhyolite (Conly 1962). It is a metamorphosed sedimentary rock composed of alternating silt and clay layers. Fresh argillite is light to dark green in color; it also appears in various shades of gray. The major characteristic of this rock is its thin graded bedding, generally less than 15 mm in thickness (Conley 1962:5). This bedding all but precludes a predictable conchoidal fracture in most specimens. Moreover, the poor flaking quality and soft nature of argillite make it a less desirable stone for knapping than rhyolite. Although numerous argillite outcrops were observed during the quarry survey, none were identified as having been quarried prehistorically. Nevertheless, the argillite in the Hardaway assemblage was probably obtained locally.

Green Metasiltstone. This designation refers to a very siliceous looking green material that actually resembles a green chert. It is apparently what has been referred to elsewhere as a welded vitric tuff (e.g., Novick 1978:428). Petrologic analysis, however, identifies this as a metasiltstone closely related to the argillite sequence (Appendix A). Unlike argillite, it is of particular interest because of its apparent high flaking quality. Indeed, even fluted-points, commonly known for being manufactured from high quality cryptocrystalline raw materials (e.g., Goodyear 1979), have been found in North Carolina made from this stone (e.g., Tippitt and Daniel 1987:Figure 9.8a). Moreover, it is likely that this is the same stone identified as "green silicified slate" in Perkinson (1971; 1973) fluted-point survey for North Carolina. Unfortunately, the source of this stone has not yet been located. The petrologic similarity of this metasiltstone to argillite would suggest a source relatively close to Hardaway, however. Further consideration of this possibility is given in the following chapter.

Chert

All cryptocrystalline rock have been included under the category chert. This includes those cherts identified archaeologically as Coastal Plain chert and Ridge and Valley chert; other cryptocrystalline rock such as chalcedony and jasper are also included.

Coastal Plain Chert. The primary type of Coastal Plain chert identified in both the Hardaway assemblage and the collections survey appears to be "Allendale chert." This chert is named for its source in western Allendale county, South Carolina which represents the greatest source of cryptocrystalline lithic raw material known within the state. There, in the vicinity of the Savannah River, several quarries have been mapped and test excavated (Goodyear and Charles 1984) and examined petrologically by a geologist (Upchurch 1984). Those few examples in the Hardaway assemblage are dark yellow or brown, typical of the earth colors that characterize Allendale chert (Goodyear and Charles 1984:5). Some examples also display a glossy pink to dark red tint that is presumably the result of heat treating (Anderson 1979). An additional characteristic of Allendale chert is the presence of tiny fossils in its groundmass. This material weathers to a yellowish cream color that is soft and chalky to the touch.

Ridge and Valley Chert. These cherts are very fine-grained and lustrous and are generally dark blue to bluish-gray in color. The few examples seen in the Hardaway assemblage (Chapter IV) and collections survey (Chapter VII) appear to be a variety of chert referred to as "Knox chert" that occur in nodular and tabular forms along the lower Little Tennessee River and its tributaries in East Tennessee (Kimball 1982, 1985).

Jasper. Several varieties of jasper were identified in the Hardaway assemblage and collections survey. Generally this stone ranges from a dark brown to fairly homogeneous honey-colored material. Some specimens also display a waxy gloss.

Known jasper sources are rare in the North Carolina Piedmont. One such source is recorded in Stokes County (SK38, Research Laboratories of Anthropology site file) about 120 km north of Hardaway, but it is unknown if it is the source of any of the specimens examined during this project. That being said, it should also be noted that what archaeologists call jasper in North Carolina sometimes bears a striking resemblance to a honey-colored chert that I have observed from the Allendale quarries mentioned above (see also Goodyear and Charles 1984:115).

Chalcedony. Two varieties of what I have labeled chalcedony were identified in the Hardaway assemblage. One variety is a a very fine-grained and glossy semi-translucent reddish-orange color while the other is fine-grained tan color. The sources of these materials is unknown.

Other chert. This category accounts for several varieties of cherts that do fit in any of the above categories. One specimen is a lustrous light gray to grayish green finely banded material that exhibits sporadic dark speckles. Another example is a homogeneous grayish-green lustrous stone that appears to be faintly banded. A final specimen is a translucent bluish-green somewhat grainy stone. Although it appears chert-like in quality, it may actually be a variety of quartz from Virginia (Larry Kimball, personal communication 1992). The sources of these cherts are unknown.

Quartz

This category includes the ubiquitous white vein quartz that was used prehistorically, as well as the less commonly used quartz crystal and orthoquartzite.

Quartz. Most quartz occurs in milky white or translucent veins ranging from a few centimeters to several meters in thickness throughout the Piedmont; it also occurs in cobble form in the gravels of major Piedmont rivers (House and Wogaman 1978:53; Novick 1978:433). Although quartz outcrops are quite numerous across the Piedmont, its flaking quality appears to have been quite variable. Most archaeological specimens appear crudely flaked suggesting a relatively poor conchoidal fracture. Other quartz artifacts, however, are quite well made. This latter group appears to have been flaked from a more "glassy" textured quartz.

Quartz Crystal. Quartz also occurs in a colorless, transparent or nearly transparent variety. Moreover, this quartz usually comes in hexagonal crystals of varying size that can be found throughout the Piedmont. Some of the larger specimens, with their glassy texture and absence of impurities would have made excellent flaking material. A few examples of some small bipolarly flaked crystals from the Hardaway assemblage are discussed in Chapter IV.

Orthoquartzite. Orthoquartzites are composed of quartz sand grains cemented by silica (Novick 1978:433; Upchurch 1984). Although no examples of this raw material are present in the Hardaway assemblage, a few orthoquartzite points were observed in the collections survey (Chapter VII). Orthoquartzite sources are known from the lower Santee River area (Charles 1981:15; Anderson et al. 1982:120-122) and Savannah River valley (Goodyear and Charles 1984:116). Although no outcrops of this material are known from the North Carolina Coastal Plain, orthoquartzite has been found in underground corings in Halifax County (Wise et al. 1981).

Chapter IV

ARTIFACTS

The artifacts recovered from Hardaway were limited almost entirely to stone tools and flaking debris. Excluding points that postdate the Early Archaic period, the first portion of this chapter presents a detailed morphological analysis of over 2,000 tools from the selected units described in the previous chapter. Some tentative inferences concerning tool function are also made. The second portion of the chapter deals with the debitage analysis. Ultimately, this chapter provides a framework for interpreting the organization of the stone tool technology at Hardaway as discussed in Chapter V.

Coe's (1964) stone tool classification is closely followed here for two reasons. First, it provides a consistency with the previous work at Hardaway as well as other Archaic sites where the classification has been generally employed. Second, in the case of the unifacial tool types, Coe's typology is implicitly based on blank type and modification which, as will be seen in the following discussion, is well suited for this analysis.

ANALYTICAL METHODS

Both metric and nonmetric attributes were recorded for each tool type and are described in Appendix B. Simple descriptive statistics such as the mean and standard deviation were calculated on metric data and are also reported in Appendix B. With regards to statistical procedures, an emphasis was placed on the methods of exploratory data analysis (EDA) in looking for significant patterning (Tukey 1977; Velleman and Hoaglin 1981). EDA stresses the visual display of data rather than summary statistics. It also has the advantage of not relying on the statistical assumption of normality, an assumption often not warranted with archaeological data. Similarly, EDA relies on the "resistant" measures which are not overly influenced by extreme values. Among the more resistant measures are the median and the hinge-spread, which are depicted in the form of boxplots, and are commonly used in EDA since they visually summarize a distribution of values for a particular variable. As the name implies, the data are illustrated in a boxlike graph with the median indicated as a horizontal line within a box. The edges of the box constitute the upper and lower hinges, which are median values for the upper and lower halves of the data. The difference between the two hinges represents the hinge-spread and thus identifies the range covered by the middle half of the data.

The remainder of the graph includes a solid line called a "whisker" which runs out from each hinge. The whiskers show the range of values which fall within 1.5 hingespreads. Some data batches include outlier values which are marked by an asterisk and are termed "outside," and extreme values which are termed "far outside" and labeled with a zero. Details on how these are determined may be found in Velleman and Hoaglin (1981:66-69).

In addition, although EDA places less emphasis on tests of statistical significance, McGill et al. (1978) implemented confidence intervals around the medians of several groups in a graph called a notched box plot. The box is "notched," forming an interval around the median, and returns to full width at the upper and lower boundaries of the confidence interval. If the intervals around the medians of two different data batches do not overlap, then the two population medians are different at a 95% confidence level. This form of box plot is useful for making simultaneous comparisons between groups and is used extensively in this analysis.

BIFACES

Bifaces are defined by the presence of a flaking pattern intended to cover both faces of the artifact in order to reduce its thickness and sometimes to produce a sinuous working edge. The bifacial series of artifacts from Hardaway includes all points, other bifaces, and adzes.

Points

The majority of identifiable Early Archaic points in the assemblage were classified as belonging to either the Hardaway, Palmer, or Kirk complexes (Coe 1964). A few point types, however, could not be assigned to the above complexes. Nevertheless, they do resemble Early Archaic point types recovered elsewhere in the Southeast and were classified accordingly.

Hardaway-Dalton Points. The Hardaway-Dalton can be described as a somewhat lanceolate shaped, relatively thin biface with a deeply concave-eared base (Coe 1964:64) (Figure 4.1). The Hardaway-Daltons, of course, are technologically similar to the Dalton forms more commonly known from Missouri and Arkansas (Goodyear 1974, 1982; Morse 1971; Morse and Morse 1983).

A total of 25 Hardaway-Daltons were recovered in the excavation units examined here. Unfortunately, only 16 of these could be located for analysis. Of those, six were complete. The remaining 10 artifacts included four ear fragments and six specimens that were missing tips and/or ears; a classic example of an impact fracture is present on one of the broken specimens (Figure 4.1:b).

Two distinctive characteristics of the Hardaway-Dalton include its deep, ground basal concavity and eared base. Basal thinning is also common with flute-like flake scars originating from the basal concavity. Two basal forms are present in Hardaway-Dalton points: one form displays incurvate lateral edges with out-flaring

Figure 4.1. Hardaway-Dalton points.

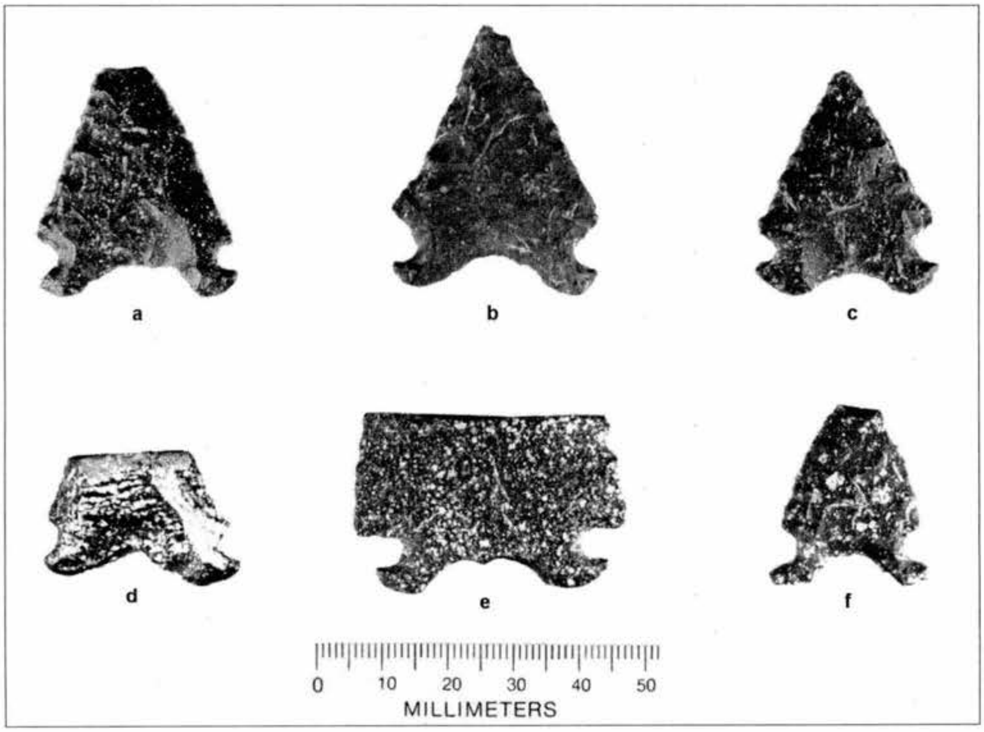


Figure 4.2. Hardaway Side-Notched points.

ears (e.g. Figure 4.1:f,g),, while the other exhibits more straight sided lateral edges with ears that point downward (e.g, Figure 4.1:c,d). The ears on both forms are usually rounded but are occasionally pointed. Coe (1964:64) described the incurvate lateral edged specimens as having "broad, shallow and roughly parallel" side-notches. This characteristic, however, is not to be confused with the distinct, small, U-shaped side-notches of the Hardaway Side-Notched discussed below.

The significance of this variation in basal forms is unknown, but given that the Hardaway Side-Notched point also possesses small out-flaring ears, it is tempting to speculate that the distinction may be a temporal one. There also may be a geographic component to this basal distinction, since the out-flaring eared form is rare throughout South Carolina, only being common in the north-central part of the state (Goodyear et al. 1990). In North Carolina, on the other hand, the out-flaring eared base may be more common.

Blade edges of the Hardaway-Dalton are usually straight resulting in a triangular shape; however, some blades are convex or excurvate in form (Figure 4.1:f; Claggett and Cable 1982:Plate 3). Blade resharpening often results in a distinct break between base and blade resulting in a shouldered appearance. Two additional characteristics of Hardaway-Dalton blade edges are serrations and, to a much lesser extent, beveling. Blade edges are lightly serrated and beveling, if present at all, is only slight. This is in contrast to Arkansas forms which are noted for their distinctive alternate beveling (Goodyear 1974).

Hardaway Side-Notched Points. The Hardaway Side-Notched point is the last of the three types Coe (1964:120) referred to as comprising the Hardaway complex. It is a relatively small, thin point identified by its the small U-shaped side notches and recurved base which give it its "horned appearance" (Coe 1964:67). These points typically have triangular blades (Figure 4.2).

A total of eight Hardaway Side-Notched points are present in the assemblage. This includes two complete specimens, five with missing tips, and one basal fragment. On average, Hardaway Side-Notched points are smaller than Hardaway-Dalton points, although some individual specimens can approach the width of Hardaway-Daltons (e.g., Figure 4.2:e).

Coe (1964:81) originally suggested that the Hardaway Side-Notched type was geographically limited to the North Carolina Piedmont. Subsequent work in the Southeast suggests that this statement is largely correct. Using data gathered by Tommy Charles (1981, 1983, 1986) in a state-wide collections survey of South Carolina, Sassaman (1992) has shown that the distribution of Hardaway Side-Notched points is fairly restricted to the northern (i.e., Piedmont) part of the state. It is also noteworthy that Sassaman (1992) observed that over half of these points are made from rhyolite, reflecting the proximity of this distribution to the Uwharrie Mountains. In contrast, the side-notched Taylor point predominates in the southern half of the state suggesting that these two points are roughly coeval.

Other Side-Notched Points. A total of six other side-notched points were identified in the assemblage that do not fit any previously defined cultural-historical category for North Carolina. One of these somewhat resembles the just mentioned Taylor point (Figure 4.3:a). It is defined based on its small U-shaped side notches, slight basal concavity and square basal edges (Michie 1966:123-124). Blade edges are usually beveled, but the specimen here lacks this feature. Moreover, its tip is missing as a result of an impact fracture.

Taylor points are restricted to the southern half of South Carolina, confined to the Coastal Plain and Fall Line areas (Sassaman 1992). The Taylor-like specimen is highly weathered and made from some metavolcanic stone, probably a rhyolitic

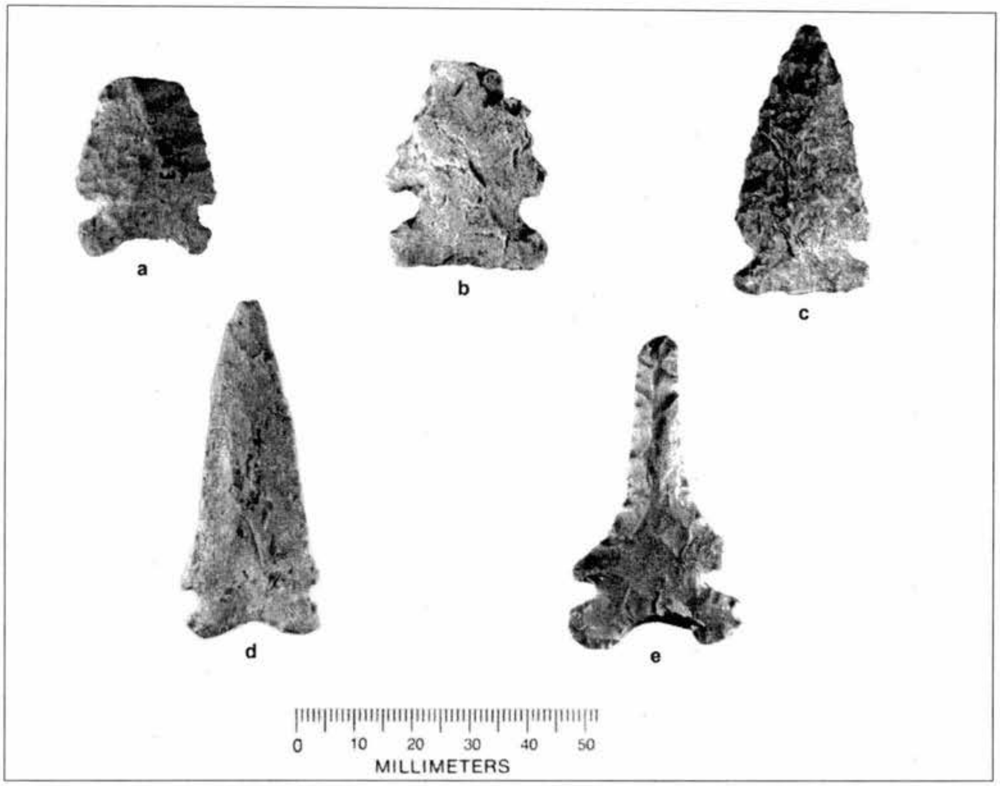


Figure 4.3. Other Side-Notched points.

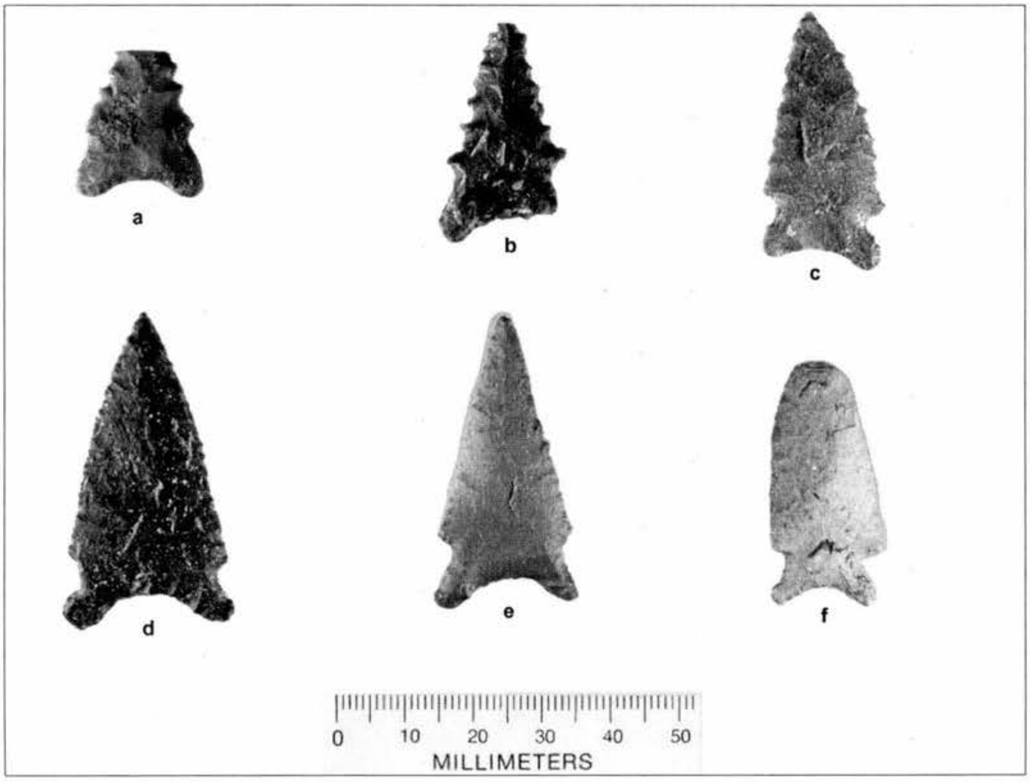


Figure 4.4. Small Dalton points.

tuff that may not have its source from the Uwharrie Mountains. This combination of point style and raw material suggest an origin outside the North Carolina Piedmont.

The remaining five side-notched points are also not commonly found in North Carolina. Three specimens (Figure 4.3:b-d), somewhat resemble the unbeveled Bolen point from Florida (Bullen 1968). The artifact in Figure 4.3e was originally classified as a drill and described as a reworked Palmer (Coe 1964:Figure 62c). The notches on this specimen, however, appear more like side-notches rather than corner-notches. Unlike Palmer points, it also appears to have an eared base; however, this may have been the result of a break along the base rather than it being intentionally manufactured.

Small Dalton Points. A final group of seven points, that also do not fit any previously established cultural-historical types from North Carolina, have been identified in the assemblage as small Daltons, for the lack of a better label (Figure 4.4). Several of these specimens were recognized during the 1970s excavations and casually referred to as "Hardapalmer" points since they exhibit technological affinities to both Hardaway and Palmer points.

Two of these points (Figure 4.4:a,b) actually resemble small Dalton points (Morse and Morse 1983:Figure 5.2a). They exhibit a slight to moderately concave eared base with the appearance of rudimentary side- or corner-notching. Blade shapes are triangular with marked serrations.

Four other points (Figure 4.4:c-f) are morphologically similar to the previous two but have somewhat more distinct notching. In fact, the specimen in Figure 4.4:d could almost be labeled a Hardaway Side-Notched. In any event, some of the these points bear a resemblance to San Patrice points defined by Webb (1946) and Webb, Shiner, and Roberts (1971) for East Texas and Louisiana. In particular, they bear some affinity to the St. Johns variety of San Patrice (Ensor 1985:Figure 2, f-i).

Recently, Ensor (1986) has summarized San Patrice as a Dalton manifestation along the central and western Gulf Coastal Plain and has argued for its chronological placement as a Gulf Coastal expression of the Dalton horizon.

A final broken rudimentary point (not illustrated) is interesting because the blade tip has been resharpened into a spur-like tip. Given their morphology, all these points probably represent a late Dalton manifestation perhaps contemporaneous with or slightly post-dating Hardaway Side-Notched points.

Palmer and Kirk Corner-Notched Points. Two somewhat similar corner-notched projectile point types with triangular blades stratigraphically follow the Hardaway Side-Notched point at Hardaway: Palmer Corner-Notched and Kirk Corner-Notched.

Palmer points are identified based upon their small size, small U-shaped corner notches, and a heavily ground and usually straight base (Coe 1964:67). Blade shapes are roughly triangular with straight to slightly excurvate blade margins that are commonly serrated and sometimes alternately beveled. Kirk Corner-Notched points (Coe 1964:69-70) are morphologically similar to Palmer points, only larger. The blade is triangular in shape with serrated and sometimes beveled edges. Bases are straight to slightly excurvate but for Coe (1964:70) are distinguished from Palmer points by the absence of basal grinding.

A total of 24 Palmer Corner-Notched points (Figure 4.5) were identified in the assemblage, two of which are missing. Of the remaining 22, 15 are whole and seven exhibit either a broken base, barb, tip, or some combination. Sixteen of the bases were ground along the entire base, 14 of which were distinctly ground; the other two were lightly ground. One base is unground, but this may be the result of basal resharpening. The remaining five bases displayed at least partial basal grinding.

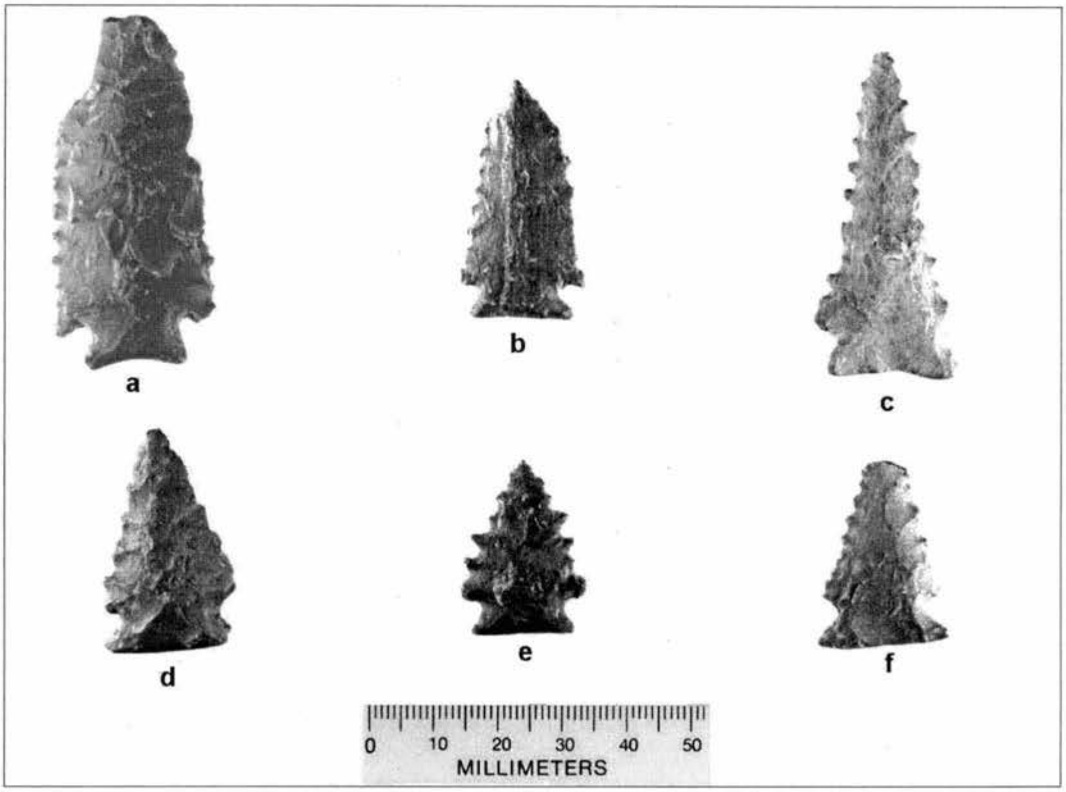


Figure 4.5. Palmer Corner-Notched points.

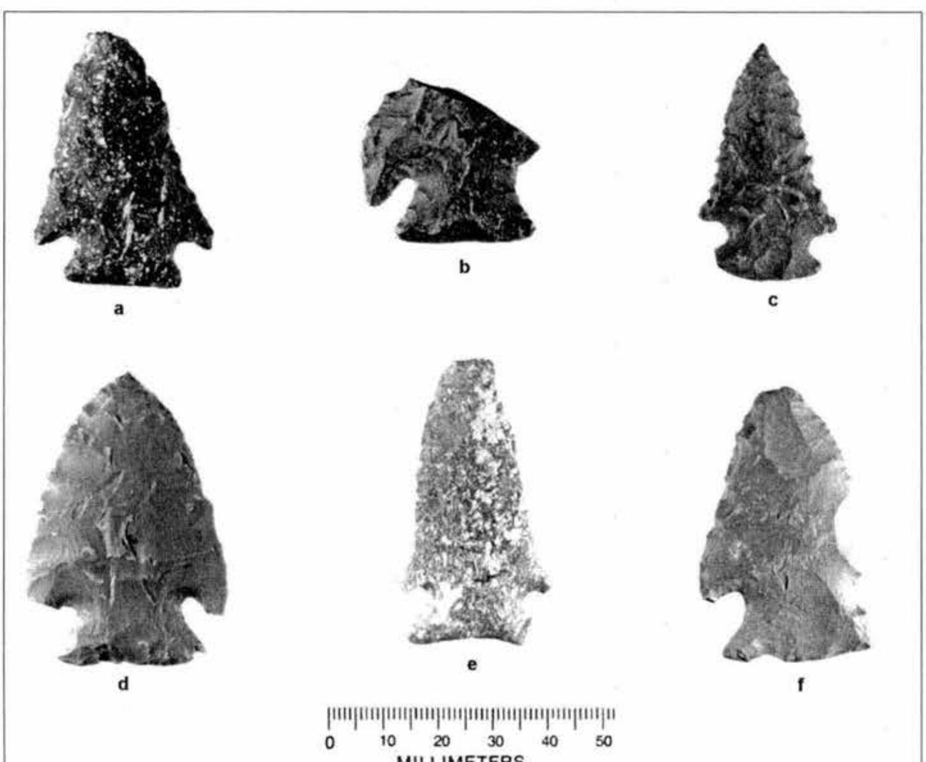


Figure 4.6. Kirk Corner-Notched points.

A total of 72 Kirk Corner-Notched points were identified in the assemblage (Figure 4.6). Forty-nine of these are whole while the remaining 23 are broken. I have not strictly adhered to the attribute of basal grinding as a defining characteristic between Palmer and Kirk Corner-Notched points. Rather, I have relied more on overall size and shape as well as certain basal characteristics discussed in more detail below. Following Chapman (1977), I have sorted Kirk points based on the presence/absence of basal grinding and basal shape (i.e., straight or excurvate). With regard to the attribute of basal grinding, approximately half (48.6%) of the total sample exhibited at least partial basal grinding.

Coe's (1964) emphasis on size and basal grinding--particularly the latter--has been problematical for other researchers in the Southeast who have tried to separate corner-notched points based upon these two attributes. For example, at the St. Albans site in West Virginia, Broyles (1971:63) identified a small Kirk Corner-Notched point metrically similar to a Palmer point but lacking basal grinding. Even the Charleston Corner-Notched point, which was found stratigraphically earlier than the small Kirk Corner-Notched, exhibited bases that were "smooth but not heavily ground" (Broyles 1971:57). Chapman (1977), working in the Little Tennessee River Valley, similarly has found a relatively broad range of variability in early corner-notched points which he referred to as the Kirk Corner-Notched Cluster. This cluster was stratigraphically separated into Upper and Lower Kirk. While basal grinding was present on points in the Lower Kirk Cluster it was not exclusively associated with these forms (Chapman 1977:53). In fact, two categories of points (categories 31 and 33) from the Upper Kirk Cluster displayed basal grinding and were described by Chapman (1977:47-48) to be similar to Palmer points.

Similar problems in distinguishing Palmer and Kirk points based upon basal grinding have been reported in North Carolina. At the Haw River site (Claggett and Cable 1982), approximately 100 km east of Hardaway, alluvial deposits provided remarkably clear stratigraphic separation among several components containing notched points. Overlying a Hardaway-Dalton zone were three corner-notched occupational zones. Within the lowest of these were several small, basally ground, corner-notched points consistent with Coe's Palmer definition (Cable 1982:329). The two overlying zones, however, included examples of larger corner-notched points metrically similar to Kirk points but still exhibiting some degree of basal grinding (Cable 1982:381-382). Thus, while the evidence generally supported Coe's observation of the increasing size of corner-notched points through time, it also demonstrated that the attribute of basal grinding did not change as consistently. Given this, Cable (1982:381-382) viewed the differences between Palmer and Kirk points as continuous rather than discrete and even argued for the elimination of the term Kirk Corner-Notched.

All of this emphasis on size and basal grinding does not include the complicating effects that tool use and maintenance can add to typological distinctions. While noting many of the cases described above, Goodyear et al. (1979:102) also emphasized that corner-notched bases were also subject to alteration during their use-life through haft attrition or reflaking altogether (see also Flenniken and Raymond [1986] for a similar discussion concerning notched points). This may be reflected in certain specimens from Hardaway that display a particular pattern of partial basal grinding. In this case grinding is pronounced on the ears but is absent in the center of the base. This absence may be the result of haft attrition or intentional reflaking for better binding.

Despite these apparent problems, some researchers have still favored the use of the Palmer/Kirk typological labels, particularly in North Carolina (e.g., Davis and Daniel 1990; Oliver 1985; Ward 1983) and South Carolina (e.g., Anderson and Schuldenrein 1983; Goodyear et al. 1979; Hanson and Sassaman 1984; Sassaman

1992), although there is some variation in how size or basal grinding are emphasized as defining attributes. While size and basal grinding were monitored in this study, another sorting criterion based upon the ratio of tang length to tang width was found to be more useful. This characteristic has long been used by UNC archaeologists to help discriminate Palmer from Kirk points and was employed in this study. Generally speaking, Palmer points have a tang that is approximately half as long as it is wide. Consequently, Palmer points have a more "stubbier" appearance than Kirk points.

Tang lengths and widths on all measurable corner-notched points recorded in this study indicate that the median tang length:width ratio (0.49) of Palmer points (n=20) is significantly smaller than the same ratio (0.65) for Kirk points (n=71) (Figure 4.7). As further illustration of this characteristic, a scatter plot of tang width versus width for Palmer and Kirk points is shown in Figure 4.8. While there is some overlap in the plotted distribution, Palmer points tend to cluster in the lower left of the distribution while Kirk points cluster in the upper right corner.

Indeterminate Corner-Notched Points. This category includes 10 corner-notched points, most of which are broken, that could not be confidently assigned to either a Palmer or Kirk type. Based on size, however, most of these might be classified as Kirk Corner-Notched.

Two complete points are worth noting. One is extremely resharpened, with its blade extending just a few millimeters above its base. The other point does not morphologically resemble any known cultural-historical type but probably postdates the Archaic period. It is small, made on a flake with slight corner notching and has a concave base.

Indeterminate Points. This category includes 125 specimens most of which are fragments (e.g., point tips) that could not be assigned to any point type. This

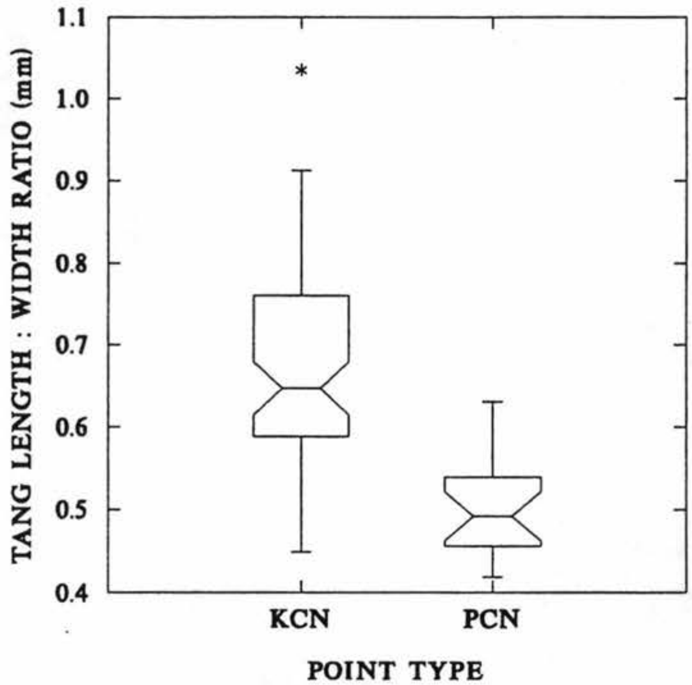


Figure 4.7. Tang length/width ratios boxplots for Kirk Corner-Notched (KCN) and Palmer Corner-Notched Points (PCN).

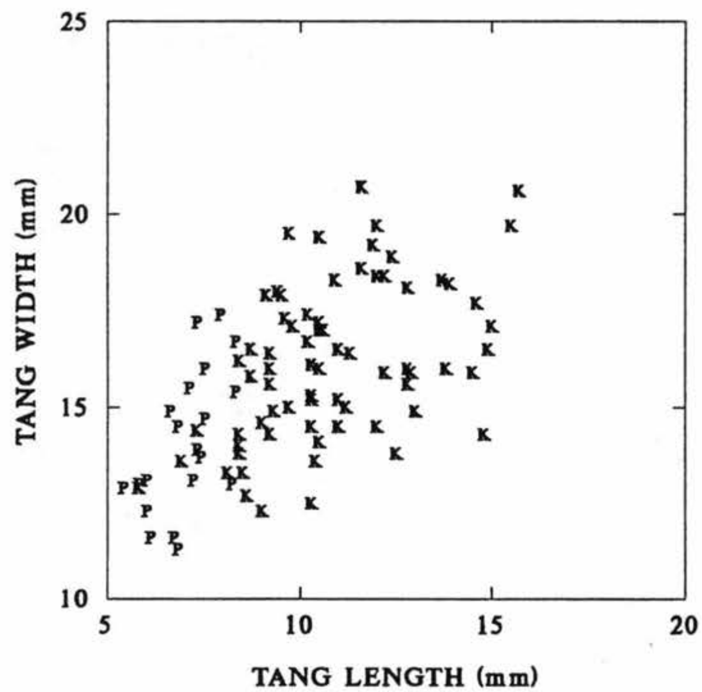


Figure 4.8. Tang length verses tang width scatterplot for Kirk Corner-Notched (K) and Palmer Corner-Notched points (P).

also includes a total of 64 unidentified points that were cataloged from the 1950s excavations but could not be located in the collections.

Other Bifaces

A total of 925 other bifaces are present in the assemblage. I have divided this category into four groups: I, II, III, and Indeterminate. Biface manufacture was clearly undertaken at Hardaway (Coe 1964:70) and the following typology attempts to measure this reduction sequence. These bifaces are what Coe (1964:50) referred to as "quarry blades," which represent unfinished points or other bifacial core/tools.

> There is little doubt that these aboriginal stone chippers reduced their raw material to as light and compact form as possible without taking the time to finish their points completely. These blades could then be transported and finished at leisure at places other than the source of the material [Coe 1964:50].

The goal of a lithic reduction sequence is to thin and shape the tool into a finished form. The relative degree of thinness indicates at what stage in the continuum the product lies. Here the ratio of artifact width to thickness is used as a rough measure of biface completeness. Later reduction stages are relatively thinner than earlier ones, a tendency clear in the Hardaway biface data (Figure 4.9).

Type I Bifaces. Most of these bifaces might be termed blanks (Crabtree 1972:42; Muto 1971) in the sense that it is not possible to determine the finished form of the tool (Figure 4.10:a-c). They are roughly oval to irregular in plan view with a highly irregular flake scar pattern; sometimes it covers both surfaces, but often it is restricted to the margins of both faces. This often results in a markedly sinuous edge. Type I Bifaces (n=132) have the greatest median width:thickness ratio (0.48) of all the bifaces.

Many of these bifaces exhibit deep expanding flake scars on their surface. Multiple hinge and step fractures are also common. Most of these specimens appear

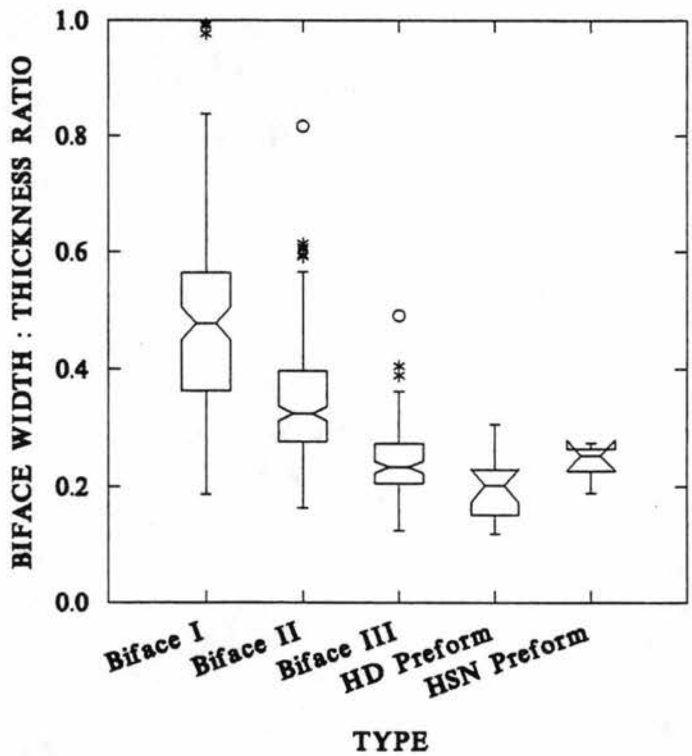


Figure 4.9. Biface width:thickness ratio boxplots.

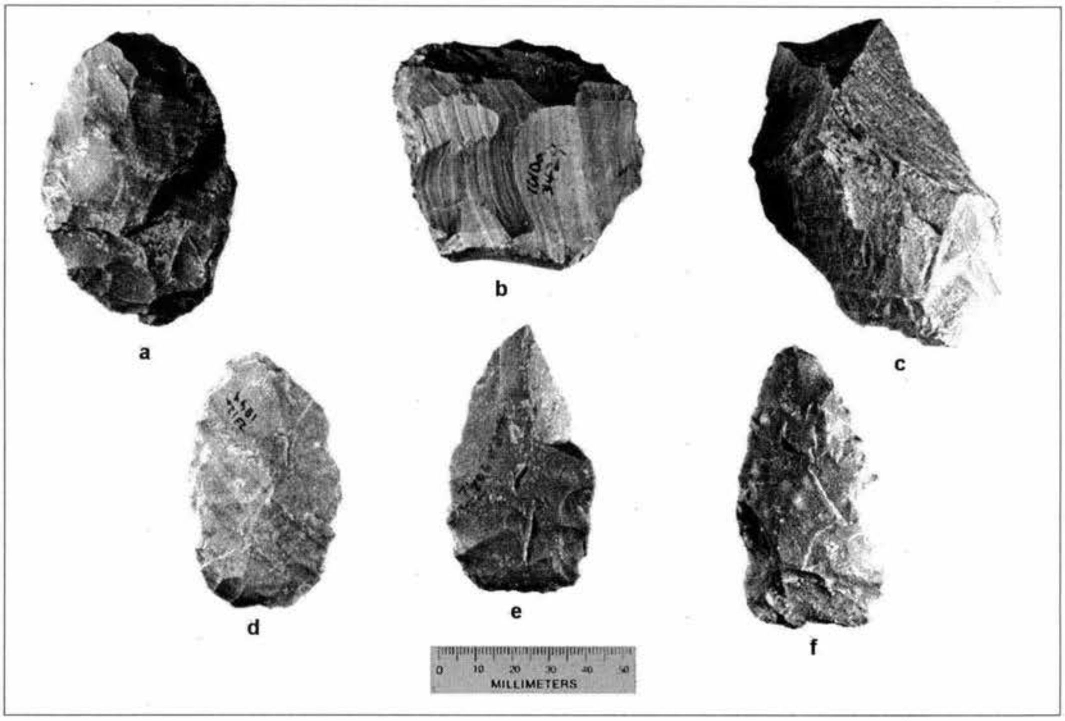


Figure 4.10. Type I and Type II Bifaces: *(a-c)* Type I Bifaces; *(d-f)* Type II Bifaces.

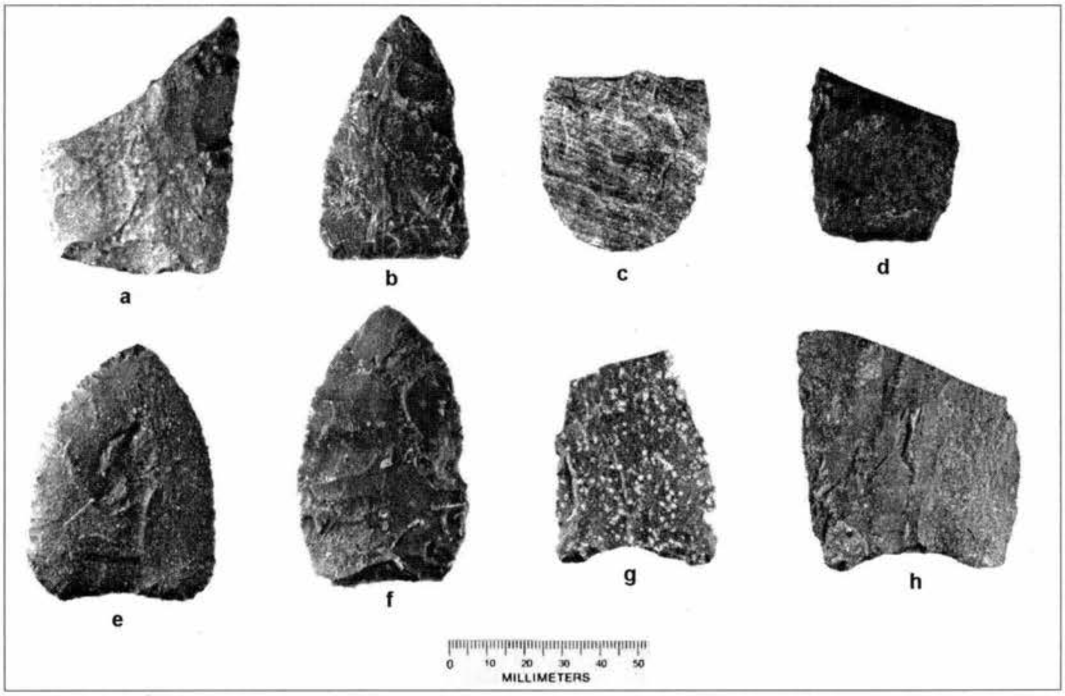


Figure 4.11. Type III Bifaces and preforms: *(a-d)* Type III Bifaces; *(e-h)* preforms.

to have originally been reduced from large thick flake blanks, while some appear to be made on larger blocky chunks. Many of these bifaces may never have been intended for further reduction into preforms; rather, they more closely resemble bifacial cores. Fifty-six percent (n=88) of this group were discarded whole. The remaining broken specimens (n=68) exhibit numerous hinge and step fractures along with some lateral snaps.

Type II Bifaces. Type II Bifaces (n=251) are relatively thinner (width:thickness ratio=0.33) and more symmetrical than Type I Bifaces (Figure 4.10:d-f). They are oval in plan view and have somewhat symmetrical margins with a rounded to slightly pointed tip and a rounded base. The tool edges are less sinuous than Type I Bifaces. The flake scar pattern is somewhat irregular and covers almost the entire surface of both tool faces. Moreover, many of the opposing flake scars are in contact, and are relatively shallow and less prominent than Type I Biface scars, although some deep scars do occur. Finally, a distinct biconvex cross section is present. Only about 30% (n=122) of these bifaces were discarded whole. Lateral snaps, followed by hinge and step fractures, account for the vast majority of the remaining production failures (n=283).

While many of these bifaces were likely intended to become points, at least nine examples appear to be bifacial adz preforms. These preforms are described below in the adz discussion.

Type III Bifaces. Type III Bifaces (n=113) are well shaped thin specimens (width:thickness ratio=0.23) with a symmetrical outline and straight to slightly sinuous edges (Figure 4.11). They exhibit a slightly pointed tip and a rounded to squarish base. Flake scars are closely spaced and cover both faces. Approximately 25.6% (n=49) of this group are whole. Lateral snaps again account for the vast majority of the broken specimens (n=142).

Included in the Type III Bifaces are a group of bifaces that I have labeled preforms (cf. Goodyear 1974:24) for both Hardaway-Dalton (n=20) and Hardaway Side Notched (n=5) points (Figure 4.11:e-h). These preforms are similar to what Coe (1964:64) described as the Hardaway Blade, which he believes predates the Hardaway-Dalton and is coeval with the fluted point tradition (Coe, personal communication 1986). Coe (1964:64) based his interpretation on artifact morphology and its stratigraphic context, placing emphasis on the relative high frequencies of this type that were recovered from the clay in Level IV.

In contrast, Goodyear (1974:24) has viewed the morphological description of the Hardaway blade as representing a preform for the Hardaway-Dalton. Support for this interpretation is seen in a comparison of dimensions between the two artifact forms in this analysis. A comparison of maximum length, width, and thickness between the preform stage (Hardaway Blade) and the completed Hardaway-Dalton shows that the dimensions of the former are generally larger than those of the latter (Figure 4.12). This evidence is consistent with the reduction continuum interpretation, but it is not conclusive given the emphasis Coe placed on the earlier stratigraphic context of the Hardaway Blade.

Nevertheless, given the site formation discussion in Chapter II, the stratigraphic evidence for the earlier context of the Hardaway Blade is not convincing. At best the stratigraphic argument is somewhat equivocal since almost as many Hardaway-Daltons were found in Level IV as Hardaway Blades (Coe 1974:Table 7), albeit perhaps not buried in the clay. Moreover, when a comparison of the frequency distributions of both types by *zone* are examined, slightly greater frequencies of Hardaway-Daltons were recovered from Zone 4 than preforms (Hardaway Blades) (Table 2.1). In short, since Hardaway points were manufactured at the site, their

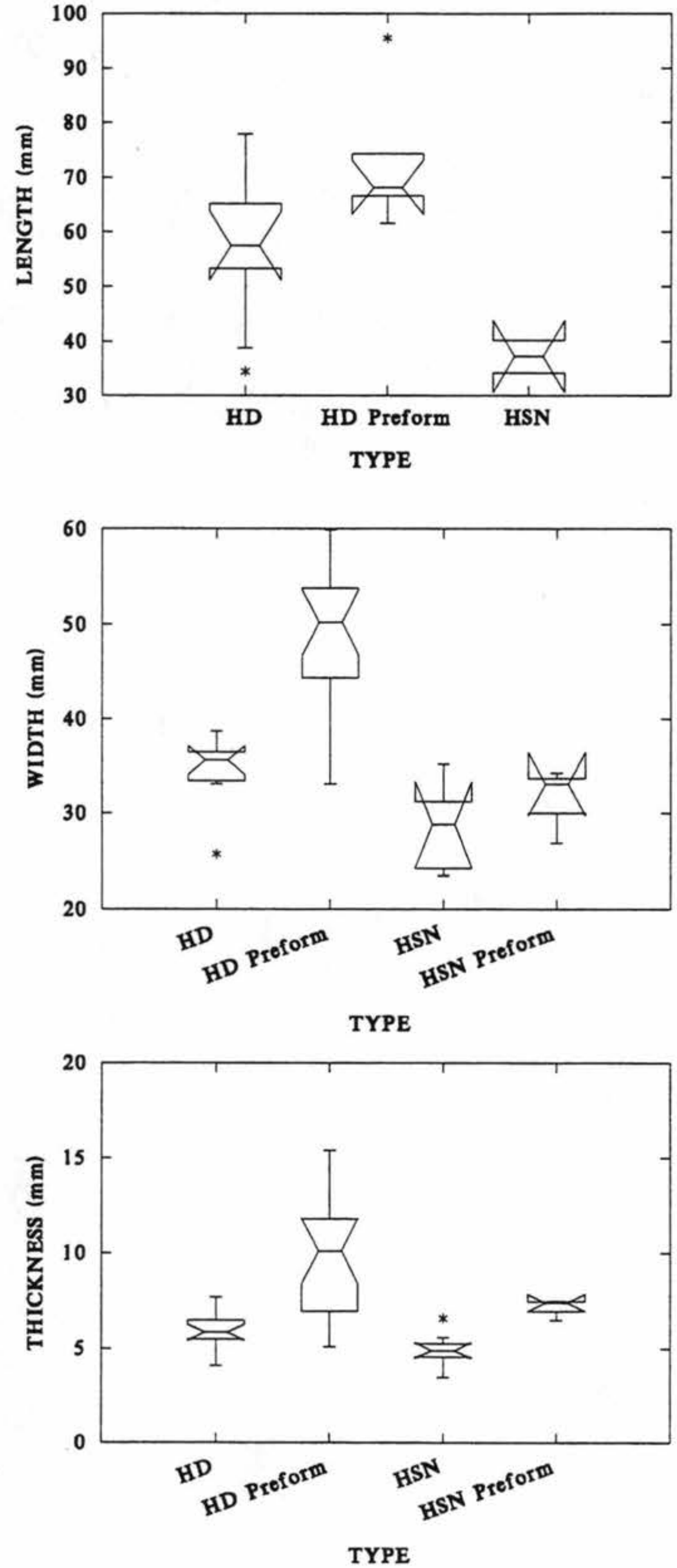


Figure 4.12. Boxplots comparing dimensions of length (top), width (middle), and thickness (bottom) for Hardaway-Dalton points (HD), Hardaway-Dalton preforms (HD Preform), Hardaway Side-Notched points (HSN), and Hardaway Side-Notched preforms (HSN Preform).

preforms must exist and the interpretation of the Hardaway Blade as a preform rather than a separate point type appears to be the more parsimonious explanation.

Indeterminate Bifaces. This is a residual category for broken bifaces (n=173) too fragmentary to be confidently placed in any of the previous categories.

Bifacial Adzes

Chipped stone adzes were not reported in the original site report but are clearly present at Hardaway. One whole specimen and one adz bit were identified in the assemblage, along with several preforms mentioned earlier (Figure 4.13). These artifacts resemble the Dalton adz described from Arkansas which was interpreted as a hafted, heavy duty woodworking tool (Goodyear 1974; Morse 1971; Morse and Goodyear 1973).

The whole adz is somewhat oval in outline and bifacially worked (Figure 4.13:a). The bit is convex in shape and is located at the maximum width of the tool which tapers down to a rounded butt; the lateral edges are heavily ground. The bits on both the whole and broken specimen (Figure 4:13:b) display the customary beveled working edge which characterizes the adz (Sememov 1964:126). Portions of both bits are smoothed or extremely ground on both faces. Most of this grinding appears to be from manufacture, although portions of the surface appear slightly polished and may be the result of use. In addition, some scratches or striations can be seen on the ground surfaces and are oriented both parallel and perpendicular to the bit. It is unclear if these striations are the result of use or manufacture by grinding. The maximum extent of this grinding on the obverse bit face of the complete specimen is over 35 mm, and at least 20 mm in extent on the bit fragment. Also noteworthy is that the complete specimen appears to have been rendered unusable by a flake scar that gouged approximately one-third of the bit edge.

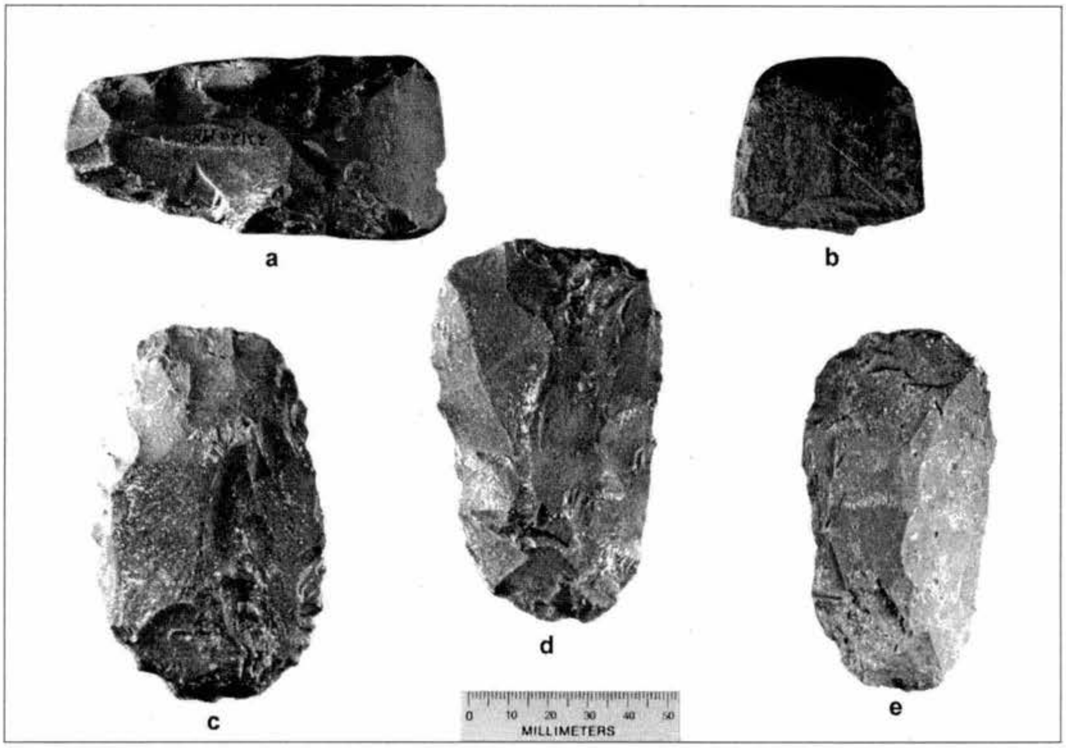


Figure 4.13. Bifacial adzes and preforms: *(a)* adz; *(b)* adz bit; *(c-e)* adz preforms.

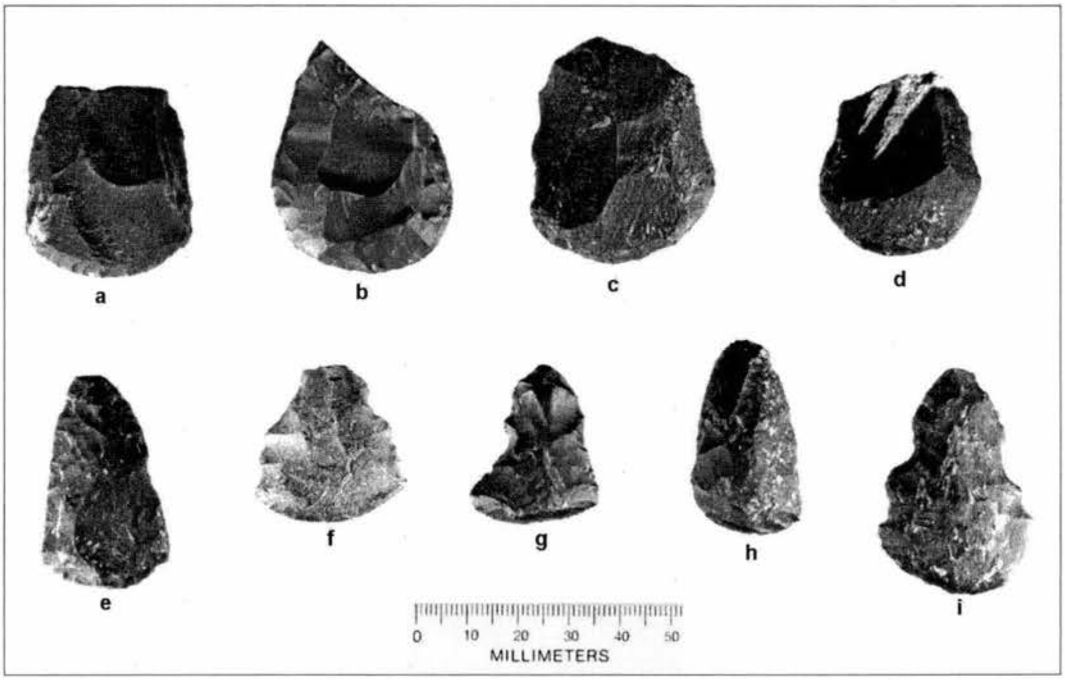


Figure 4.14. Type I End Scrapers: *(a-d)* Type Ia End Scrapers; *(e-i)* Type Ib End Scrapers.

Finally, an additional observation was made on the whole adz that is suggestive of tool recycling. Although both lateral edges are heavily ground along the length of the tool, the grinding ends abruptly about half way down one lateral edge near the butt, having been obliterated by a bifacially worked margin. The exact reason for this flaking is unclear, but a similar pattern of flaking was noted on adz butts at the Brand site which Goodyear (1974) interpreted as evidence of recycling broken adzes into knives.

> The Dalton adz-knife is characterized by regular bifacial retouch along the margins of the broken adz butt .... In some cases only one side was bifacially flaked, giving the impression that the extant ground edge of the broken adz was providing a backing for the hand .... The function of the adz-knives is interpreted here as cutting, probably on rugged surfaces such as bone and tendon. Whatever the material being worked, the adz-knife provides a mechanical advantage, since it is more massive than such other cutting implements as the Dalton points and flake knives [Goodyear 1974:41-42].

If the specimen from Hardaway was recycled as a knife, it is intriguing to speculate that it may not have been used at Hardaway but rather just discarded there. Given the abundance of available stone, it seems unlikely that it would be necessary to recycle another tool into a new form. Rather, such behavior would more likely occur at places where such resources were less accessible. Consequently, the recycling and use of this adz probably took place elsewhere with the tool eventually reaching Hardaway to be discarded and replaced.

As noted above, several of the Type II Bifaces described above have been identified as adz preforms (Figure 4.13:c-e). These preforms tend to have oval shapes in plan view with one end, presumably the butt, being slightly narrower than the other. All that is needed to finish these specimens into adzes is to manufacture the bit and heavily grind the lateral and basal edges.

Given their primary association with Dalton remains in Arkansas, these adzes may date as early as the Hardaway-Dalton component. However, a few instances of adzes recovered from Early Archaic contexts have been reported outside Arkansas. Both a chipped adz and a polished adz were reported from Kirk strata at the G.S. Lewis site along the Savannah River (Anderson and Hanson 1988:275, Figure 6). Similarly, chipped and ground "celts" have also been reported from Kirk and Bifurcate strata at Bacon Farm and Rose Island in the Little Tennessee River Valley (Chapman 1978:68; Chapman 1975:16). Thus, these adzes may not exclusively be a part of a Hardaway-Dalton toolkit.

UNIFACES

Unifacial tools are defined by the presence of intentional flake removal from one surface along one or more margins of an artifact edge. In most cases this retouch is presumed to shape the working edge or bit, although in some cases, this mode of retouch is also intended to shape the tool to facilitate hafting. The unifacial series of artifacts from Hardaway primarily includes several types of end scrapers and side scrapers.

End Scrapers

End Scrapers are defined by the presence of steep, regular unifacial retouch that forms a relatively narrow convex bit or working edge. This bit is usually located transversely to the long axis of the tool. A total of 425 end scrapers are present in the assemblage that have been divided among seven types. This includes five end scraper types based upon Coe's typology and two additional types defined herein. These various types are based upon bit size and overall tool shape presumably related to the presence or absence of hafting modifications.

Type I End Scrapers. The Type I End Scraper is a distinctly shaped unifacial tool that has long been associated with both the Paleoindian and Early Archaic periods. Coe (1964:73-76) defined two related types at Hardaway based upon their small size and triangular to drop-like morphologies. Type Ia End Scrapers (n=135) exhibit a triangular to trapezoidal shape in plan view with well executed retouch along their lateral and distal edges (Figure 4.14:a-d). In cross section, these end scrapers are most often flat trapezoidal (30.4%) or offset triangular (17.6%) in shape (Table 4.1). Type Ib End Scrapers (n=41) are similar in form to Type Ia End Scrapers except that the former display extensive retouch across their dorsal surface giving "the whole upper surface a smooth rounded contour" (Coe 1964:75). Consequently, this latter type exhibits a highly formalized drop-like form in plan view and predominately plano-convex (58.3%) cross sections (Figure 4.14:e-i).

Bits on both end scrapers are very well made and display relatively steep continuous unifacial retouch. Median bit widths are moderate among all end scrapers in the assemblage (Figure 4.15) and combined with their relatively shallow bit depth they exhibit only slightly convex shaped bits. Type I end scrapers are the smallest end scrapers in the assemblage (Figure 4.16). This small size is probably the result of two factors. First, these tools were made on small flake blanks, and second the blanks have undergone extensive modification. Such modification traditionally has been interpreted to be the result of hafting and the specimens from Hardaway appear consistent with this interpretation. Their small size and regularized form, the presence of retouched and tapered lateral edges, thinned proximal elements, and the occurrence of lateral notches, all qualify as characteristics of once-hafted tools (Keeley 1982).

The presence of lateral edge retouch was designed to taper and reduce the width of the blank to facilitate hafting. A little over half (56.6%) of Type Ia End Scrapers have bilateral retouch while approximately equal frequencies (about 19%) of these tools have either unilateral or no lateral retouch (Table 4.2). Type Ib End Scrapers, on the other hand, virtually all (97.6%) display bilateral retouch, with the

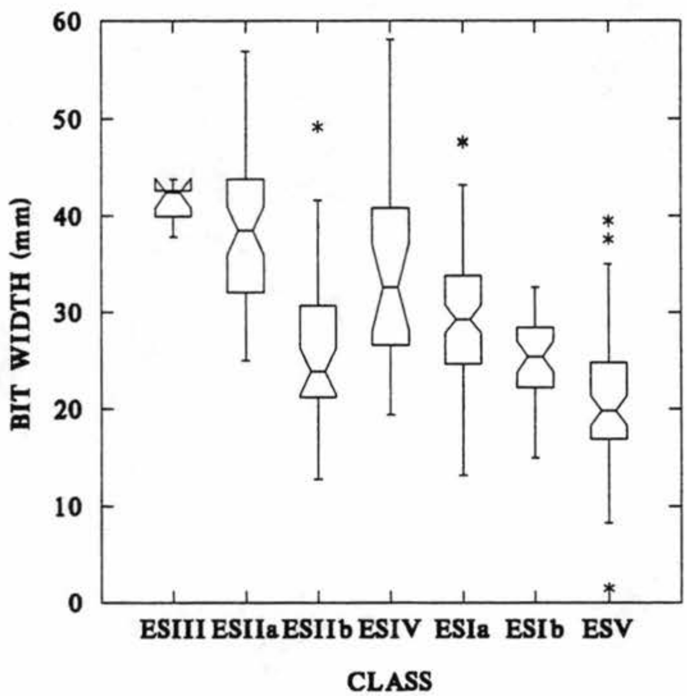


Figure 4.15. Boxplots comparing end scraper bit widths.

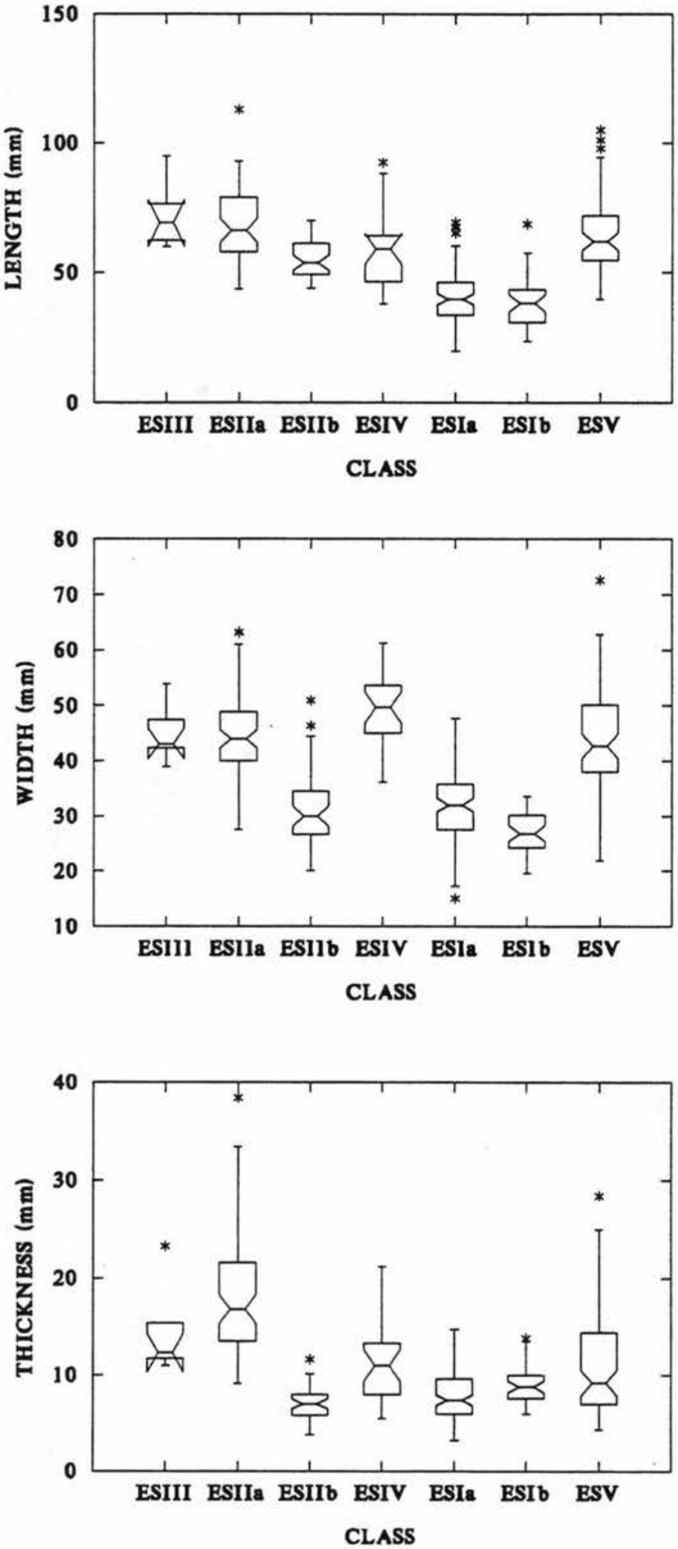


Figure 4.16. Boxplots comparing end scraper dimensions of length (top), width (middle), and thickness (bottom).

Table 4.1. End Scraper Cross-section Tabulation.

	Triangular		Offset Triangular		Flat Trapezoidal		Convex Trapezoidal		Concave Trapezoidal		Plano-Convex		Other		Indet.		Total	
Type	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Ia	12	11.1	23	17.0	41	30.4	8	5.9	6	4.4	10	7.4	13	9.6	19	14.1	135	100
Ib	2	4.9	3	7.3	10	24.4	1	2.4	-	-	24	58.3	1	2.4	-	-	41	100
IIa	13	14.9	15	17.2	25	28.7	6	6.9	1	1.2	3	3.4	6	6.9	18	20.7	87	100
IIb	11	25.0	6	13.6	13	29.5	4	9.1	3	6.8	3	6.8	3	6.8	1	2.3	44	100
III	-	-	-	-	4	33.3	-	-	1	11.1	4	44.4	-	-	1	11.1	9	100
IV	-	-	2	8.0	6	24.0	3	12.0	1	4.0	1	4.0	11	44.0	1	4.0	25	100
V	9	11.4	12	15.2	11	13.9	5	6.3	5	6.3	8	10.1	22	27.8	7	8.9	79	100

Table 4.2. Location of Lateral Retouch on End Scrapers.

	Right Lateral		Left Lateral		Bilateral		Absent		Indeter-minate		Total	
Type	n	%	n	%	n	%	n	%	n	%	n	%
Ia	12	8.8	13	9.6	77	56.6	26	19.1	8	5.9	136	100
Ib	-	-	1	2.4	40	97.6	-	-	-	-	41	100
IIa	12	13.8	5	5.7	41	47.1	12	13.8	17	19.5	87	100
IIb	4	9.1	10	22.7	23	52.3	4	9.1	3	6.8	44	100
III	-	-	-	-	7	77.8	1	11.1	1	11.1	9	100
IV	2	8.0	3	12.0	5	20.0	13	52.0	2	8.0	25	100
V	11	13.9	14	17.7	44	55.7	2	2.5	8	10.1	79	100

Table 4.3. Proximal Thinning Location on End Scrapers.

	Dorsal		Ventral		Dorsal and Ventral		Absent		Indeter-minate		Total	
Type	n	%	n	%	n	%	n	%	n	%	n	%
Ia	72	52.9	1	.7	10	7.4	28	20.6	25	18.4	136	100
Ib	22	53.7	1	2.4	13	31.7	4	9.8	1	2.4	41	100
IIa	34	39.1	1	1.1	12	13.8	18	20.7	22	25.3	87	100
IIb	26	59.1	3	6.8	1	2.3	7	15.9	7	15.9	44	100
III	2	22.2	-	-	4	44.4	1	11.1	2	22.2	9	100
IV	2	8.0	4	16.0	-	-	17	68.0	2	8.0	25	100
V	1	1.3	-	-	-	-	69	87.3	9	11.4	79	100

Table 4.4. Lateral Notch Location on End Scrapers.

	Right Lateral		Left Lateral		Bilateral		Absent		Indeter-minate		Total	
Type	n	%	n	%	n	%	n	%	n	%	n	%
Ia	3	2.2	1	.7	2	1.5	103	75.7	26	19.9	136	100
Ib	1	2.4	3	7.3	4	9.8	32	78.0	1	2.4	41	100
IIa	-	-	-	-	-	-	65	74.7	22	25.3	87	100
IIb	1	2.3	1	2.3	-	-	38	86.4	4	9.1	44	100
III	-	-	-	-	-	-	7	77.8	2	22.2	9	100
IV	-	-	-	-	-	-	23	92.0	2	8.0	25	100
V	-	-	-	-	-	-	73	92.4	6	7.6	79	100

remaining small percentage exhibiting unilateral retouch. In all cases this retouch was applied to the dorsal surface of the tool.

Similarly, additional retouch was sometimes focused on the proximal end of the specimen in order to thin that tool segment to facilitate hafting (Table 4.3). This was accomplished by removing several small flakes from either the dorsal, ventral, or both faces of the tool. While some of the flaking observed on the dorsal surface near the striking platform may have been fortuitous (i.e., the result of the manufacture of the flake blank itself), most did not appear to be. Presumably, dorsal thinning was intended to remove thick points or ridges along the flake blank. Likewise, the location of flake scars on the ventral surface of end scrapers is clear evidence of deliberate attempts to thin the bulb of percussion. Dorsal thinning was most common (about 53%) on both types while bifacial thinning of the haft segment was relatively common (31.7%) on Type Ib but much less so (7.4%) on Type Ia examples. Ventral thinning alone was rare, occurring on only one specimen of each type.

Additional evidence for hafting on Type I End Scrapers can be found in the form of small U-shaped notches present on the lateral edges of some specimens (Table 4.4). Coe (1964:76) referred to these features as haft-notches and noted they occurred on about 20% of Type I specimens in his analysis, most often on only one side. These notches form small indentations along the tool's lateral edges manufactured from small multiple flake scars which appear to have originated from the ventral surface of the tool. They occur on a small percentage of Type Ia specimens either unilaterally (1-2%) or bilaterally (1.5%); and somewhat more often on Type Ib forms, in a unilateral or bilateral mode of equal frequencies of about 10%.

The variety of modifications to the proximal ends of these end scrapers would indicate that more than one mode of hafting was employed to secure these tools. With reference to hafting, Morse (1973:27) has suggested that the extensive lateral retouch on Dalton end scrapers in Arkansas would allow easy insertion into a hollowed out antler handle. This is the "jam" or wedge haft that Keeley (1982:799) describes as one of three possible types of haft arrangements he has identified based on ethnographic and experimental data. The presence of lateral retouch and proximal thinning on the majority of Type I End Scrapers from Hardaway is consistent with hafting in this manner. The small widths of these scrapers is also consistent with small diameter hafts made of bone or antler.

The other two hafting methods described by Keeley (1982) include wrapping or lashing the tool to a handle and a mastic hafting process by which the implement is secured by a glue, resin, or tar; sometimes these methods were done in combination. The presence of haft-notches would certainly imply that at least a small portion of the end scrapers from Hardaway were secured by wrapping. No obvious traces of a mastic were observed on the Type I End Scrapers; of course, this may be related to preservation factors.

Certain distinctive breakage patterns are also suggestive of hafting. These occur in the form of both proximal and bit tool ends exhibiting lateral snaps at the presumed hafting point. This same breakage pattern has been observed at the Brand site where Goodyear (1974:44) considered it unlikely that using these small tools without hafts could have provided enough force to snap them in this manner.

Finally, an additional accessory often noted on end scrapers is the "graver spur" which occurs on 7.3% of Type Ia specimens and 9.7% of Type Ib End Scrapers (Table 4.5). It is worth noting that this feature is virtually absent on the other end scraper forms in the assemblage. Graver spurs are flaked on the left or right side of the specimen at the juncture of the tool bit and lateral edge. An isolated example of a bilateral occurrence of a graver spur is present on a Type Ib End Scraper. Spurs appear triangular in plan view and could have been used for moderately robust graving activities.

Table 4.5. Spur Location on End Scrapers.

Type	Right Lateral		Left Lateral		Bilateral		Absent		Indet.		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Ia	7	5.1	3	2.2	-	-	103	75.7	23	16.9	136	100
Ib	1	2.4	2	4.9	1	2.4	36	87.8	1	2.4	41	100
IIa	1	1.1	1	1.1	-	-	66	75.8	19	21.8	87	100
IIb	1	2.3	-	-	1	2.3	36	81.8	6	13.6	44	100
III	-	-	-	-	-	-	7	58.3	2	16.7	9	100
IV	-	-	-	-	-	-	25	100.0	-	-	25	100
V	-	-	-	-	-	-	74	100.0	-	-	74	100

Table 4.6. Frequency of End Scrapers with Edge Rounding Microwear.

Type	Total No. of End Scrapers	No. with observed edge rounding	Percentage
Ia	136	37	27.2
Ib	41	17	41.5
IIa	87	10	11.5
IIb	44	5	11.4
III	9	-	-
IV	25	3	12.0
V	79	16	20.3

Type II End Scrapers. Type II End Scrapers were defined by Coe (1964:76) as being made on flakes about twice as long as their width and with retouch restricted primarily to the bit edge. Two related types were identified, differing primarily in blank size: Type IIa End Scrapers were made on "large, thick irregular flake[s] that [were] casually shaped at one end" while Type IIb End Scrapers were manufactured from "thin, narrow, prismatic flake[s]" (Coe 1964:76) (Figure 4.17).

It should be noted that I have included a number of specimens as Type II End Scrapers that exhibit lateral edge retouch which, following a strict reading of Coe's definition, would not be included in this class. An examination of the specimens in Coe's analysis (e.g. Coe 1964:Figure 65B), however, reveals that Type II End Scrapers do display lateral edge retouch; although many specimens do not exhibit as extensive an amount of retouch as present on Type I End Scrapers.

Given the presence of lateral retouch, it proved harder to distinguish between Type IIb (n=44) and some Type Ia End Scrapers. I suggest that this is the result of the artificial separation of essentially one tool type. With the exception of tool length, the Type IIb End Scraper is little different in form than Type Ia End Scrapers. An examination of both quantitative and qualitative attributes illustrates their overall similarity.

For example, the occurrence of lateral retouch, along with proximal thinning, and lateral notching indicates that the Type IIb, like Type Ia End Scrapers, were also hafted (Tables 4.2-4.4). Moreover, the only significant difference in tool dimensions between the two end scrapers is that of length (Figure 4.16), which can be explained as a result of tool resharpening.

A similar explanation may also account for the apparent significant differences in bit width between these two end scrapers. Median bit width (23.9 mm) for the Type IIb end scraper is significantly narrower than the bit width (29.3 mm) for

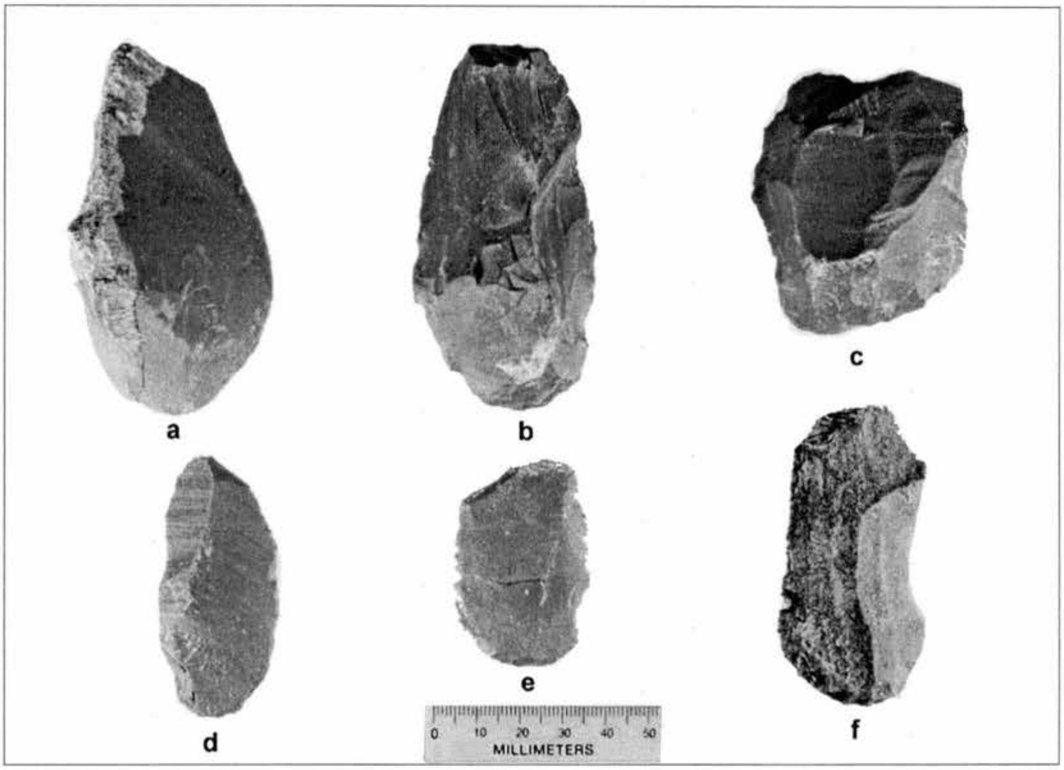


Figure 4.17. Type II End Scrapers: *(a-c)* Type IIa End Scrapers; *(d-f)* Type IIb End Scrapers.

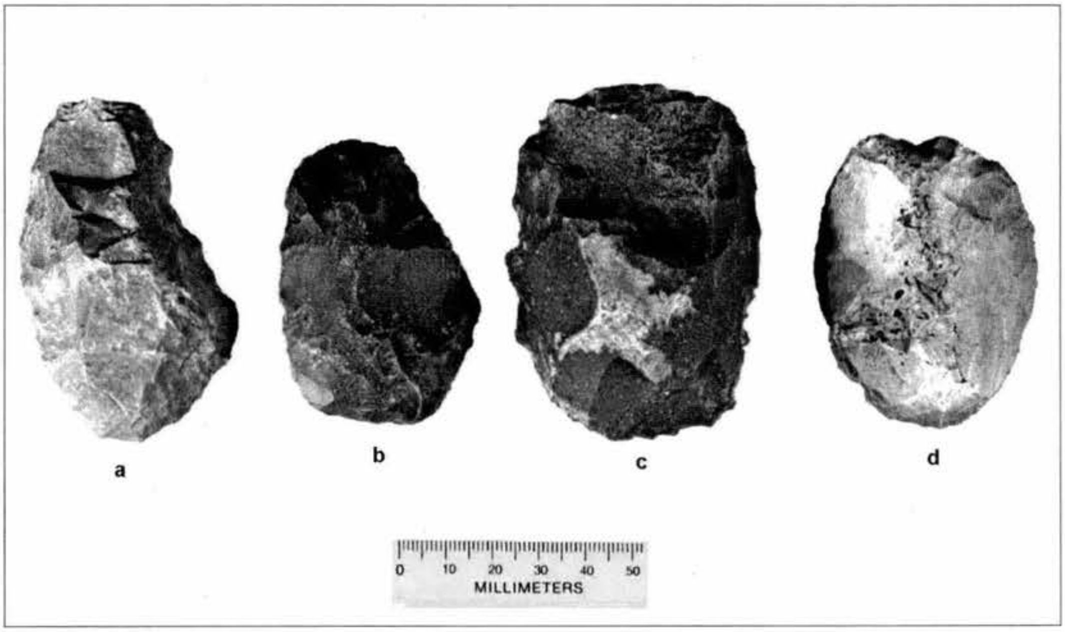


Figure 4.18. Type III End Scrapers.

the Type Ia end scraper (Figure 4.15). This difference would be expected if the Type Ia End Scraper was made on a relatively long narrow flake blank, where the distal end of the flake was narrower than its midsection. The bit would become wider as it approaches the middle of the flake blank through resharpening. That this is the case is attested to by the fact that the median maximum width (30 mm) of Type IIb End Scrapers is about 6 mm greater than its bit width. Maximum widths (32 mm) of Type Ia End Scrapers, on the other hand, are virtually no different than median bit widths (29.3 mm).

The Type IIa End Scraper (n=87), however, is certainly made from a larger flake blank. Along with the Type III End Scraper described below, it is the largest end scraper in the assemblage (Figure 4.16). It was made from large block derived flake blanks and exhibits a wide and often irregularly retouched bit. In fact, these tools have the second widest median bit width (38.5mm) of all the end scrapers. Given its large size (particularly its width and thickness) it may have been hand held, however, many specimens exhibit some retouch suggesting hafting. This evidence includes relatively high frequencies of unilateral (19.5%) or bilateral (47.1%) edge retouch and proximal thinning (54%) (Tables 4.2-4.3).

As noted above, the lateral edge retouch present on these end scrapers is less uniform than similar retouch on Type I End Scrapers and results in only a slight (if any) tapering back from the bit. Rather, the lateral retouch appears to only minimally shape the tool. Given the tools' relatively large size, this retouch in some instances may have been used to modify tool shape just enough to allow it to have been hand held rather than hafted (cf. Gould 1980:127-129). Alternatively, this ambiguity may result simply from the fact that this tool was used either unhafted or hafted.

In any event, if some Type IIa End Scrapers were hafted, they were undoubtedly hafted in a different size haft than Type I End Scrapers. The extreme thickness of the tool in particular argues against the use of a hollow socket haft. Rather, their large width and thickness might reflect the use of wooden hafts.

With regard to hafting, Binford (1979:267) has noted that functionally similar tools may exhibit different hafting modifications based upon their intended roles (i.e., long verses short-term usage) in the technology. For example, curated gear may exhibit more design features related to hafting, whereas expedient tools used for similar functions may exhibit minimal and perhaps technically different hafting modifications. Thus, given the minimal nature of lateral retouch these tools may represent more expediently hafted tools intended primarily for use at Hardaway.

Type III End Scrapers. Coe (1964:76) described the Type III End Scraper as a "large and rough duplication of the more finely made Type I variety." It is a minority type among the end scrapers as only six tools were identified by Coe (1964:76) and only nine specimens were observed in the present analysis (Figure 4.18).

With the exception of tool thickness, it is virtually the same size as the Type IIa End Scraper (Figure 4.16) and was probably manufactured on a similar, albeit thinner blank form. The Type III End Scrapers, however, display more of the flaking qualities of the Type I End Scrapers and exhibit the widest median bit value (42.4mm) among all end scraper types (Figure 4.15). Consequently, I view this tool as a large end scraper that needed more dorsal and lateral retouch to fit hafting requirements.

Type IV End Scrapers. The Type IV End Scraper (n=25) is a newly identified form (Figure 4.19). I believe these tools were an unhafted, hand held variety of end scraper. They display virtually no attempt to shape the flake blank beyond the manufacture of the bit. Tool bits exhibit careful regular unifacial retouch and with

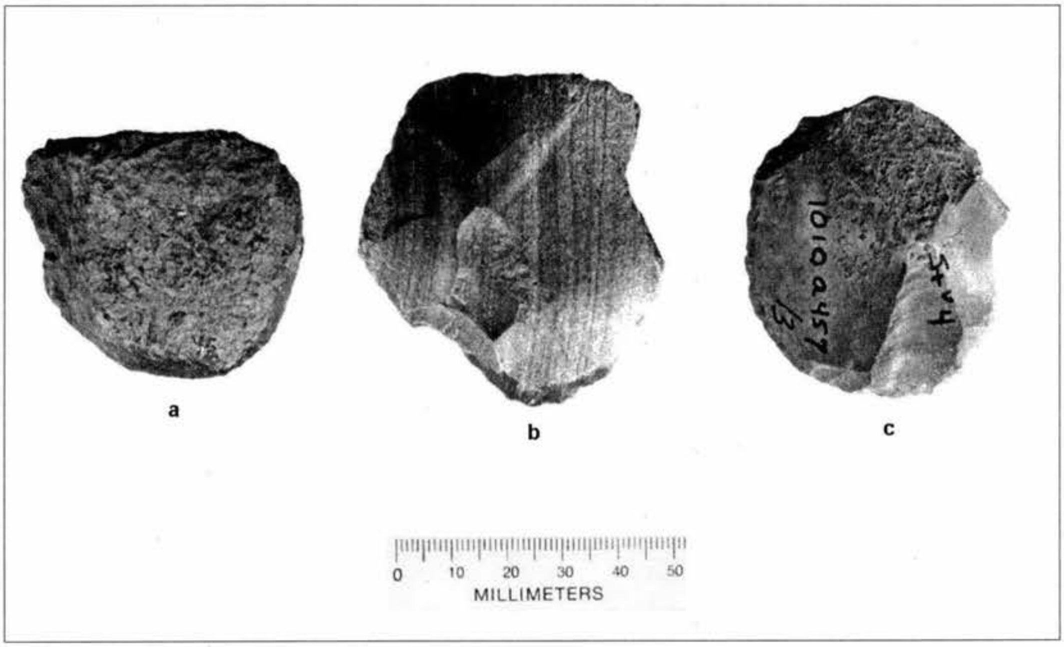


Figure 4.19. Type IV End Scrapers.

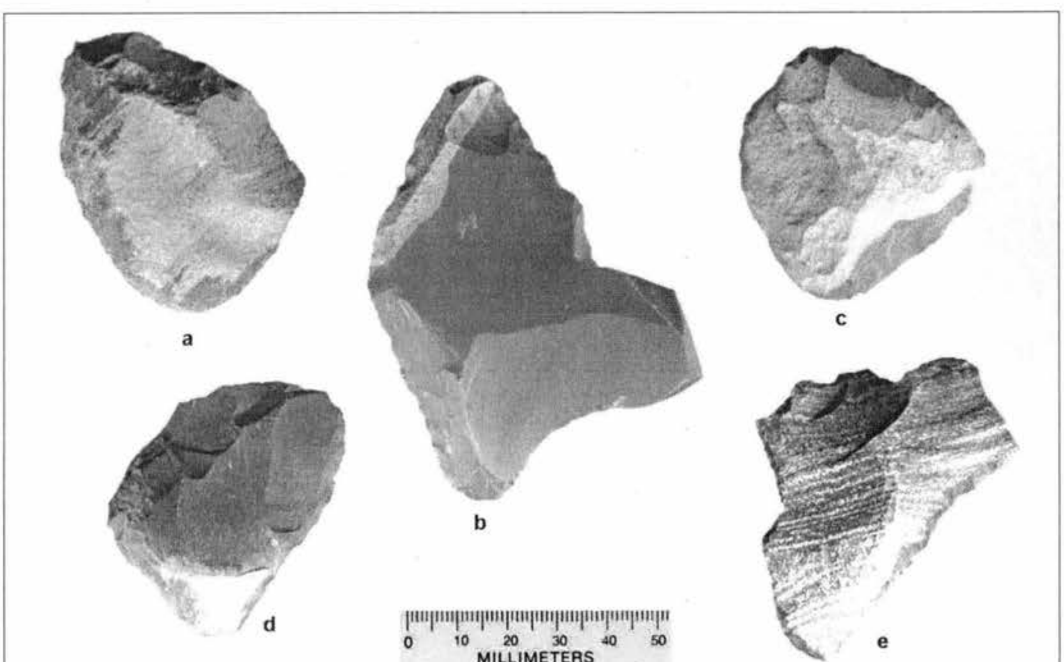


Figure 4.20. Type V End Scrapers.

the exception of the larger Type IIa and III End Scraper forms, median bit width (49.7mm) is slightly greater than in the remaining end scraper types (Figure 4.15).

Over half (52%) of the specimens display no lateral retouch and those that do exhibit a limited amount restricted to the edges near the bit (Table 4.2). Furthermore, this retouch appears more related to isolating and defining the bit rather than shaping the lateral margins for hafting.

Although median tool length (50 mm) is not substantially greater than median tool width (49.7 mm) (Figure 4.16), this group tends to display a high degree of morphological variability both in flake blank choice and bit placement. Evidence for blank variability can be seen in that 44% of the tools do not exhibit the triangular, trapezoidal, or plano-convex forms that commonly characterize other end scrapers (Table 4.1). This suggests that fewer restrictions were placed on blank choice as compared to the other end scrapers.

An additional factor that contributes to this morphological variability is the placement of the bit in relation to the blank striking platform. Among the vast majority of end scraper types, maximum flake length parallels the axis of percussion and bit placement is opposite the striking platform; however, this is not generally the case with Type IV End Scrapers. Over half (56%, n=14) of the Type IV specimens have their maximum length oriented at perpendicular or oblique angles to the axis of percussion, requiring bits to be placed laterally to the striking platform.

A final characteristic of this end scraper is the presence of a high incidence of tools with cortex (44%, n=11). Moreover, when present, cortex appears to cover much of the dorsal surface. While this may be fortuitous, it is tempting to speculate that the slightly roughened texture presented by the cortex would have aided grasping the tool.

In short, the variability in flake blank morphology, the absence of unifacial modification beyond bit manufacture, and the presence of cortex on a medium sized flake blank all suggest a hand held end scraper that was manufactured on an *ad hoc* basis; presumably for use in a specific and immediate task.

Type V End Scrapers. The Type V End Scraper (n=79) also appears to have been an unhafted end scraper (Figure 4.20). Type V End Scrapers were made on block-derived flakes with varied cross sections (Table 4.1) comparable in size to Type IV specimens (Figure 4.16).

This category is based upon bit size and placement, and a particular mode of lateral edge modification. First, it is distinguished by a relatively narrow, well made bit that is usually asymmetrically placed at a corner or distal end of the blank, as opposed to being well centered as in other end scraper forms. In other words, the bit is somewhat offset or cantered towards the distal-lateral intersection of the flake blank, presumably to take advantage of the narrow point of this juncture. Consequently, the bit is consistently narrow. In fact this type has the narrowest median bit width (19.8mm) of all the end scrapers in the assemblage (Figure 4.15), despite the fact that its median tool width (42.7mm) is among the highest.

Second, most specimens have straight to slightly incurvate retouched lateral edges that expand away from the bit. This retouch is generally well executed and continuous on one or more commonly both lateral edges. On specimens that exhibit bilateral edge retouch, one side tends to display more extensive and continuous retouch than the other and results in little to no marked juncture between the bit and lateral edges. In contrast, the lateral edges of most of the other end scraper forms tend to contract away from the bit forming a distinct outline break, a break that is also distinguished by differences in the size and steepness in edge retouch between the bit and lateral edges.

Although this tool is labeled an end scraper because of its distinctively retouched bit, its lateral edges may have been utilized as well. This inference is based on the observed similarity in the mode of retouch between its distal and lateral edges and the fact that lateral retouch was clearly not extensive enough to regularize the tool for hafting. As noted above, this retouch similarity contrasts with other end scraper types in the assemblage which exhibit marked differences in modes of retouch between tool bits and lateral tool edges.

If the lateral edge was a functional one, however, it apparently was used in a different task than the end scraper bit since none of the lateral edges exhibited the edge rounding--similar to that noted on Type I End Scrapers--that was noted on many of the accompanying bits. This conclusion is speculative, of course, and needs further investigation by microwear analysis.

Another interesting characteristic of this tool type is the presence of double bits on four specimens, oriented at opposite ends from each other (Figure 4.20:c). Bit placement in this fashion is further indication of an unhafted tool--assuming one would not haft a tool over a bit.

One of these tools is particularly noteworthy as it appears to have been recycled from another tool type, a Type IV Side Scraper. Although this side scraper is detailed in the next section, it can be described briefly as having an oval shape with a steeply retouched, relatively thick bit that is broadly convex and parallel to the tool's long axis. Additional thinning opposite the bit is suggestive of hafting modifications. In this instance, an end scraper bit was fashioned on one corner of the former side scraper bit. Additional modification formed the lateral edges of the end scraper by retouching the former side scraper bit and one of its lateral edges. This retouch resulted in a distinct tapering along both edges and a distinct break in tool plan view--presumably done to help narrow the corner of the side scraper to adapt to proper end scraper bit width. Further thinning was accomplished by ventral retouch on both lateral edges and a portion of the end scraper bit.

As in the case of the recycled adz mentioned previously, this end scraper may not have been made or used at Hardaway, but rather modified elsewhere and subsequently discarded at Hardaway--an interpretation supported by the fact that this artifact appears to made from a rhyolitic tuff, perhaps from the Asheboro region approximately 30 km northeast of the site.

In sum, given their variable blank morphology, the apparent absence of hafting modifications, and the presence of some tools with two bits, Type V End Scrapers also were probably an expediently made and used tool. This end scraper type has not been described from any other assemblages in the Southeast. A very similar type, however, labeled a "proximal end and side scraper" has recently been identified in Paleoindian assemblages from the Great Lakes region by Ellis and Deller (1988).

Functional Considerations. Although no highpowered microwear analyses were performed, some tentative inferences with respect to tool function are discussed below based upon such criteria as the presence of bit edge rounding, bit edge angles, and tool morphology. While mindful of the problems with assuming "form equals function" (e.g., Odell 1981), certain insights into tool function can be obtained by routine morphological and technological analyses (see Ellis and Deller 1988).

End scrapers traditionally have been interpreted as hide scrapers and there is some evidence to suggest that this may be the case with many of the end scrapers from Hardaway. A distinct edge rounding was noted on several end scraper bits during the analysis. In some cases this rounding was so marked that it could be seen with the naked eye. Coe too, noticed this pattern when he stated that "nearly all of them [Type I End Scrapers] have been used until their cutting edge has worn smooth" (1964:76).

Subsequently, all bits were examined under a minimum of 10x magnification for the presence/absence of edge rounding. Edge rounding appears to be most frequently associated with Type I varieties occurring on 41.5% of Type Ib and 27.2% of Type Ia End Scrapers (Table 4.6). It occurs with much less frequency on Type V End Scrapers (20.3%) and least of all among Types II and IV End Scrapers (ca. 11-12%). No edge rounding was observed on Type III End Scrapers, although sample size is low.

Moreover, the intensity of rounding was also noted to vary among individual specimens, although it was not systematically recorded. For example, some bit edges exhibited only a light degree of rounding that was confined to the dorsal-ventral bit edge junction, while others displayed a marked band of rounding that extended a millimeter or more up the dorsal face of the bit virtually obliterating flake scars there. In fact, there is an indication that Type I, and to a lesser extent Type V, End Scrapers have the more heavily rounded bits. Finally, some linear features resembling striations oriented transversely to the bit edge were also observed on at least five specimens.

My interpretation of hide working remains preliminary of course, but the association of edge rounding and striations with hide working has been noted on both ethnographic (Hayden 1979) and experimental (Keeley 1980:50) scrapers. Of particular interest too, is the influence that the condition of the hide (i.e., wet/fresh vs. dry) has on the intensity of edge rounding. In short, a drier hide results in greater amounts of abrasion on the tool edge (Keeley 1980:50; Hayden 1979:225), resulting in pronounced rounding and striations. Thus, pushing my interpretation even further, many end scrapers appear to have been used on dry hides.

Bit edge angles were also recorded for all end scrapers. Mean bit edge angles were computed from averaging maximum and minimum values for each bit. Following Wilmsen (1970), bit edge angles in lithic analyses are often relied on for functional determinations. Wilmsen's (1970) work is presented in more detail with respect to the side scraper functional discussion; implications for end scraper functions only are discussed here.

Histograms of mean values for each end scraper type indicates that edge angles cover essentially the same range (Figures 4.21-4.27). Edge angles are routinely high for each type (ca. 55° to 85°). Wilmsen (1970:73) has suggested a bone and woodworking function for these steep angled scrapers, however, he also notes that such steepness may be a function of bit resharpening. In this case I view such steep angles as more a reflection of tool exhaustion and view the presence of edge rounding as more reliable indicator of tool function.

In sum, given the absence of a microwear analysis, only some tentative suggestions concerning tool use can be made. The noticeable presence of edge rounding on many specimens suggests that, with the exception of the Type III End Scraper, all end scraper forms were employed to some degree in hide working activities. The relatively high frequency of edge rounding associated with the Type I end scrapers suggests that hide scraping was an important function of this tool. (Given a more sophisticated microwear analysis this frequency may actually be higher.) The next highest incidence of edge-rounding is present on Type V End Scrapers which may have been an unhafted but functionally equivalent version of the Type I scrapers. Although the presence of edge rounding on Types IIa and IV would indicate some hide scraping, the low occurrence of this wear pattern (coupled with the tools' less formalized shapes and larger bit sizes), suggests uses somewhat distinct from those of the smaller end scraper types. Along this line, Coe (1964:76) suggested that the Type IIa End Scraper was most often used for working hard materials such as wood or bone.

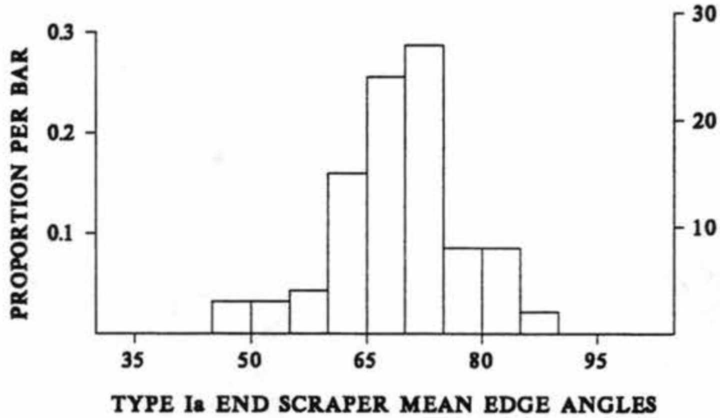


Figure 4.21. Histogram of Type Ia End Scraper mean edge angles.

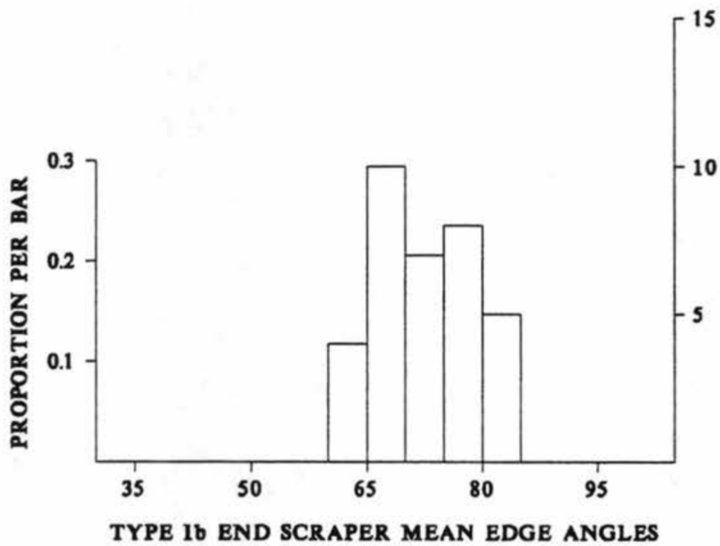


Figure 4.22. Histogram of Type Ib End Scraper mean edge angles.

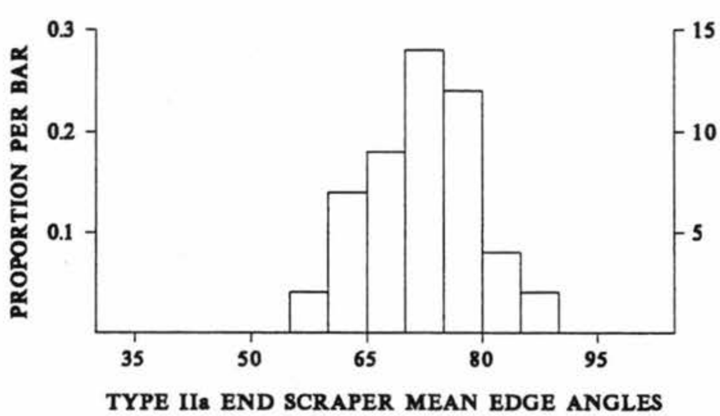


Figure 4.23. Histogram of Type IIa End Scraper mean edge angles.

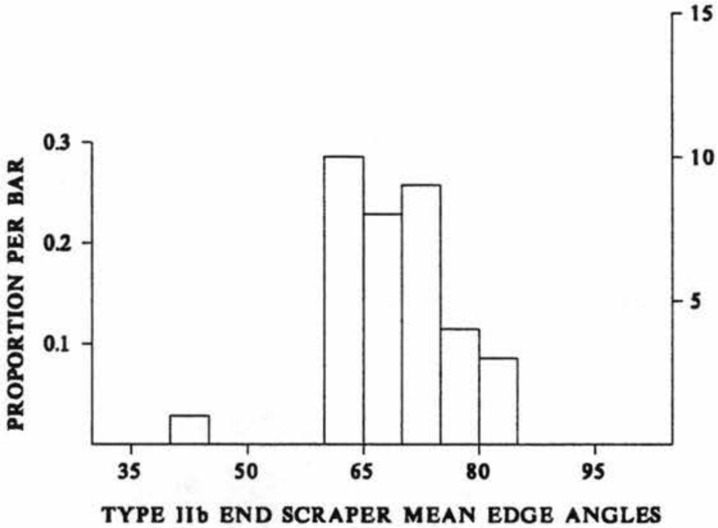


Figure 4.24. Histogram of Type IIb End Scraper mean edge angles.

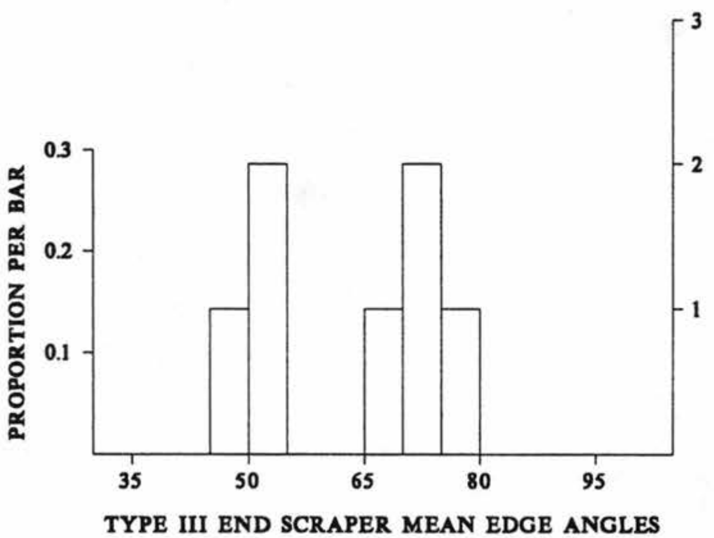


Figure 4.25. Histogram of Type III End Scraper mean edge angles.

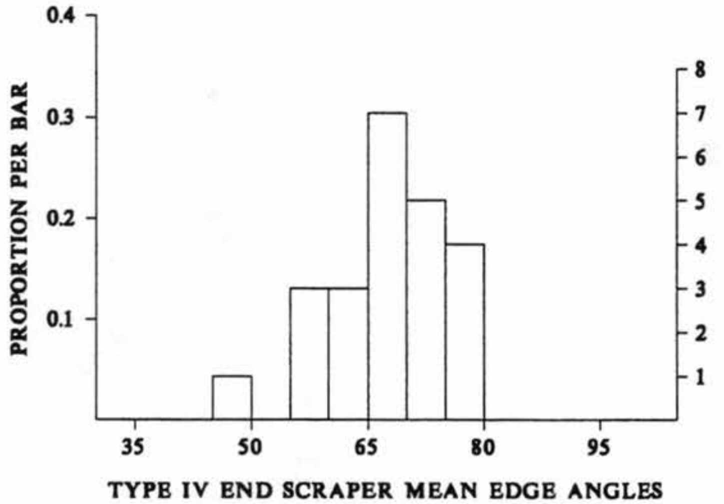


Figure 4.26. Histogram of Type IV End Scraper mean edge angles.

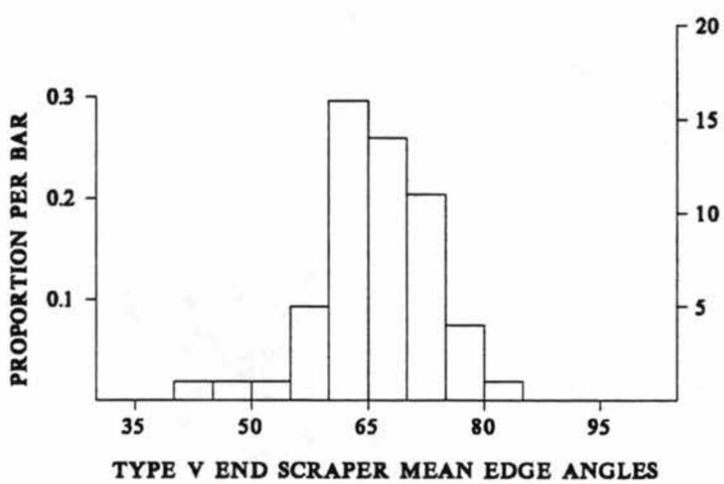


Figure 4.27. Histogram of Type V End Scraper mean edge angles.

Side Scrapers

Side scrapers are defined by the presence of one or more unifacially retouched working edges that parallel the long axis of the flake blank. A total of 409 side scrapers are present in the assemblage and have been divided into five types. Again, I have followed Coe's (1964) side scraper typology, with the addition of two new types. Side Scraper types are identified based upon flake blank type, bit retouch, and overall tool morphology.

Type I Side Scrapers. Type I Side Scrapers (n=20) are manufactured from relatively large, block-derived, oval shaped flakes such that the working edge is perpendicular to the flake's axis of percussion (Figure 4.28). As Coe (1964:77) states, most of these tools retain evidence of their striking platform. These scrapers tend to have offset triangular or flat trapezoidal cross sections, giving them a wide flat appearance (Table 4.7). Tool bits exhibit well-executed, continuous retouch forming a broad, slightly convex to straight working edge (Coe 1964:77).

Along with the Type IV Side Scrapers described below, Type I Side Scrapers are typically the largest side scrapers in the assemblage (Figure 4.30) and could have been hand held, but their regularized shape also suggests a once-hafted tool (Keeley 1982). This possibility is elaborated upon below in the discussion of a morphologically similar tool: the Type IV Side Scraper.

Type II Side Scrapers. Coe (1964:79) defined Type II Side Scrapers as being made on "large irregular flake[s]" that possess bits displaying "no attempt to shape the working edge into any other form than what existed." Within this group I have separated two types based upon flake-blank size (Figure 4.29). The Type IIa Side Scraper (n=221), which corresponds to Coe's Type II Side Scraper, exhibits bits

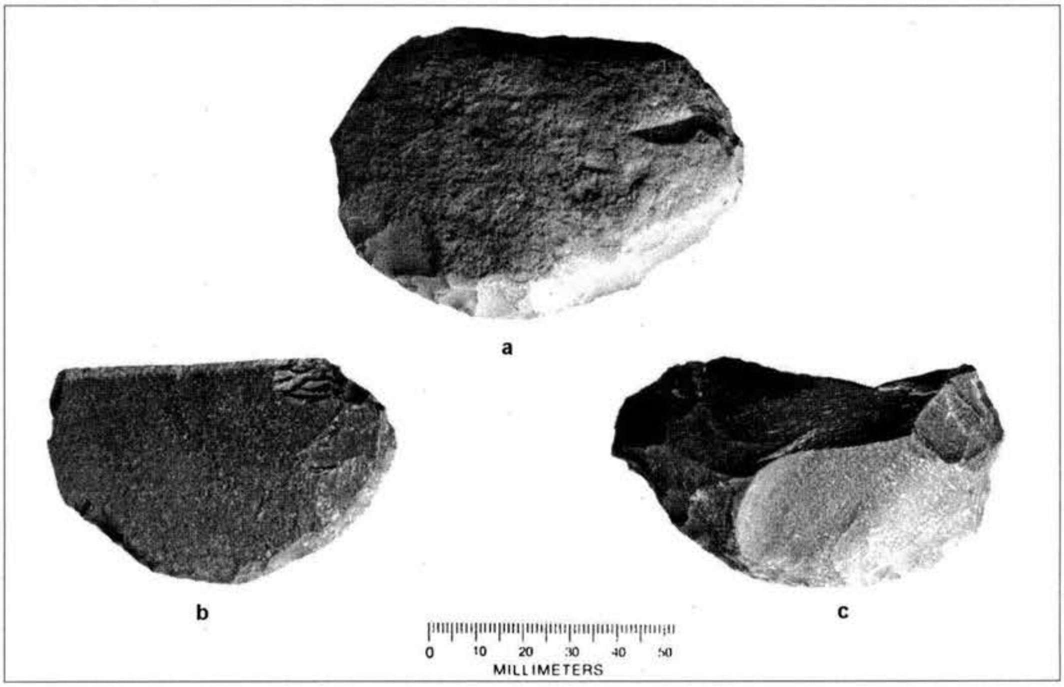


Figure 4.28. Type I Side Scrapers.

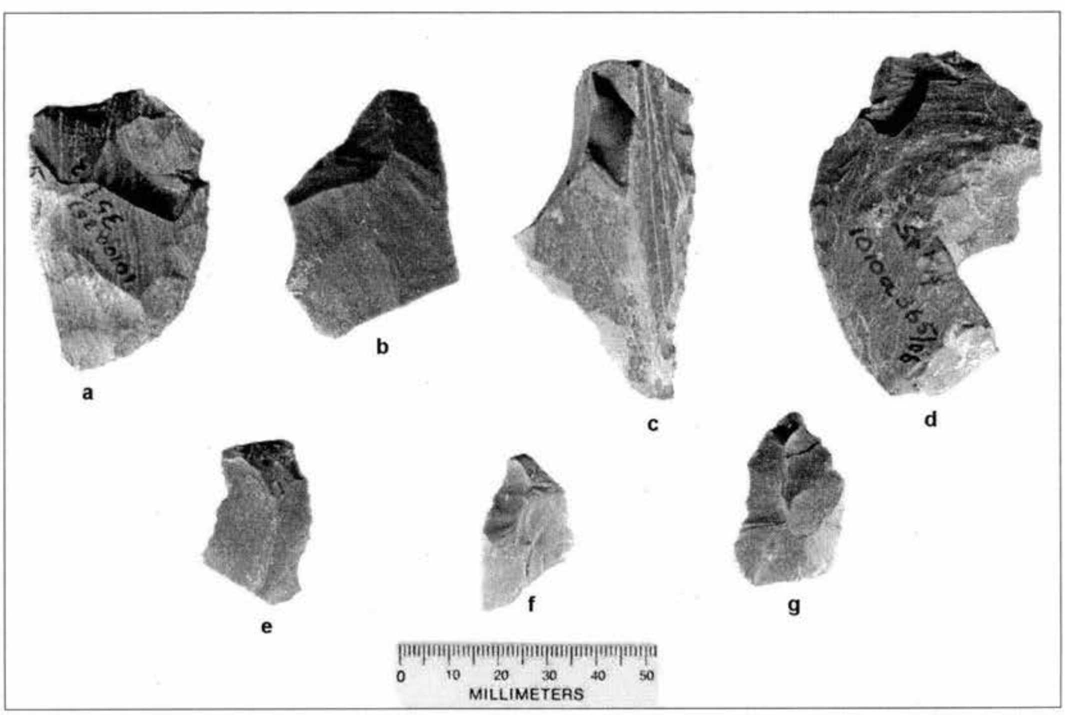


Figure 4.29. Type II Side Scrapers: *(a-d)* Type IIa Side Scrapers; *(e-g)* Type IIb Side Scrapers.

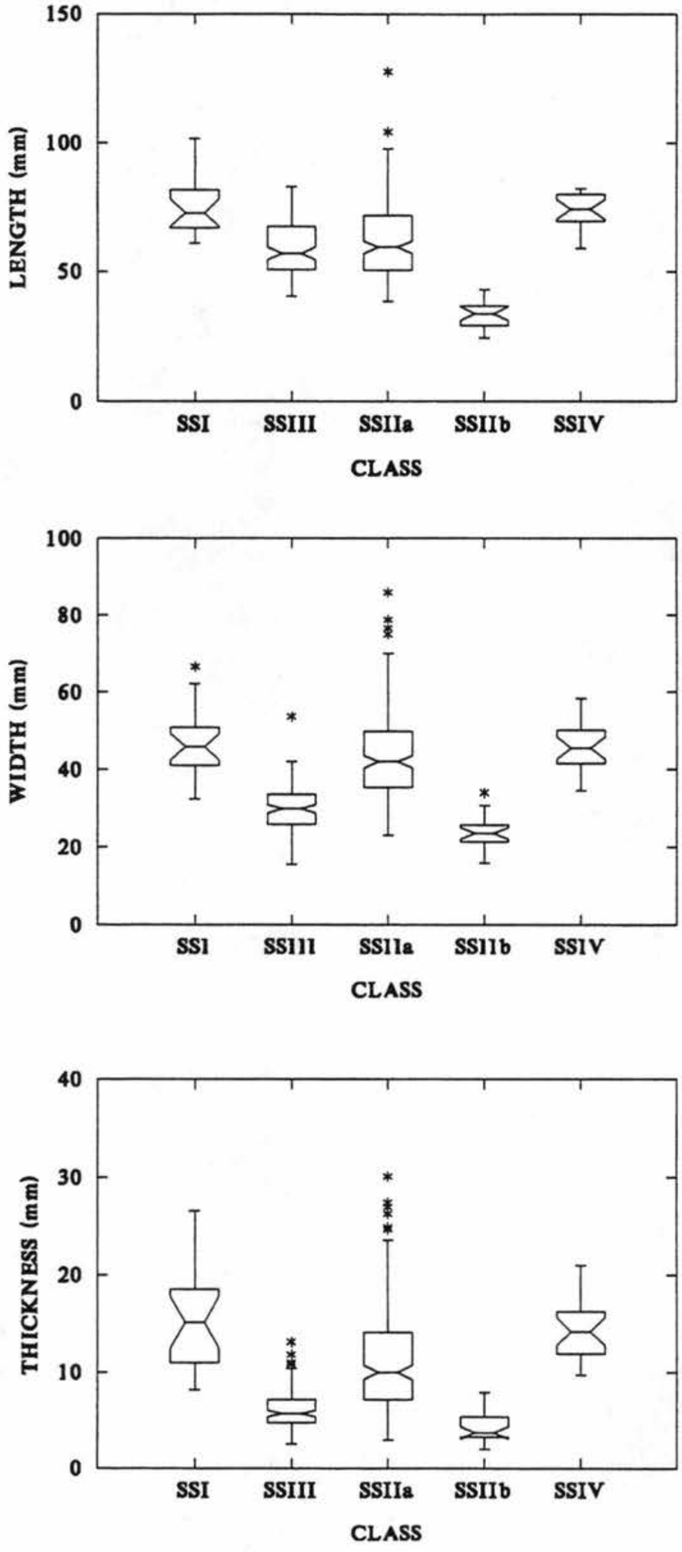


Figure 4.30. Boxplots comparing dimensions of length (top), width (middle), and thickness (bottom) for all side scrapers.

Table 4.7. Side Scraper Cross-section Tabulation.

	Triangular		Offset Triangular		Flat Trapezoidal		Convex Trapezoidal		Concave Trapezoidal		Plano-Convex		Other		Indeterminate		Total	
Type	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
I	1	5.0	5	25.0	4	20.0	1	5.0	2	10.0	2	10.0	5	25.0	-	-	20	100
IIa	37	16.7	48	21.7	36	16.3	7	3.2	12	5.4	27	12.2	47	21.3	7	3.2	221	100
IIb	2	8.3	11	45.8	3	12.5	-	-	1	4.1	3	12.5	4	16.7	-	-	24	100
III	26	21.1	33	26.8	28	22.8	2	1.6	6	4.8	16	13.0	12	9.8	-	-	123	100
IV	2	8.7	3	13.0	4	17.4	-	-	-	-	4	17.4	10	43.5	-	-	23	100

placed on somewhat large flake blanks of various shapes; the Type IIb Side Scraper (n=24) is essentially a much smaller version of the Type IIa.

Type IIb Side Scraper are significantly smaller than Type IIa Side Scrapers (Figure 4.30). The small size of this scraper may, in part, be related to its tendency to have been manufactured from a bifacial core rather than the block cores from which the Type IIa Side Scrapers were predominantly made (see blank discussion in Chapter V). Only a small number of these tools were identified, but this tool class may be underrepresented in the assemblage. Because of its small size and delicate nature, this tool easily could have passed through the half-inch screen during excavation. Moreover, given its delicate nature, it could have suffered postdepositional breakage making it more difficult to recover.

In general, bits for both side scraper types are unifacially retouched lateral edges. A majority of both types have only one bit, but a small percentage (16-17%) of both Type IIa and Type IIb side scrapers have double bits (Table 4.8). Moreover, the majority of both types exhibit retouch on the dorsal surface of the flake blank. Some Type IIa Side Scrapers (19.4%, n=43) and Type IIb Side Scrapers (16.7%, n=4), however, have at least one edge with retouch on the ventral surface. The significance of this mode of retouch, if any, is unknown.

Two Type IIa and one Type IIb Side Scrapers have bits that are slightly bifacially retouched. Although this bifacial retouch might technically exclude these items from being included in a unifacial class, the bifacial retouch is limited to the bit edge (i.e., it is not intended to thin the entire tool) and the overall morphology of the tool is otherwise virtually identical to other side scrapers.

Bits of both scraper types tend to be slightly convex or straight in plan view, although this distinction is somewhat arbitrary due to the difficulty in differentiating these two shapes. Among single-edge Type IIa Side Scrapers, convex (61.7%) and straight (30.6%) edges dominate bit shapes (Table 4.9). A similar pattern is noted

Table 4.8. Number of Bits for Type II and III Side Scrapers.

	Number of Bits							
	Single		Double		Indeterminate		Total	
Type	n	%	n	%	n	%	n	%
IIa	183	82.8	36	16.3	2	.9	221	100
IIb	19	79.2	4	16.7	1	4.2	24	100
III	90	73.2	33	26.8	-	-	123	100

Table 4.9. Cross Tabulation of Type IIa Side Scraper Bit Shapes.

	Number of Bits					
	Single		Double		Total	
Bit Shape Combination	n	%	n	%	n	%
Single-Straight	56	30.6	-	-	56	25.3
Single-Convex	113	61.7	-	-	113	51.1
Single-Concave	5	2.7	-	-	5	2.3
Single-Other	7	3.8	-	-	7	3.2
Double-Straight	-	-	7	19.4	7	3.2
Double-Convex	-	-	4	11.1	4	1.8
Double-Concave	-	-	2	5.6	2	.9
Straight-Convex	-	-	13	36.1	13	5.9
Straight-Concave	-	-	3	8.3	3	1.4
Straight-irregular	-	-	3	8.3	3	1.4
Convex-irregular	-	-	1	2.8	1	.4
Concave-irregular	-	-	1	2.8	1	.4
Double Other	-	-	2	5.6	4	1.8
Indet.	-	-	-	-	2	.9
Total	183	100	36	100	219	100

for single-edged Type IIb Side Scrapers (Table 4.10). The majority exhibit one straight and one convex bit edge (36.1%) or double straight (19.4%) edges, followed by lesser amounts of other bit shape combinations. With the small number of double-edged Type IIb Side Scrapers it is hard to determine any significant patterning. It is possible that bit shape is at least partially related to tool function among these artifacts and this is discussed in more depth below.

Similarly, from a use-life perspective, it might be hypothesized that double-edge side scrapers represent a more heavily worked single-edged variety. For example, in working with Mousterian assemblages, Dibble (1984, 1987) has suggested that doubled-edged side scrapers represent a later stage in a continuum of reduction than single-edged side scrapers. Following this interpretation, double-edged side scrapers began their use-life as single-edged scrapers but were subsequently converted when a second bit was manufactured on the opposing edge. This reduction model has important implications for interpreting side scraper variability beyond the Middle Paleolithic. Due to the morphological similarity of all laterally retouched unifacial tools, the question of intensity of reduction is plausible for any assemblage and bears examination here.

If side scrapers in the Hardaway assemblage were part of a similar reduction sequence, then it would likely manifest itself in the attributes associated with tool size. For example, given that the lateral edges were retouched, it would be expected that single-edged side scrapers would have greater widths (i.e., exhibit the removal of less stone) than the double-edged variety. However, this expectation is not met. A comparison of single-bit and double-bit tool median widths for Type IIa Side Scrapers show similar values which are not significantly different (Figure 4.31).

Similarly, an analysis of retouch intensity also does not support the reduction hypothesis. If double-edged side scrapers represent more heavily retouched single-

Table 4.10. Cross Tabulation of Type IIb Side Scraper Bit Shapes.

Bit Shape Combination	Number of Bits: Single n	Single %	Double n	Double %	Total n	Total %
Single-Straight	7	36.8	-	-	7	29.2
Single-Convex	9	47.4	-	-	9	37.5
Single-Concave	2	10.5	-	-	2	8.3
Single-Indet.	1	5.3	-	-	1	4.2
Double-Straight	-	-	1	25.0	1	4.2
Double-Concave	-	-	1	25.0	1	4.2
Straight-Convex	-	-	1	25.0	1	4.2
Straight-Concave	-	-	1	25.0	1	4.2
Indet.	-	-	-	-	1	4.2
Total	19	100	4	100	24	100

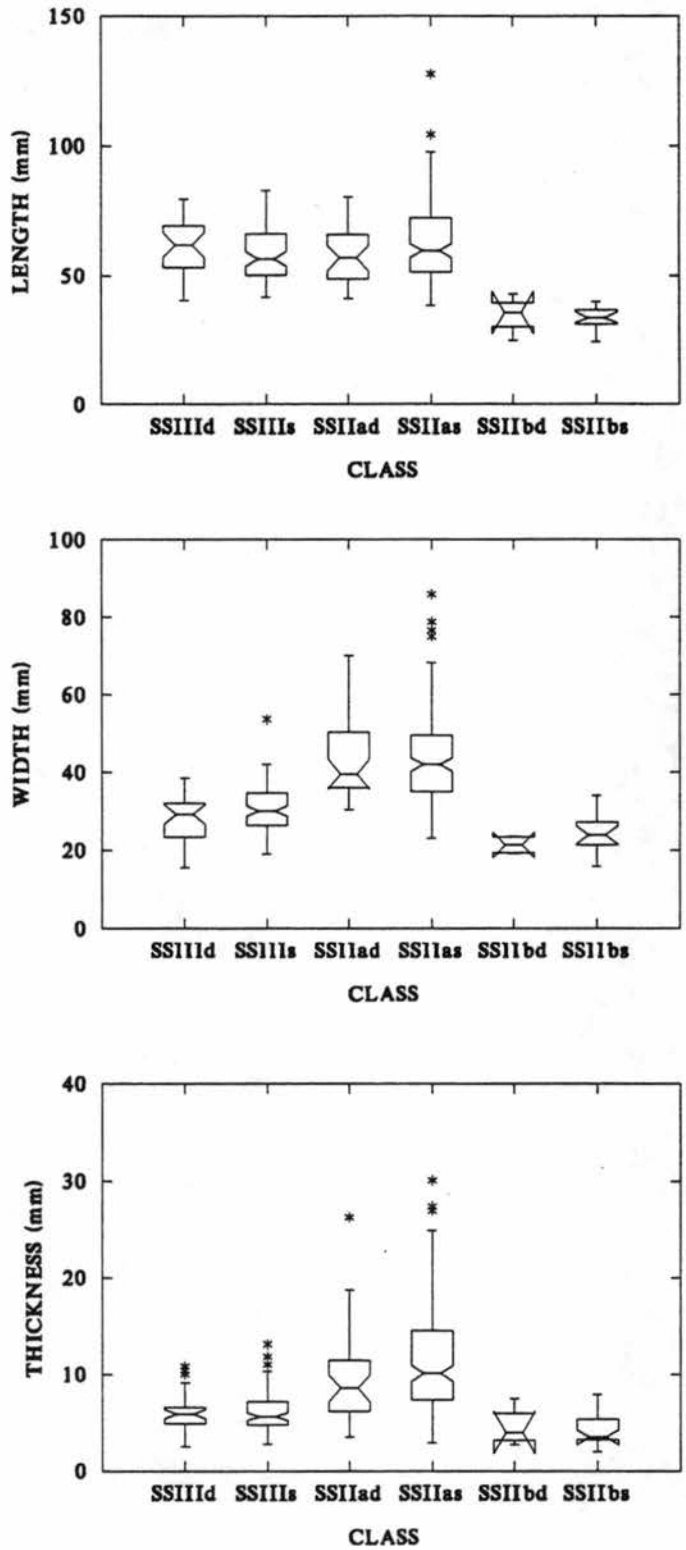


Figure 4.31. Boxplots comparing Type II and III Side Scraper dimensions for single (s) verses double (d) bit tools.

edged scrapers, then they should display the removal of relatively more bit edge than single-edged scrapers. This characteristic was roughly monitored on Type IIa Side Scrapers by measuring both the minimum and maximum values of the flake scar lengths on side scraper bits. Contrary to the reduction hypothesis, no significant differences exist in median values (either minimum or maximum) between the right bits of single- and double-edged side scrapers (Figure 4.32). In fact, median values for scar length of double bit side scrapers are slightly *smaller* than single bit side scrapers--precisely the opposite of what is anticipated with the reduction model.

Similar results are also reached from a comparison of the left bit edges between single and double bit side scrapers, except that median minimum retouch lengths are significantly different (Figure 4.32). Again, however, the median value of double bit side scrapers is smaller than the single bit variety.

Comparisons of tool width and retouch intensity, however, are only an indirect test of the reduction hypothesis as they assume that both groups were manufactured on similar size blanks. As Dibble (1987:39) points out, a more direct test would be to measure how much reduction has taken place on the side scrapers relative to their original blank size. Controlled experimental work (Dibble 1985; Dibble and Whittaker 1981; Speth (1972, 1975, 1981) has shown that original flake size is largely a function of striking platform size; that is, striking platform size is positively correlated with flake size. Thus, the relationship between striking platform size and artifact size allows us to estimate the amount of reduction that the tool has undergone. On the average, blanks that are more reduced should exhibit smaller ratios of flake area to platform area than blanks less reduced from their original size.

Given this, an estimate of tool reduction was derived on Type IIa Side Scrapers by dividing the remaining tool surface area (as estimated by the product of its length times width) by the surface area of the striking platform (as estimated by the product of its width times thickness). A comparison of the resulting ratios are also

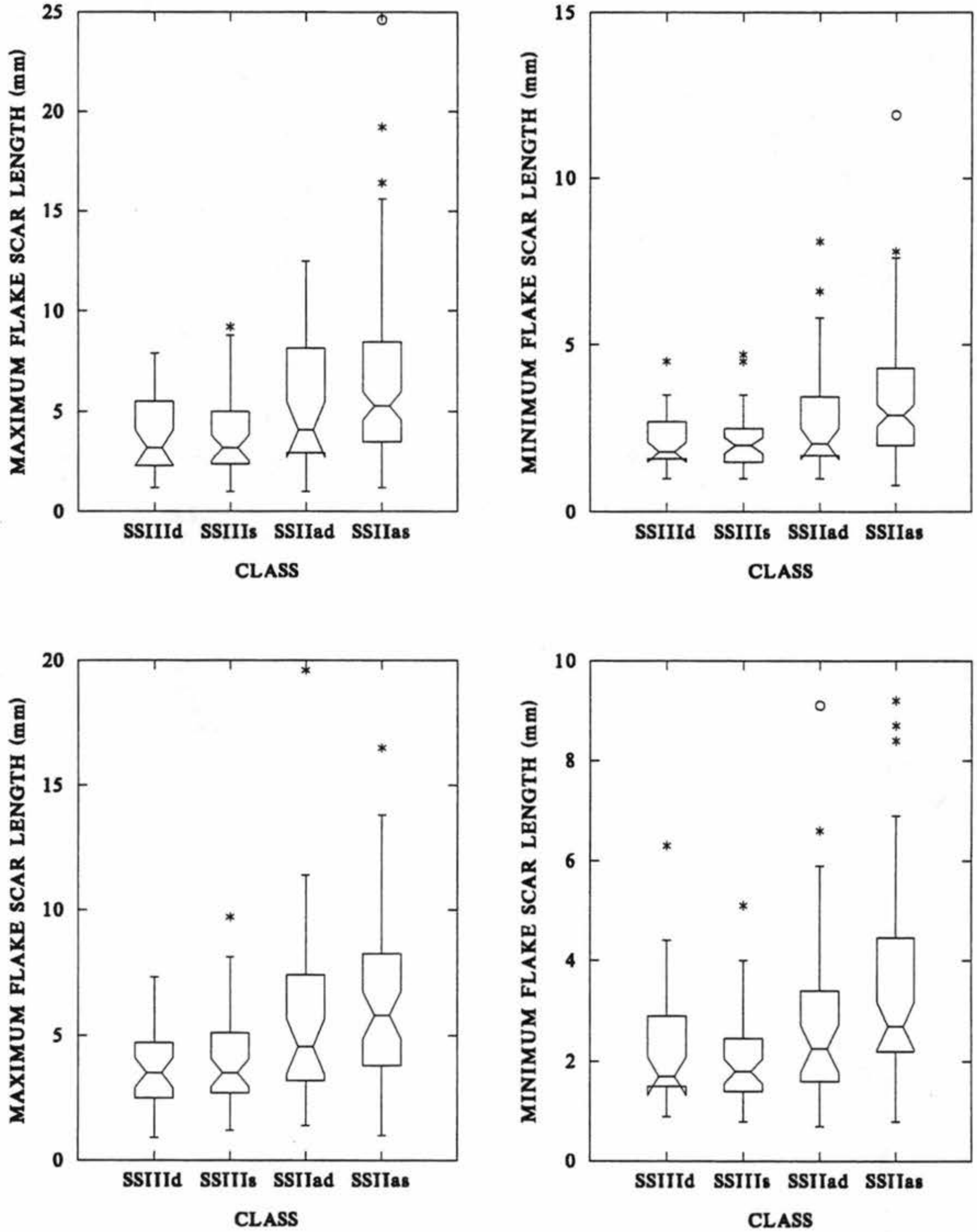


Figure 4.32. Boxplots comparing bit retouch lengths of left (top) and right (bottom) bits for single (s) and double (d) bit Type II and III Side Scrapers.

opposite the expectations of the reduction hypothesis (Figure 4.33). That is, single-edged Type IIa Side Scrapers have undergone more reduction (i.e., have smaller ratios) than the double-edged group. These results suggest that, if anything, single-edged side scrapers have undergone more reduction than double-edged side scrapers.

The rejection of this reduction hypothesis may be explained, at least in part, by side scraper blank morphology--in particular, the orientation of the striking platform in relation to the long axis of the blank. Side scrapers, by definition, have working edges that are parallel to the long axis of the tool. Most double-edged side scrapers (75%, n=27) display striking platforms that are positioned perpendicular to the long axis of the tool, essentially freeing two lateral edges for bit production. On the other hand, only about half (55.7%, n=102) of single-edged scrapers display striking platforms positioned in the above orientation. Instead, single-bit side scrapers have higher frequencies of platforms oriented at parallel or oblique angles (34.9%, n=64) to the long axis than do double-edged side scrapers (19.5%, n=7). Consequently, flake blanks with striking platforms oriented in this manner essentially leave only one edge suitable for bit production.

Given this explanation, the question remains: Why do blanks with two available edges exhibit only one bit? The answer may lie in the consistency of median width between double-bit (40mm) and single-bit (42mm) Type IIa Side Scrapers. Apparently, bit edges were retouched until a certain minimum width was attained, at which point the tool was discarded. If this is the case, it was not the number of retouched edges but the width to which the tool was reduced that was the significant factor in determining its use-life. Presumably this was related to grasping requirements since these side scrapers were probably unhafted (cf. Dibble 1987:39).

In sum, the above evidence suggests that few, if any, of the double-edged side scrapers at Hardaway were reworked from single-edged forms. While both kinds apparently were made on blanks of similar size, the variable shape of these

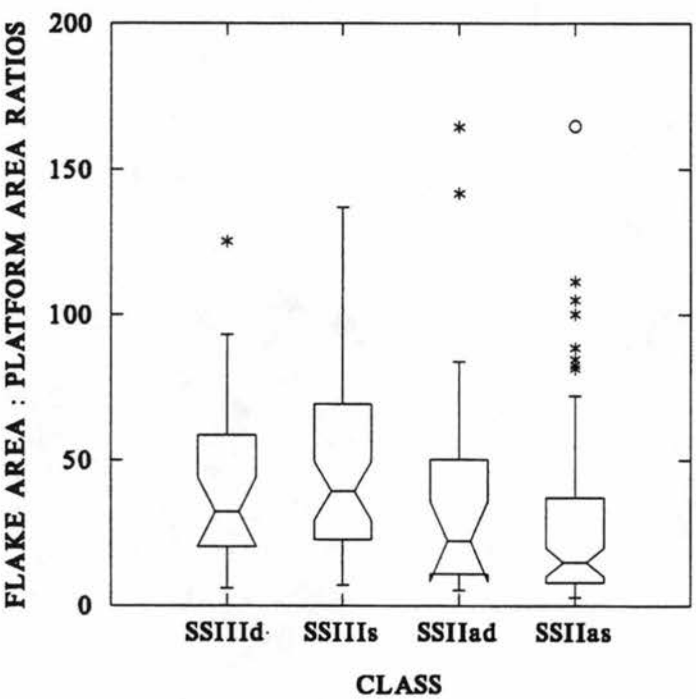


Figure 4.33. Boxplots comparing tool reduction (flake area:platform area ratios for single (s) or double (d) bit Type II and III Side Scrapers.

blanks in combination with width restrictions resulted in predominantly one edge being used for bit production.

Type III Side Scrapers. Coe (1964:79) defined these side scrapers as being made on relatively thin, narrow flakes (Figure 4.34). In fact, Type III Side Scrapers (n=123) are blade-like in appearance, being about twice as long as they are wide and, with the exception of the Type IIb Side Scraper, they have the thinnest median width (5.7 mm) among side scrapers in the assemblage (Figure 4.30).

As with the Type II Side Scraper these tools display single (73.2%) and double (26.9%) bits (Table 4.8). Bits are relatively thin and are generally slightly convex to straight in shape (Table 4.11). As is also the case with the Type II Side Scraper there appears to be no evidence for an intentional reduction sequence from single to double bits. No significant differences exist in tool dimensions between single and double-bit Type III side scrapers (Figure 4.31). As noted above, double-edged side scrapers should be significantly narrower in width than single-edged side scrapers, if the reduction hypothesis were true. And although the median area ratio of double-edged side scrapers is less than the single-edged variety, this difference is not a significant one (Table 4.11, Figure 4.33). Similarly, no significant difference is seen in retouch intensity between the two groups either (Figure 4.32). As in the Type II Side Scraper case, this suggests that it was the width to which the tool was reduced and not the number of retouched edges that was the important factor in tool use-life.

Type IV Side Scraper. I have identified a previously undefined type of side scraper in the Hardaway assemblage: a Type IV Side Scraper (Figures 4.35-4.36). A total of 23 specimens were identified that are very similar morphologically to the Type I Side Scraper, with the exception of one additional characteristic: the presence of a bifacial edge.

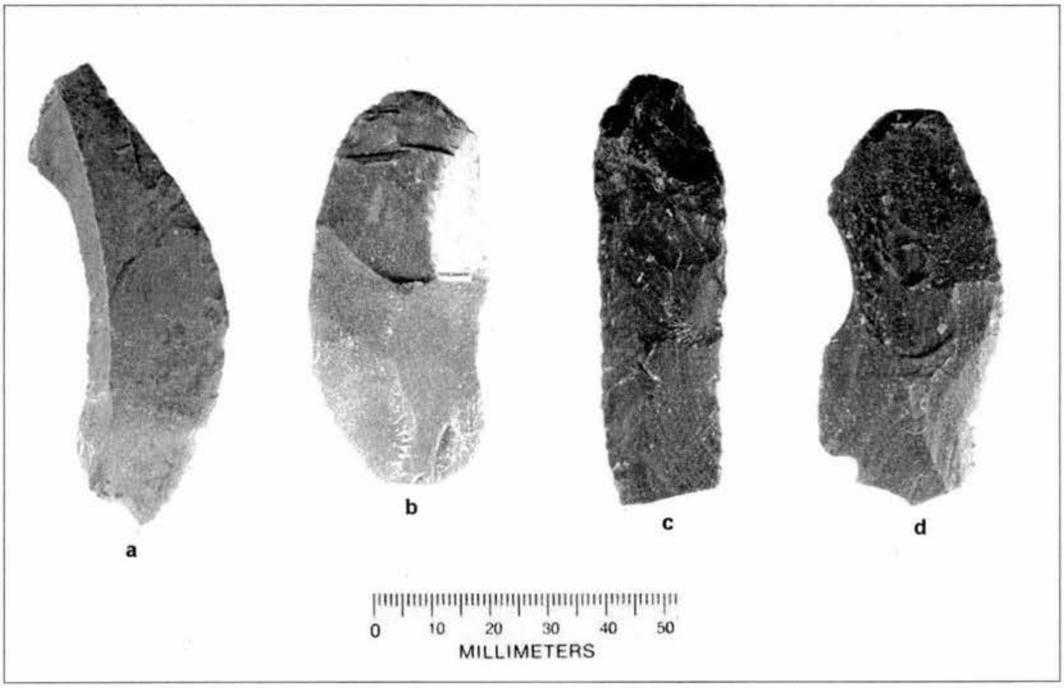


Figure 4.34. Type III Side Scrapers.

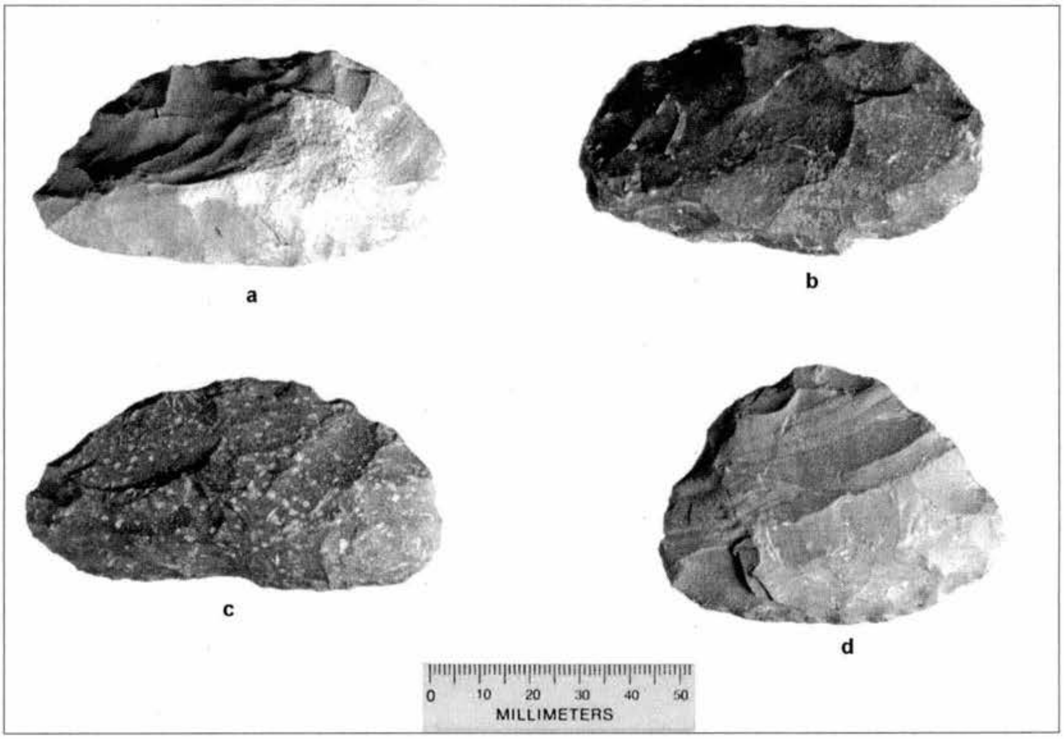


Figure 4.35. Type IV Side Scrapers (obverse).

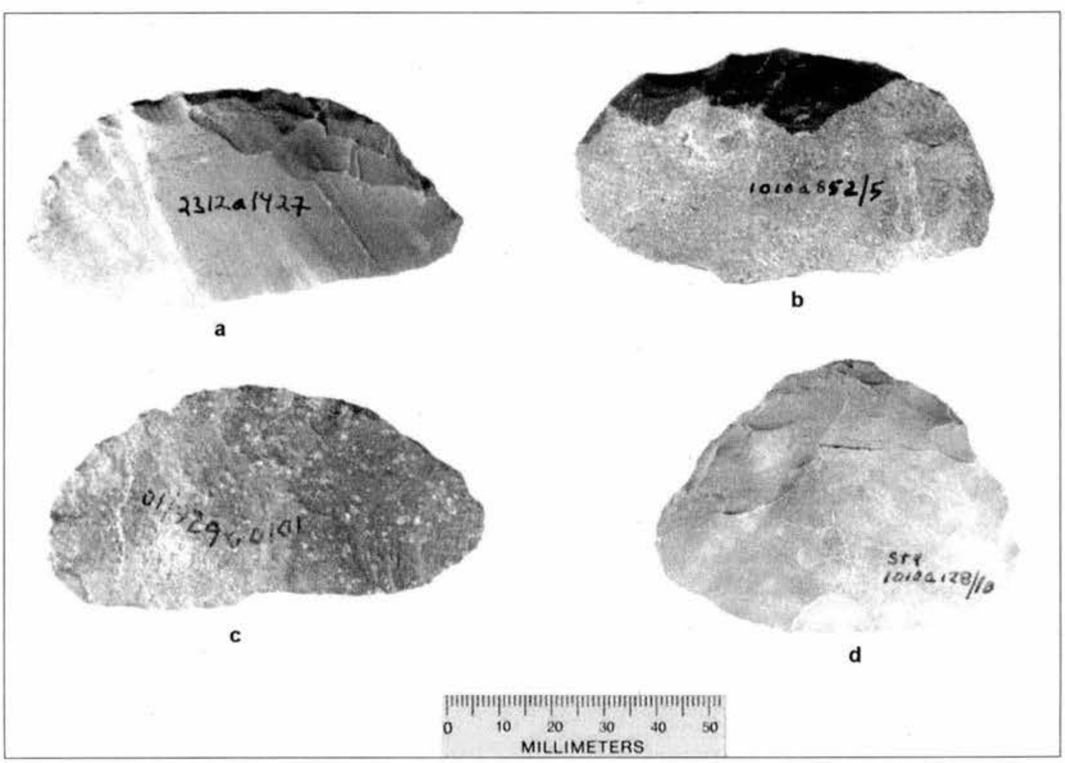


Figure 4.36. Type IV Side Scrapers (reverse).

Table 4.11. Cross Tabulation of Type III Side Scraper Bit Shapes.

Bit Shape Combination	Number of Bits: Single n	Single %	Double n	Double %	Total n	Total %
Single-Straight	29	32.2	-	-	29	23.6
Single-Convex	45	50.0	-	-	45	36.6
Single-Concave	3	3.3	-	-	3	2.4
Single-Other	13	14.4	-	-	13	10.6
Double-Straight	-	-	9	27.3	9	7.3
Double-Convex	-	-	4	12.1	4	3.3
Straight-Convex	-	-	9	27.3	9	7.3
Convex-Concave	-	-	1	3.0	1	.8
Straight-Irregular	-	-	1	3.0	1	.8
Convex-Irregular	-	-	5	15.2	5	4.1
Concave-Irregular	-	-	2	6.1	2	1.6
Double Other	-	-	2	6.1	2	1.6
Total	90	100	33	100	123	100

A comparison of the two scraper types reveals that there are no significant differences in length, width, and thickness (Figure 4.30). Likewise, the Type IV Side Scraper has a relatively thick, broadly convex unifacial bit edge virtually identical to the Type I Side Scraper bit. Moreover, no significant differences are found in minimum or maximum bit thickness between the two scrapers; nor are there any significant differences in minimum or maximum bit flake scar length (Figure 4.37).

What is different between the two side scrapers is the presence of a bifacial edge opposite the unifacial bit edge of the Type IV Scraper on all but two of these tools. These latter two specimens, however, exhibit extensive unifacial thinning of the striking platform that is similar in nature to the bifacial thinning.

Two explanations may account for this additional modified edge. First, this bifacial edge could have been functional, resulting in a multipurpose tool. For example, the unifacial edge may have been used for scraping purposes while the bifacial edge may have been was used for cutting activities. This interpretation, however, presents a problem. In order to use the unifacial edge, the tool has to be held by its bifacial edge and vice versa. This mode of use is not very practical. Rather, I think the bifacial edge is the result of retouch intended to thin the tool for hafting--much like the proximal thinning present on end scrapers--while the unifacial edge was the actual working edge.

Additional support for this interpretation can be seen by an examination of the mode of bifacial retouch. The bifacial edge displays relatively large percussion flake scars that appear to be struck more to thin the edge than to shape it. Moreover, these edges routinely lack small retouch flake scars that are typically the result of sharpening bifacial edges.

Assuming that this modification is designed to facilitate hafting, the question remains as to the positioning of the tool in the haft. This issue is raised due to the unusual orientation of the presumed hafting retouch in relation to the bit. As in the

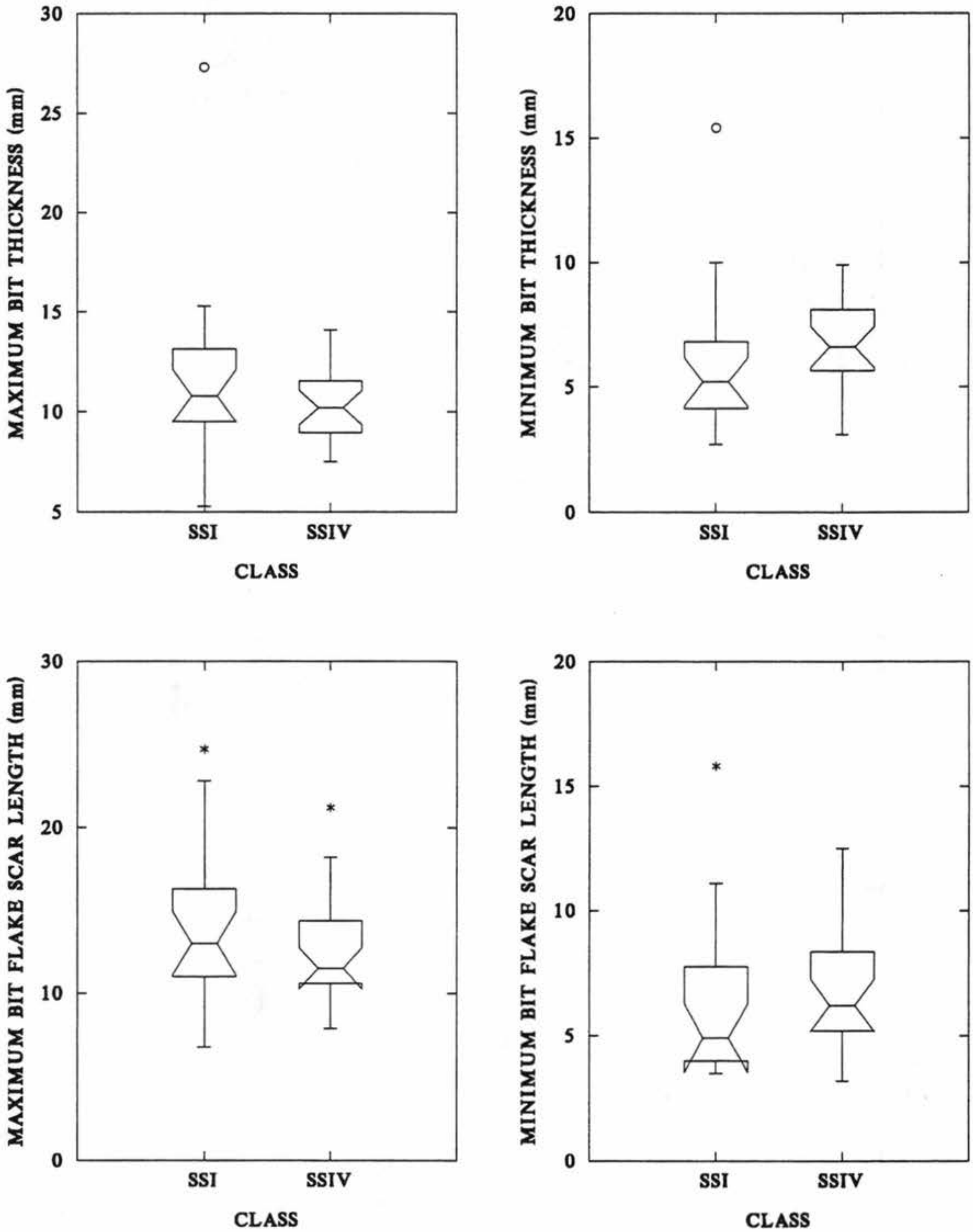


Figure 4.37. Boxplots comparing bit thickness (top) and bit flake scar length (bottom) for Type I and Type IV Side Scrapers.

cases of the end scrapers and adzes mentioned earlier, retouch for hafting is located perpendicular to the bit; this is not the case for the Type IV Side Scrapers. As noted above, the hafting retouch is oriented parallel to the bit. If this interpretation is accurate, this tool may likely have been hafted in such a fashion that it could have been use two-handed in a draw-knife fashion.

Although I have used the hafting modification as an attribute important enough to separate this side scraper from the Type I form, this distinction may be more apparent than real. The absence of a bifacial edge on the Type I Side Scraper does not necessarily mean that it was not hafted. The tool blank for the Type I Side Scraper may have been sufficiently thin to begin with, eliminating the need for further thinning. The absence of any significant difference in median tool thickness between the two types suggests such a possibility (Figure 4.30).

Functional Considerations. As with end scrapers, precise determinations of side scraper functions must await microwear analyses. Nevertheless, it is likely that a variety of functions are represented among the side scrapers in the assemblage, based on their varying shapes and edge characteristics.

Following Wilmsen (1970), edge angles are routinely reported in lithic analyses and are often relied on for functional determination. Wilmsen's (1970) found patterning in edge angle distributions among Paleoindian scrapers and suggested these distributions represented functional categories. For example, Wilmsen (1970:70-71) suggested that relatively acute (i.e., 26°-35°) angles were associated with cutting on soft materials such as meat and skin, while steeper angles (i.e., 66°-75°) were representative of bone or wood working or heavy shredding. Middle-range values (i.e., 46°-55°) were suggested to have been associated with a broad range of activities such as skinning, hide working, sinew and plant-fiber shredding, and heavy cutting.

While an association between edge angles and tool functions is intuitively appealing, the link between the two still remains undemonstrated. And while a complete reliance on edge angles to determine tool function may be unwarranted, edge angles are probably associated with tool functions at some level, even if an interpretation of the functions remain unclear.

Frequency histograms comparing the distributions of mean bit edge angles for each side scraper type are displayed in Figures 4.38-4.41. Excluding Side Scraper Types I and IV for the moment, a broad range of values from 25° to 85° is exhibited. The distribution of Type IIa Side Scrapers displays peaks at 65° for both left and right bits, while Type II Side Scrapers have peaks at 55° for left bits and 60° for right bits. Perhaps more importantly, however, is the suggestion of multimodality within these ranges--particularly for the Type III Side Scraper. (The multimodality seen in the Type IIb Side Scraper may be spurious for two reasons. The first reason is related to the small number of tools [n=24]. Second, the tools' small size made accurate estimates of edge angles very difficult.)

Based on Wilmsen's classification, a number of different functional categories are present among Type II and III Side Scrapers. The possibility of multifunctional applications is also consistent with the varying bit shapes on these specimens noted earlier. Although tool functions among these scraper types probably overlapped, I speculate that the Type IIa Side Scrapers were probably used more often on harder materials than Type IIb or Type III Side Scrapers. This inference is based upon their larger size (thickness in particular) more conducive to working on dense substances. Given their thinness and delicate nature, Type III Side Scrapers probably were employed on lighter materials such as soft woods and meat. In short, morphological variability combined with the evidence of multiple functions all suggest that Type III Side Scrapers were an expedient tool.

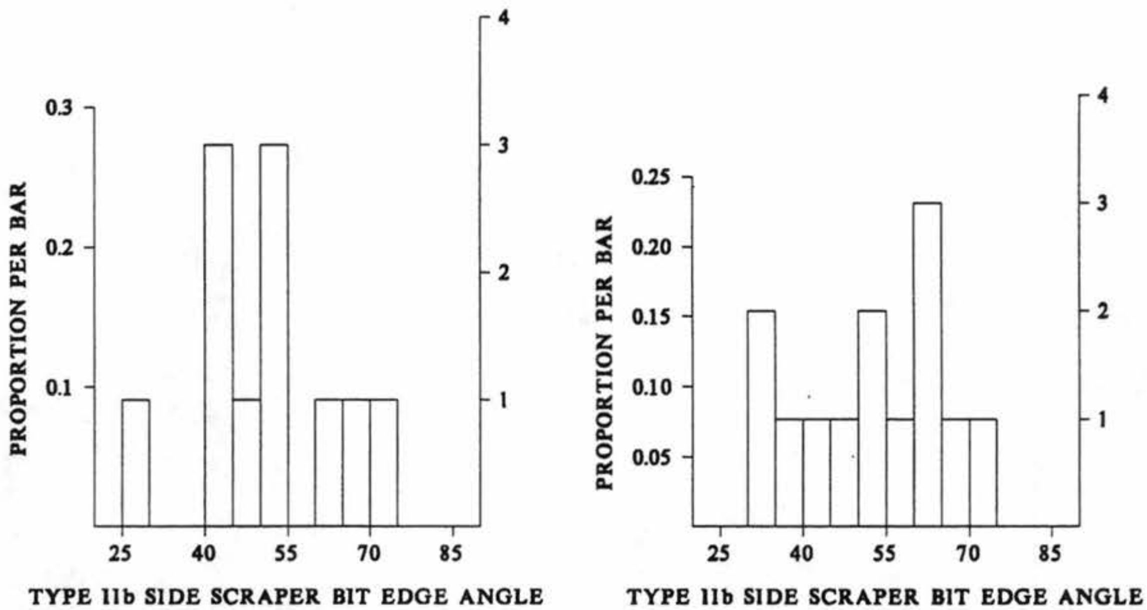


Figure 4.38. Histograms of left (left) and right (right) Type IIb Side Scraper mean bit edge angles.

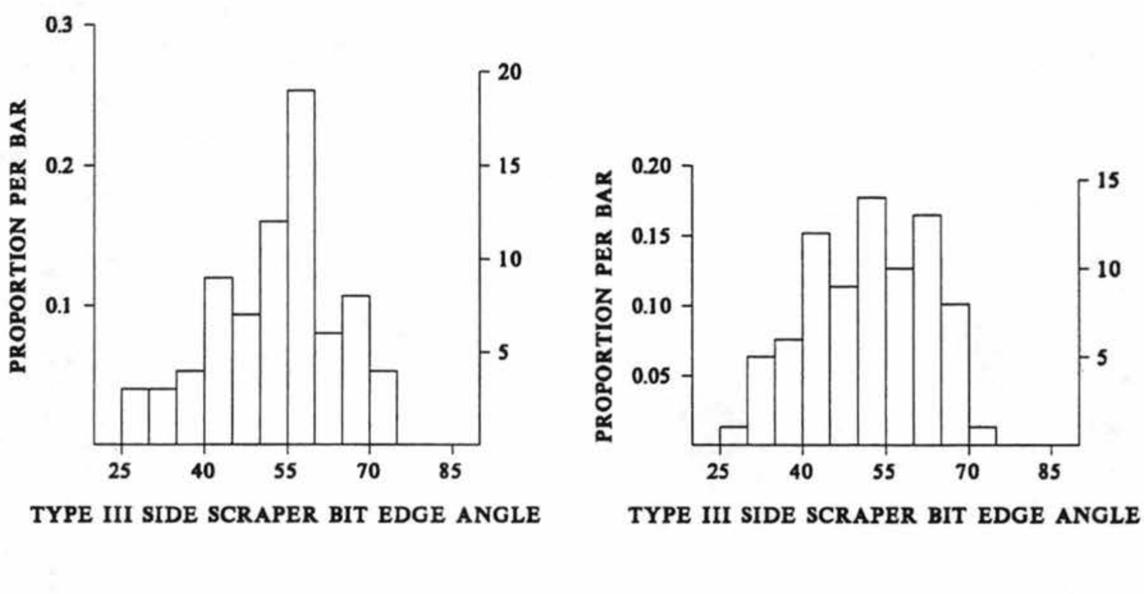


Figure 4.39. Histograms of left (left) and right (right) Type III Side Scraper mean bit edge angles.

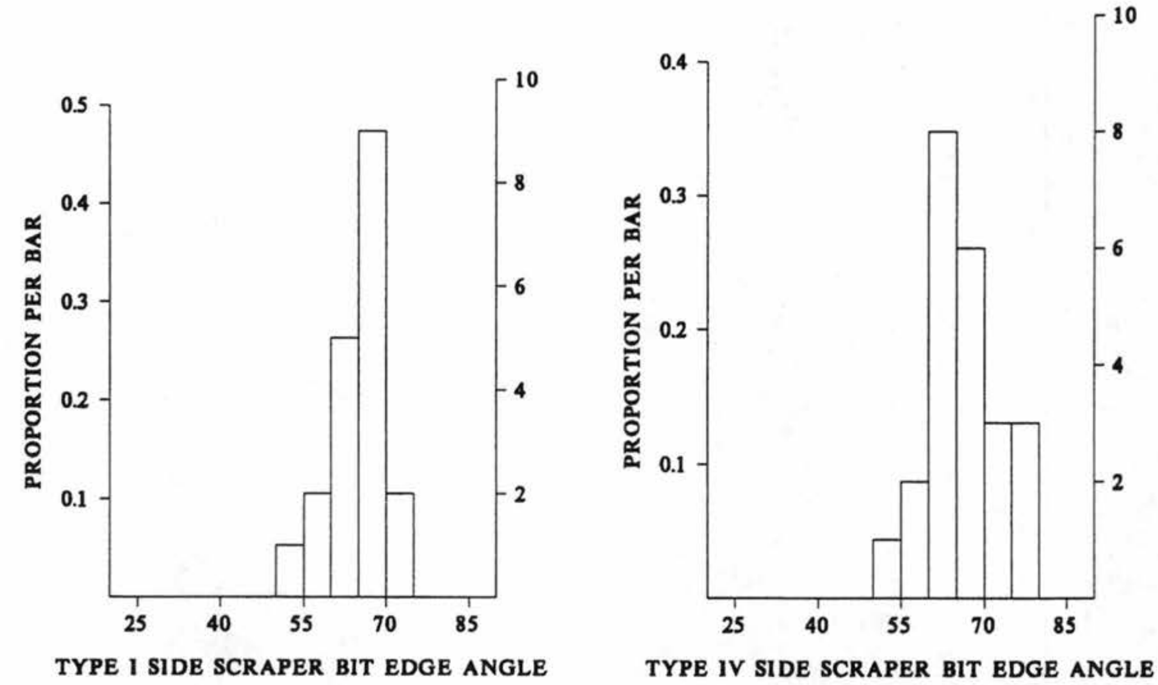


Figure 4.40. Histograms comparing mean bit edge angles of Type I Side Scrapers (left) and Type IV Side Scrapers (right).

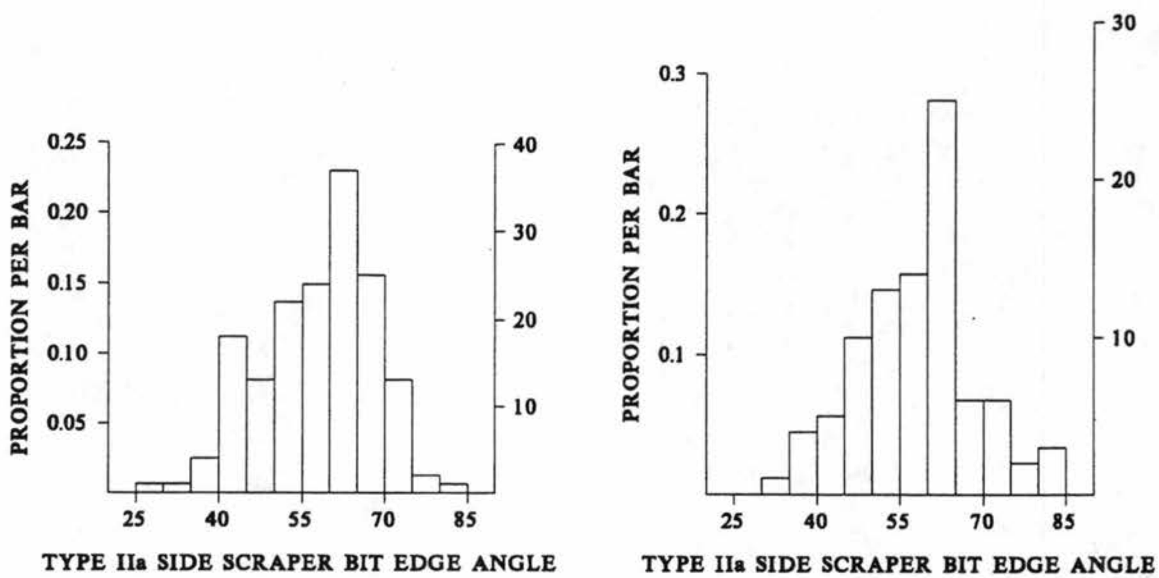


Figure 4.41. Histograms of left (left) and right (right) Type IIa Side Scraper mean bit edge angles.

Type I and IV Side Scrapers, on the other hand, have unimodal edge angle histograms that are much narrower in range (55°-80°) than the previous side scrapers. In fact, the edge angle distributions are more like those of end scrapers than other side scrapers. This similarity, however, is not meant to imply hide working functions for these scrapers since no evidence of edge rounding was observed on their bits. Rather, the relatively steeper edge angles, the narrower range of edge angles, and the tools suggest heavy scraping activities consistent with their use as a draw knife.

Other Unifacial Tools

The remaining flake tools in the assemblage include a variety of unifacial types. Some of these were previously reported by Coe (1964) (e.g., Pointed Scrapers, Oval Scrapers and Drills) while others (e.g., Hafted spokeshaves, and Denticulates) were not but have been found in other Early Archaic assemblages.

Oval Scrapers. Five oval scrapers are present in the assemblage (Figure 4.42:a-b). These tools exhibit well executed, continuous retouch around the tool margins resulting in a circular outline in plan view (Coe 1964:79). Although Coe (1964:79) noted oval scrapers were recovered from all levels of his excavations, he suggested that they were associated predominantly with the Hardaway component. Similar tools have been found in Dalton contexts in Arkansas (Morse 1973:27), and in Suwannee/Bolen contexts in Florida (Daniel and Wisenbaker 1987:69-70).

Morse (1973:27) has suggested that these tools may represent a hand-held version of the triangular end scrapers. While the specimens in the Hardaway assemblage were probably unhafted, they lacked the noticeable edge rounding that occurred on the end scrapers, and given their relatively thick bits and steep edge angles they were probably used to scrape heavy materials.

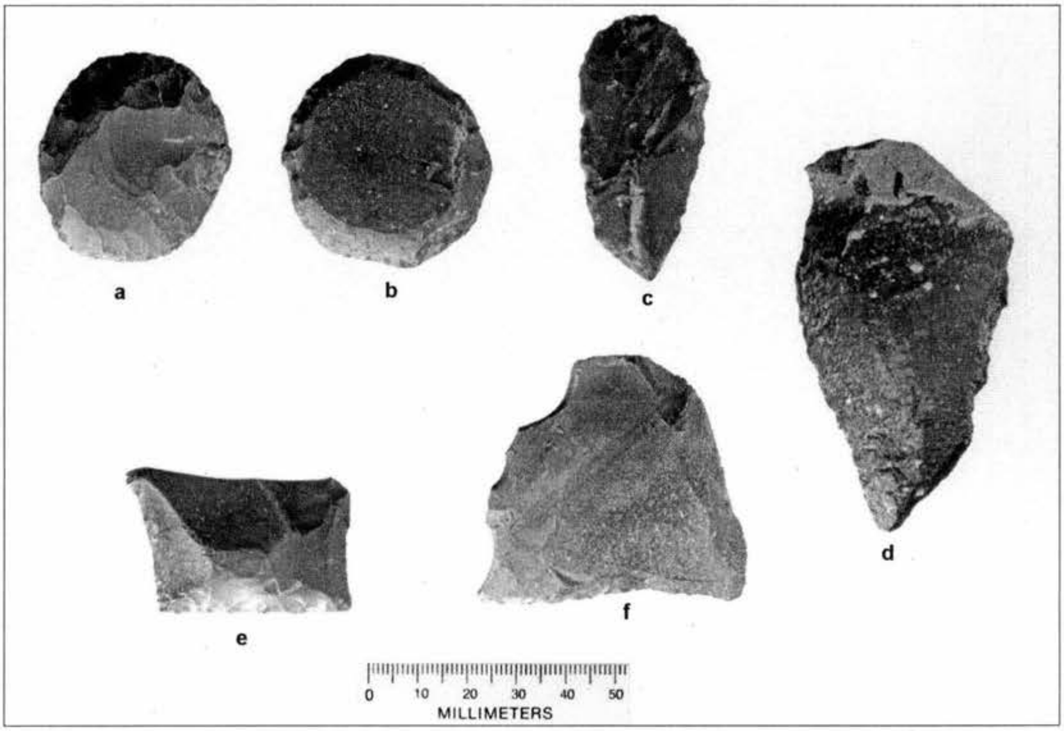


Figure 4.42. Other unifacial tools: *(a-b)* Oval Scrapers; *(c-d)* Pointed Scrapers; *(e-f)* Miscellaneous Scrapers.

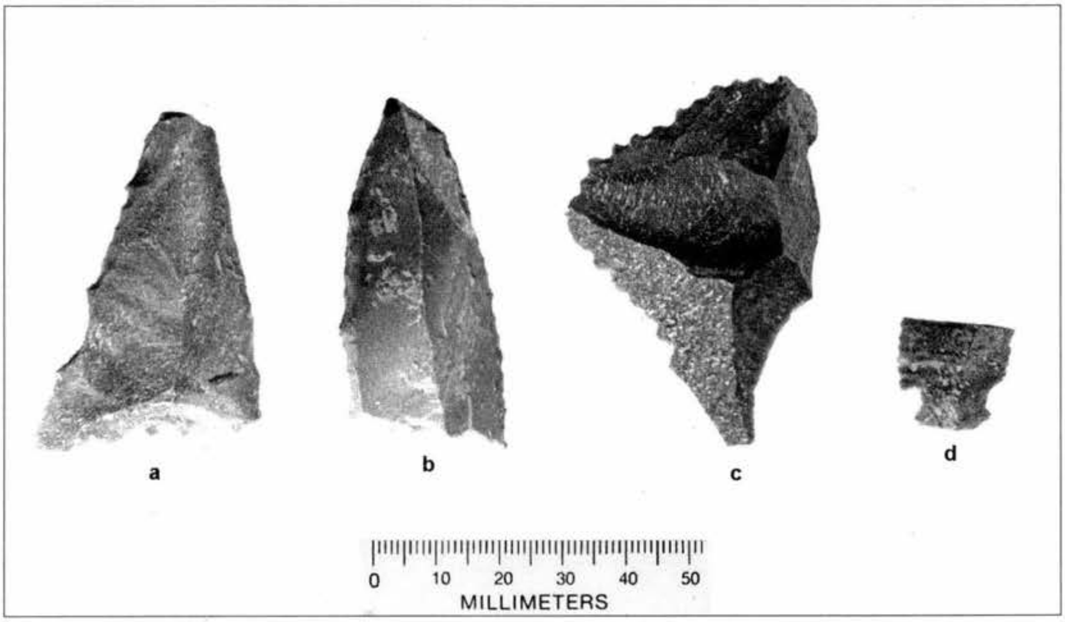


Figure 4.43. Hafted Spokeshaves, Denticulates, and Waller knife: *(a-b)* Hafted Spokeshaves; *(c)* Denticulate; *(d)* Waller knife.

Pointed Scrapers. Coe (1964:79) defined a pointed scraper as an "adaptation of the type II side scraper," produced "from a thick flake with two sides shaped to form a definite point." Nine such specimens were identified in the assemblage (Figure 4.42:c-d). Based upon a noticeable difference in flake blank size I have divided pointed scrapers into two groups. Type Ia Pointed Scrapers were made on thicker flake blanks consistent with Coe's definition. Type Ib Pointed Scrapers, however, were made on thinner flake blanks that do not strictly fit his original description. Nevertheless, they still display retouched edges that form a point and are included here based on that criterion.

Of the nine tools, five have their points formed from the retouch of two straight lateral edges that converge distally; the remaining four specimens have one laterally retouched edge angled transversely across the flake blank until it reaches the opposite lateral edge--essentially forming a distal bit.

Following Coe's description, it might be concluded that pointed scrapers were modified side scrapers. That is, these pointed scrapers might represent a more heavily reduced Type IIa or Type III Side Scraper. The small number of these specimens make this determination difficult. Regardless, the similar nature of bit attributes with those of Type II and Type III Side Scrapers would suggest comparable tool uses.

Miscellaneous Scrapers. This class essentially represents a residual category of unifacial flake tools that could not be placed in any of the previous types. It includes 17 tools exhibiting a variety of shapes and sizes (Figure 4.42:e-f). They exhibit at least two and sometimes three adjoining unifacially retouched edges that have straight, convex, and concave shapes. Given their variety of shapes and sizes these were presumably hand held tools manufactured for specific tasks on an ad hoc basis.

Indeterminate Scrapers. A total of 231 unifacially retouched artifacts are too broken or fragmentary to assign to any of the previous categories and are thus classified as indeterminate scrapers. In all likelihood, however, these specimens represent some type of side scraper.

Hafted Spokeshaves. This tool type was originally defined by Goodyear (1973, 1974) who noted its occurrence in Dalton contexts in Arkansas and possibly similar early contexts in Florida. Confirmation of this association in central Florida has come from excavations at Harney Flats where they were recovered in Suwannee/Bolen contexts (Daniel and Wisenbaker 1987:85-86).

The Hardaway assemblage contained only two specimens, one of which has a missing bit (Figure 4.43:a-b). They were both made on a blade-like flakes with marginal lateral retouch resulting in a slight tapering towards the striking platform. The one complete specimen displays a slightly concave, steeply retouched working edge that is typical of this tool. It also exhibits a graver spur at one corner of the working edge. It may in fact have had two graver spurs, but damage at the other corner prevents this determination. Goodyear (1973:40) has noted these graver spurs often occur on both sides of the bit. Moreover, he has also suggested that these small tools were hafted and used for scraping materials such as wood.

Denticulates. Two denticulates were identified in the assemblage (Figure 4.43:c). This tool class was identified by the presence of a series of regularly-spaced small sharp projections along the working edge bit that results in a serrated or saw-like bit. One specimen was made on a relatively thin flake, exhibiting a thin bit with shallow flake removals continuously along adjacent lateral and distal edges. The remaining denticulate was made on a thicker flake and displayed shallow but wider and steeper flake removals along one lateral edge. Presumably these items would have been used in a cutting fashion on materials of soft to medium hardness.

Waller knife. A single example of what appears to be a broken "Waller knife" is present in the assemblage (Figure 4.43:d). This tool class was originally noted in Florida (Purdy 1981:31-32; Waller 1971:173-174) where it was identified as a small unifacial tool with distinctive small side notches--presumably for hafting.

The specimen from Hardaway was made on a small flake and is only 18.1 mm wide and 4.3 mm thick. Small U-shaped notches form the base and are bifacially chipped. The blade, which is broken, exhibits very light unifacial retouch on the ventral surface of both lateral edges. Given its small size and delicate nature this tool could not have been used in heavy duty activities. Cutting of soft materials is probably the function of this tool (Purdy 1981:31-32).

This type has been found in Early Archaic contexts in Florida (e.g., Bullen and Beilman 1973) and Mississippi (e.g., Geiger and Brown 1983) and has been observed in private collections from South Carolina (Goodyear et al. 1979). Occurrences of this tool in the Piedmont are rare; it is much more commonly found in the Coastal Plain.

Drills, Perforators, and Gravers. Twenty-eight tools exhibiting flaked projections were identified in the assemblage which have been sub-divided into two groups based on bit shape. Eight have been classified as drills/perforators on the basis of their relatively long pointed bits formed by either bifacial or unifacial retouch. The second group has much shorter "graver" projections formed by unifacial retouch. In both cases, this retouch is usually present at the lateral-distal juncture of the flake.

Within the first group, three of these tools could be classified as "drills" since they exhibit bifacial retouch forming a definite rod-like projection that is biconvex or diamond shaped in cross-section (Figure 4.44:a-b). Only one is complete, however, with the projection measuring 25 mm in length (Figure 4.44:a). Two of the specimens were probably hafted as they are retouched along the flake's lateral margins beyond the bit. Given their sturdy appearance, these tools were probably used on dense materials.

The remaining five specimens have relatively long, thick bits formed by unifacial retouch and morphologically resemble perforators (Figure 4.44:c-d). Their bits are relatively thick and triangular in cross section. One exception is a very well made specimen except that it has a thinner more delicate bit than the others (Figure 4.44:d). As such it appears more suited to punching holes in soft material such as hides. The other perforators, however, could have been used to bore holes in denser materials.

Gravers are characterized by a relatively short unifacially flaked projection that ranges from 3 to 5 mm in length (Figure 4.44:e-g). Twenty such tools were identified in the assemblage. Gravers traditionally have been interpreted to create fine engravings or create small slots in bone or wood. Most of the specimens in the Hardaway assemblage exhibit relatively thick stubby bits capable of being used to incise dense material such as wood, bone, or antler.

LARGE CHIPPED-STONE TOOLS

Two categories of large roughly chipped stone tools are also present in the assemblage: choppers and cores/scrapers.

Choppers

Twelve choppers were identified in the assemblage (Figure 4.45:a-b). These are large roughly chipped stone tools that are oval to rectangular in plan view, and tend to have a broad crudely shaped convex working edge. Flaking is usually bifa-

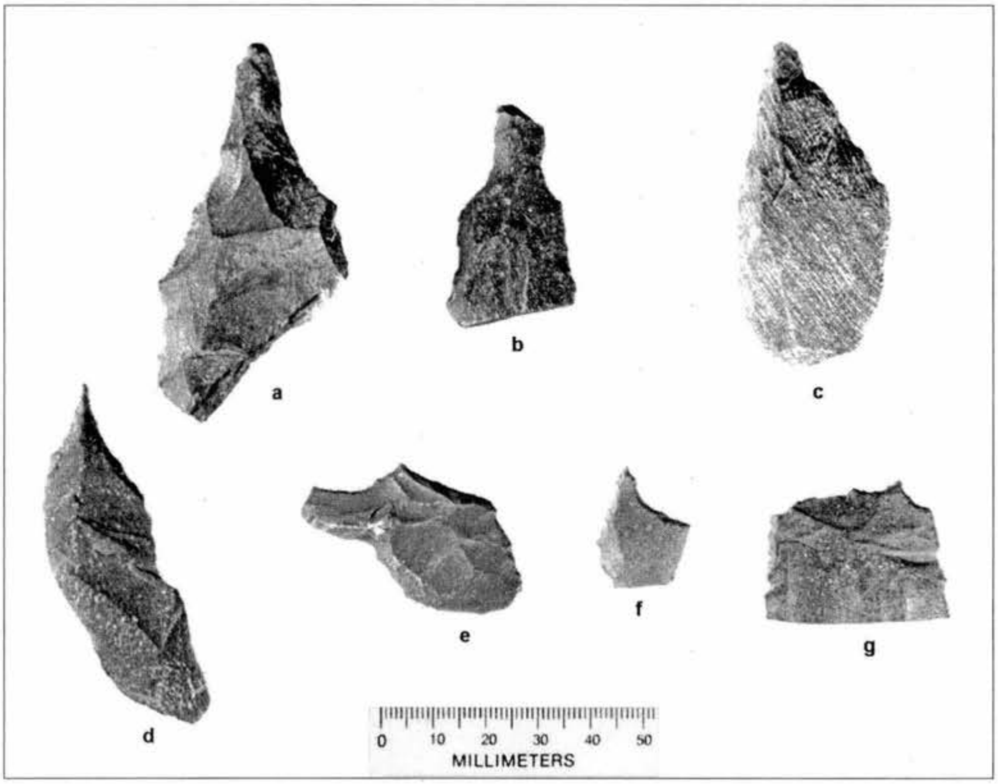


Figure 4.44. Drills, Perforators, and Gravers: *(a-b)* Drills; *(c-d)* Perforators; *(e-g)* Gravers.

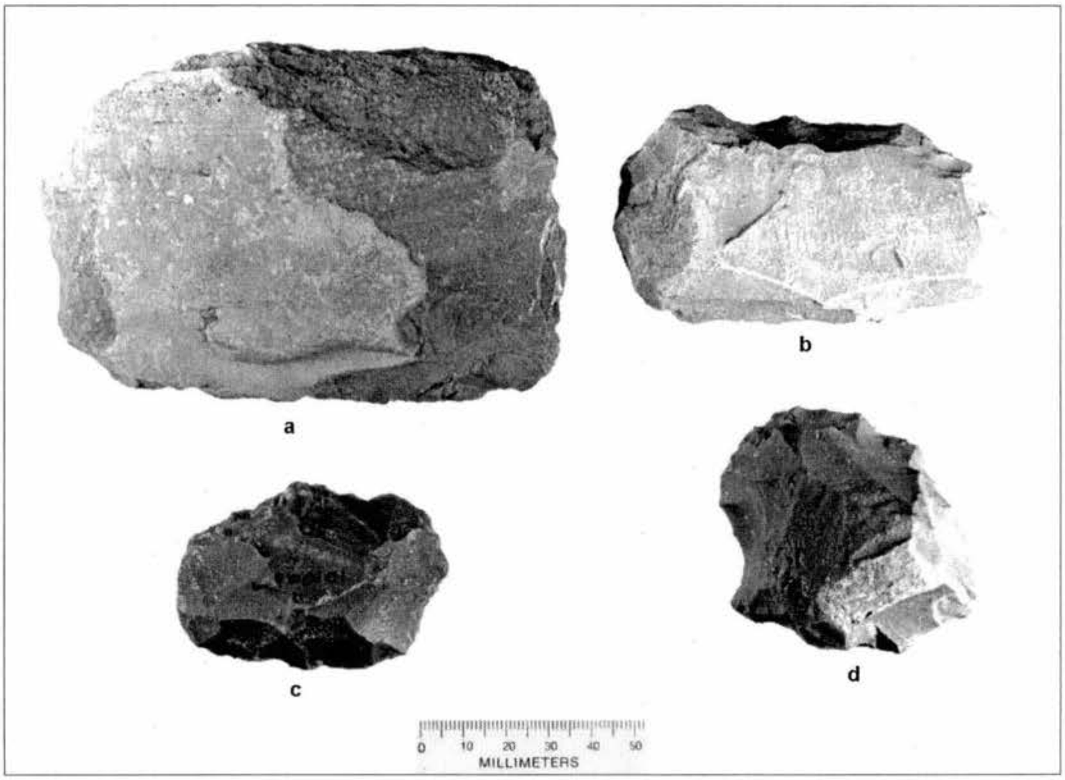


Figure 4.45. Choppers and Core/Scrapers: *(a-b)* Choppers; *(c-d)* Core/Scrapers.

cial, although some are unifacially chipped and flaking is confined to the tool margins. Given their large size these tools were probably used in heavy-duty chopping or digging activities.

Cores/Scrapers

This category includes six large unifacially chipped artifacts, somewhat smaller in size than choppers and more regularly flaked (Figure 4.45:c-d). They tend to be plan-convex to trapezoidal in cross section and have the appearance of being cores that were slightly modified into scrapers. All of these artifacts have a relatively large, flat, oval surface that served as the striking platform for all flake removals. In fact, two of these specimens actually resemble polyhedral cores.

CORES

In addition to the bifacial cores mentioned earlier, three additional core types are represented at Hardaway: a blocky, irregular-shaped core, and two bipolar core forms. Included in this category are 88 examples of cores and core fragments, and with one exception--an unusual small chunk of chalcedony--are all made from rhyolite and quartz. All of these artifacts are small and exhibit at least one negative bulb of percussion or are blocky chunks lacking any obvious flake characteristics, perhaps representing large pieces of shatter.

Block Cores

Six blocky shaped rhyolite cores including five aphyric and one porphyritic variety are present in the assemblage weighing from 110-265 g. These are medium sized blocky-shaped specimens displaying flake removal from different directions. An additional eighteen examples are all aphyric rhyolite chunks that range from 26-163 g.

One small specimen is unusual for its raw material. It is a semi-translucent chunky piece of chalcedony with a waxy luster that varies form amber to reddish-orange in color. The source of this stone is unknown. It, is roughly rectangular in plan view with a diamond-shaped cross section and weighs only 21 g. Its small size has prevented much in the way of further reduction with most of the flaking confined to one face located along one edge of the piece. Two other flake scars are present on the opposite face along the same edge at what may be an early attempt at bifacial flake removal.

Finally, small (10-188 g) blocky white quartz cores (n=30) that display no more than one or two flake scars--as if the material was being tested for flaking quality--are also present in the assemblage.

Bipolar Cores and Pièces Esquillées

Another 29 artifacts are quartz crystal, most of which are the clear glassy type, and have undergone bipolar flaking (Figure 4.46:a-d). These are small specimens, weighing from 4-72 g; they tend to be thick and amorphous with elongate flake scars originating from opposite directions on more than one face of the crystal, several of which retain remnants of the original, faceted, crystal surface (cf. Binford and Quimby 1963; Hayden 1980).

The small size and faceted surface of these crystals virtually precludes any other flaking technique than bipolar percussion. Thus, the use of a bipolar technique--placing the raw material on an anvil and repeatedly striking it with a hard hammer to derive small flakes--allows the reduction of these small pieces of hand held raw material.

An additional four artifacts were identified as *pièces esquillées*--the more common formalized bipolar artifact class found in several Paleoindian and Early Archaic assemblages (e.g., Chapman 1975; Goodyear 1974, 1992; Lothrop and

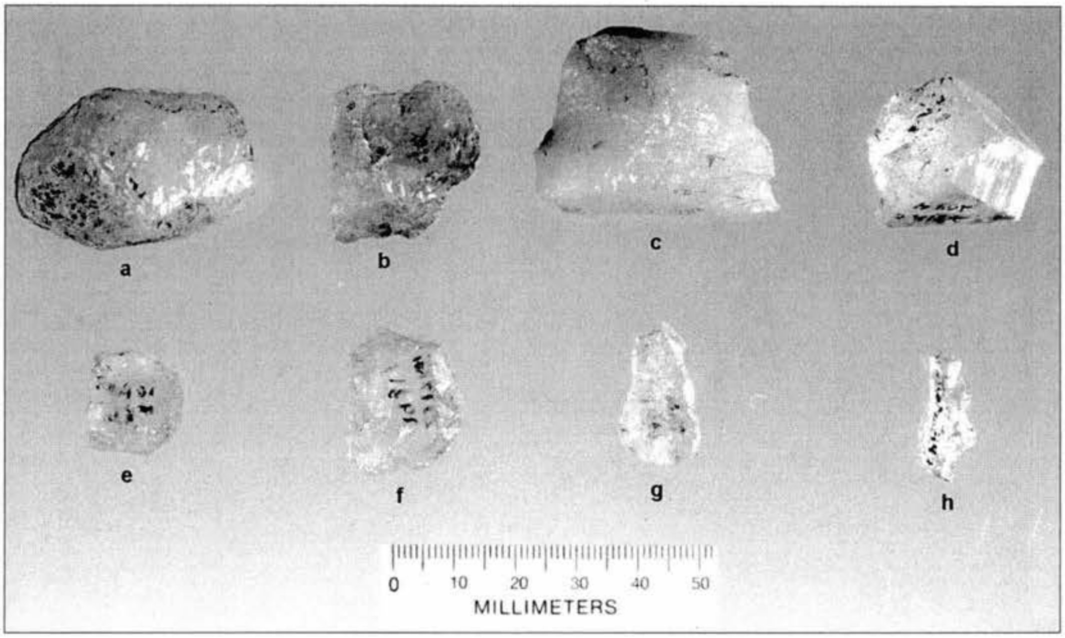


Figure 4.46. Bipolar Cores and *Pièces Esquillées*: *(a-d)* Bipolar Cores; *(e-h) Pièces Esquillées*.

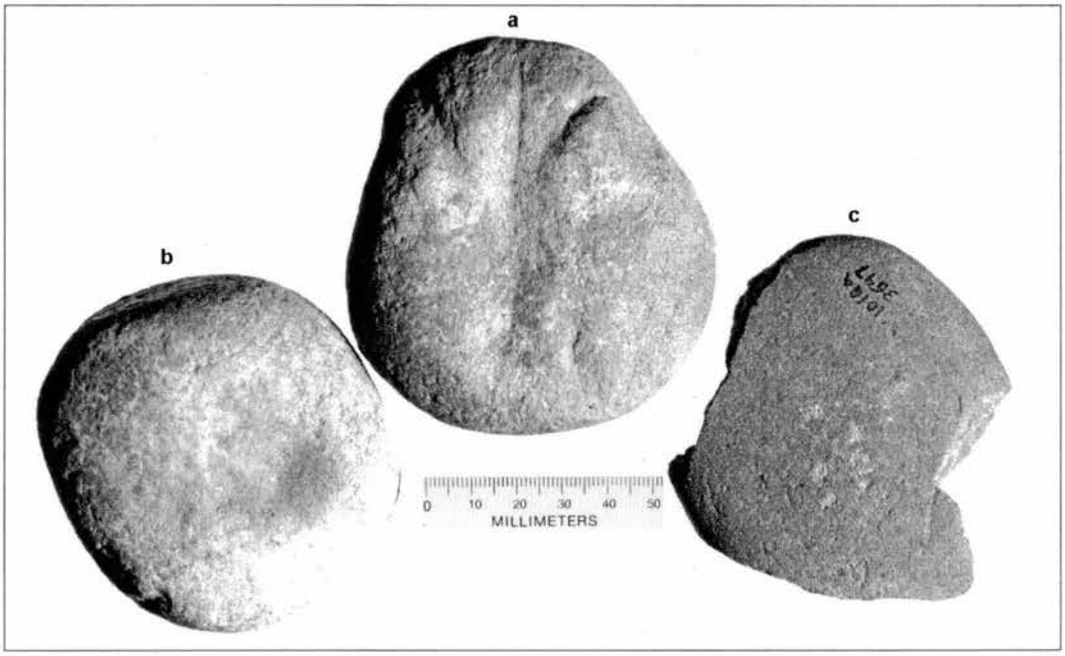


Figure 4.47. Hammerstones/Anvils and Hammerstones/Abraders: *(a)* Hammerstone/Abrader; *(b-c)* Hammerstones/Anvils.

Gramly 1982; MacDonald 1968). No one attribute distinguishes *pièces esquillées*, but they are generally made on flakes, blade fragments, or exhausted tool fragments and are thin and squarish. This is in contrast to the thick and blocky shape of bipolar cores. Moreover, *pièces esquillées* exhibit crushing (i.e., small flake removals) at two ends but lack the large colinear flake scars characteristic of bipolar cores.

The four *pièces esquillées* from Hardaway were made from quartz crystal and are about 15 mm in size (Figure 4.46:e-h). They were probably derived from flakes but this is difficult to determine due to their small size. Two specimens, being rather thin and squarish with crushing at opposite ends, are rather classic examples of this artifact (Figure 4.46:e-f). One of these artifacts, however, appears to have been split in half while the other still retains a portion of the original crystal face along one edge. A third *pièce esquillée* is more rectangular in shape and the final specimen may actually be a columnar fragment from a *pièce esquillée* (Figure 4.46:h). These are thin column-like fragments that sheared off from the edge of the specimen during flaking (Goodyear 1974:61-63; MacDonald 1968:86-87).

The functional interpretation of pièces esquillées in archaeological assemblages in the Eastern United States is the source of some debate. Following the lead of Old World archaeologists, who first identified this artifact class in Paleolithic assemblages, *pièces esquillées* have been interpreted largely as tools used as wedges or for slotting bone, wood, or antler (e.g., MacDonald 1968:88). Goodyear (1993), however, has taken exception to this interpretation--at least on northeastern Paleoindian sites. He argues, based on ethnoarchaeological and technological data coupled with a spatial-statistical analysis of *pièces esquillées* at the Debert site, that these items are in fact bipolar cores where small, otherwise unusable bits of raw material (and sometimes tools) have been recycled to produce flakes.

The functional interpretation of the bipolar artifacts identified as *pièces esquillées* here is problematic. Although their size and shape does not preclude them from having been used as wedges, neither does it prevent them from having been cores as well (see Shott 1989c). If they were used as wedges, however, one must wonder why such tools appear to only have been made from quartz crystal? Given the abundance of nearby rhyolite, why were no rhyolite bipolar artifacts found? In fact, the question becomes: why bother to flake crystal quartz at all?

Assuming that rhyolite was the "functional" equivalent of quartz in a utilitarian sense, I can only suggest that it was something special about the quartz crystals themselves--some special property not directly related to a utilitarian function. Thus, I speculate that the Hardaway *pièces esquillées* were probably used as cores to derive small flakes for use in some social or ritual context. This interpretation would also explain the presence of the other crystal quartz bipolar cores in the assemblage. Their thick and blocky (if not amphoras) shape would preclude their use as a wedge or slotting tool.

But, given their small size, it would appear that the flakes produced from these crystals would be too small to be of any practical use. Goodyear (1993), however, has cautioned against such a view. In reviewing both ethnoarchaeological and archaeological studies, he provides evidence that even small flakes (<20mm) produced from bipolar reduction are almost routinely used. With respect to the cases of exceptionally small flakes--such as were likely produced at Hardaway--there is the possibility that they were hafted. Again, regarding the utility of small bipolar flakes, Hayden (1980:4) notes "that the vast majority of ethnographically recorded uses of small bipolar flakes concerns cutting flesh, either in ritual, butchering contexts or as barbs on spears." Moreover, with respect to cutting flesh, Hayden (1980:4) specifically notes the practice in Tanzania of the bipolar technique to obtain small "slivers of clear quartz in scarification activities."

Unfortunately, a close inspection of the crystal quartz flakes in the assemblage revealed no evidence of any specimens having been derived from bipolar reduction. A cursory examination of flake scars on the quartz crystal cores indicate that flakes would have been less than 15 mm in length and very delicate. Most of the quartz debitage is either too large to be derived from the crystal specimens or was bifacially derived. Given their delicate nature, bipolar debitage may not have survived intact or could have been lost as a result of the use of .5 (circa 13 mm) inch screen.

The possibility, of course, also exists that the worked crystals themselves were the desired product; the bipolar technique being necessary to convert an otherwise unusable piece of raw material into a small tool with several sharp edges (MacDonald 1968:69). Many of the quartz specimens from Hardaway have sharp edges that could have been used. This determination must await a microwear analysis, although it is notoriously difficult to detect use-polish on quartz.

STONE TYPES

A minimum of 15 stone types are present in the Hardaway flaked-tool assemblage (Table 4.12). Clearly, the dark gray aphyric rhyolite that is often flow-banded dominates the assemblage (68.3%). The abundance of this stone is not surprising given Hardaway's proximity to Morrow Mountain which is the primary source of this stone. Among the major tool types, this rhyolite occurs in highest frequencies among bifaces (76.9%), followed by equal amounts in both end scrapers (66.5%) and side scrapers (66.7%), and slightly less frequencies (60.6%) in points. Aphyric rhyolite also dominates among the remaining tool categories of adzes (100%), miscellaneous scrapers (58.8%), and a combine combined category of denticulates, drills, and gravers (83.3%). Cores and large chipped stone tools are the only two tool types that are not dominated by aphyric rhyolite.

Table 4.12. Frequency Distribution of Chipped Stone Raw Materials by Artifact Class.

Raw Material	Points		Bifaces[a]		End Scrapers[b]		Side Scrapers[c]		Miscellaneous Scrapers[d]		Large Chipped Stone[e]	
	n	%	n	%	n	%	n	%	n	%	n	%
Aphyric Rhyolite	86	60.6	579	76.9	280	66.5	274	66.7	20	58.8	7	38.9
Rhyolitic Metatuff	47	33.1	93	12.4	87	20.7	92	22.4	8	23.5	8	44.4
Quartz	2	1.4	19	2.5	10	2.4	-	-	-	-	-	-
Green Metasiltstone	5	3.5	2	.3	21	4.9	20	4.9	3	8.8	-	-
Argillite	-	-	17	2.3	7	1.7	13	3.2	-	-	2	11.1
Crystal Quartz	-	-	3	.4	-	-	3	.7	-	-	-	-
Plagioclase-Quartz Porphyritic Rhyolite	-	-	22	2.9	7	1.7	1	.2	1	2.9	-	-
Plagioclase Porphyritic Rhyolite	-	-	14	1.9	6	1.4	6	1.5	1	2.9	-	-
Quartz Porphyritic Rhyolite	-	-	-	-	-	-	1	.2	1	2.9	-	-
Jasper	1	.7	2	.3	-	-	-	-	-	-	-	-
Ridge and Valley Chert	1	.7	-	-	-	-	1	.2	-	-	-	-
Chalcedony	-	-	1	.1	-	-	-	-	-	-	-	-
Other Chert	-	-	-	-	2	.5	-	-	-	-	-	-
Coastal Plain Chert	-	-	-	-	1	.2	-	-	-	-	-	-
Greenstone	-	-	-	-	-	-	-	-	-	-	1	5.6

[a] Includes Types I, II, and III Bifaces.
[b] Includes all end scraper types.
[c] Includes all side scraper types.
[d] Includes Oval Scrapers, Pointed Scrapers, Hafted Spokeshaves, and Waller Knives.
[e] Includes Choppers and Core Scrapers.

(continued)

Table 4.12 (continued). Frequency Distribution of Chipped Stone Raw Materials by Class.

	Adzes		Gravers, Drills Denticulates		Cores		*Pièces Esquillées*		Totals	
Raw Material	n	%	n	%	n	%	n	%	n	%
Aphyric Rhyolite	2	100.0	25	83.3	23	27.4	-	-	1296	68.3
Rhyolitc Metatuff	-	-	2	6.7	-	-	-	-	337	17.8
Quartz	-	-	-	-	30	35.7	-	-	61	3.2
Green Metasiltstone	-	-	2	6.7	-	-	-	-	53	2.8
Argillite	-	-	-	-	-	-	-	-	39	2.1
Quartz Crystal	-	-	-	-	29	34.5	4	100.0	39	2.1
Plagioclase-Quartz Porphyritic Rhyolite	-	-	-	-	1	1.2	-	-	32	1.7
Plagioclase Porphyritic Rhyolite	-	-	-	-	-	-	-	-	27	1.4
Quartz Porphyritic Rhyolite	-	-	1	3.3	-	-	-	-	3	.2
Jasper	-	-	-	-	-	-	-	-	3	.2
Ridge and Valley Chert	-	-	-	-	-	-	-	-	2	.1
Chalcedony	-	-	-	-	1	1.2	-	-	2	.1
Other Cherts	-	-	-	-	-	-	-	-	2	.1
Coastal Plain Chert	-	-	-	-	-	-	-	-	1	.1
Greenstone	-	-	-	-	-	-	-	-	1	.1

While Hardaway's proximity to Morrow Mountain is obviously an important factor in the presence of high frequencies of aphyric rhyolite in the assemblage, distance alone cannot entirely account for its abundance as numerous porphyritic rhyolite quarries exist near Hardaway as well, several such quarries are even closer than Morrow Mountain (Appendix A). I suggest that the intensive use of Morrow Mountain rhyolite is also related to its better flaking quality relative to the porphyritic (and other metavolcanic) stone outcrops in the area, if not the entire Piedmont.

This statement is at least partially supported by the results of an informal experiment whereby samples of both rhyolite from Morrow Mountain and porphyritic rhyolite from nearby Falls Dam (Appendix A) were given to several knappers who were asked to reproduce a biface and to evaluate each stone type with respect to flaking quality. Without exception, each knapper clearly preferred Morrow Mountain rhyolite which appeared to have an excellent conchoidal fracture. The comments of the flint knappers was that the porphyritic rhyolite was much harder to knap. Presumably, the presence of phenocrysts in the porphyritic rhyolite negatively affected its flaking quality, although more rigorous tests need to be undertaken to verify this.

At 17.8%, rhyolitic tuffs constitutes the second most commonly used raw material in the assemblage (Table 4.12). As noted above, some of this raw material could have their origins in the rhyolitic tuff sources identified in the northern Uwharrie Mountains approximately 30 km to the northeast of Hardaway near Asheboro.

The remaining 13 raw materials all represent minority types in the assemblage. Occurring at about 3%, quartz and a green metasiltstone dominate the minority raw materials. Two types of porphyritic rhyolite, crystal quartz, and argillite constitute 1-2% of the assemblage, while the remaining seven stone types make up less than 1% of the total. This latter group primarily includes all "cherts" (i.e., Coastal Plain chert, Ridge and Valley chert, jasper, chalcedony, and other chert.)

One specimen of Coastal Plain chert, a broken Type Ia End Scraper, appears to be from the Allendale quarries (Albert Goodyear, personal communication 1992) whose source is over 300 km to the southwest of Hardaway. Two other specimens, a Palmer point and a Type IIa Side Scraper appear to be made of Knox chert from the Ridge and Valley province over 300 km to the west of Hardaway. Jasper artifacts in the assemblage include two bifaces and one Kirk Corner-Notched point. As mentioned previously the origins of this stone is unknown, although a source could lie in the Piedmont. For example, the one source described above is located about 120 km north of Hardaway.

The remaining four specimens include two Type Ib End Scrapers made from "other cherts" and a core and biface made from two varieties of chalcedony. The sources of all these raw materials are unknown, however, it seems likely that their origins lies outside the Piedmont.

The presence of these examples of nonlocal cherts is interesting for the distance they have traveled from their source. If the distance an artifact travels from its source reflects the use-life of a tool from which it was made, then 8 of the above 10 chert tools include points, bifaces, or Type I End Scrapers--all tool classes identified with extended use-lifes in earlier discussions. The remaining two tools include a core and a Type IIa Side Scraper. A closer inspection of these two examples, however, suggests that the side scraper may be an exception since the blank for the this tool may have been derived from a bifacial, and likely curated, core.

Finally, some additional comments can be made concerning the origins of the siliceous green metasiltstone in the assemblage. Assuming that this stone would have been readily used where available, its relatively low percentage at Hardaway might suggest a distant source. As noted above, however, its petrologic similarity to argillite would suggest a source relatively close to the site. A close source is also supported by the relatively high frequencies of cortex pieces in the debitage (Table 4.18). Similarly, although the collections survey identified only a very small number of points made from this material, the greatest number of recorded points were concentrated around Stanly County (Appendix D).

If true, then this stone's minor presence in the assemblage could be related to the "package size" in which the material occurs. As also mentioned above, argillite occurs in units with well developed bedding planes that are less than 15mm in thickness. If the green metasiltstone occurs as a unit in the argillite, such a structure would obviously pose restrictions in raw material procurement and tool manufacture.

Another factor contributing to this material's minor presence at Hardaway might be the geomorphic history of the Yadkin River Valley. Since argillite forms much of the lower volcanic-sedimentary sequence of the Yadkin River (Conley 1962:5), then outcrops exposed very early in the Holocene may have been subsequently covered by floodplain deposits (cf. Goodyear 1991). In other words, it is possible that this stone had a limited temporal as well as spatial exposure during the Early Archaic, thereby restricting its availability for use.

Although the above scenario is speculative, a limited temporal use of this stone is also consistent with the observation that point types made of green metasiltstone rarely post date the Early to Middle Archaic. This is my impression based upon an examination of some 22,000 points in the Research Laboratories of Anthropology collections (Davis and Daniel 1990) as well as my observations from examining numerous private collections as well.

In sum, a diversity of raw materials were used by the occupants of Hardaway; although an emphasis was placed on one source--Morrow Mountain rhyolite. Additional exploited metavolcanic sources included porphyritic rhyolite and some unidentified metavolcanic stone. While the sources of the former are known, the latter are not; although they are most likely located in the Carolina Slate Belt--if not elsewhere in the Uwharrie's themselves. At least two metasedimentary stone types were also used: argillite and a metasiltstone. Both raw materials were probably obtained near Hardaway, although no specific quarries of either stone were identified. Similarly, quartz was probably obtained either locally or within the Piedmont. In contrast, the presence of minor amounts of several nonlocal cherts stone were probably obtained outside the Piedmont.

COBBLE AND TABULAR STONE TOOLS

A series of large stone tools primarily made on river cobbles and other large tabular pieces of stone are also present in the assemblage. Within this class various categories have been constructed based on artifact size, shape, and the nature and location of wear patterns (e.g., battering, pitting, grinding, etc.) that are used to reconstruct tool functions.

Hammerstones

There are 53 hammerstones in the assemblage, most of which are broken or small fragments. Cobbles identified as hammerstones are recognized by battering and extensive pitting present on ends, edges, or intermediate surfaces. Other non-cobble masses of quartz and rhyolite were also used as hammerstones. Presumably these tools were used as percussors in stone tool production or as pounders in food processing.

Twenty-one quartz cobbles were used as hammerstones. Six of these are whole, spherical to elliptical in shape, ranging between 123 g and 205 g in weight. The remaining 15 include broken cobbles or small cobble fragments that exhibit hammerstone use. These range in weight from 7 g to 217 g. An additional eight specimens appear to be extensively battered masses or fragments of vein quartz rather than cobbles. They range in weight from 14 g to 194 g.

Twenty-one igneous cobbles, mostly of greenstone, also display hammerstone battering. They are small to medium sized cobbles and are spherical to elliptical in shape. Three examples, however, are distinctly bar shaped. Whole specimens (n=6) range in weight between 37 g and 466 g. Fifteen broken and fragmented examples range from 13 g to 654 g. One exceptionally large but broken hammerstone weighs 1350 g.

The remaining three hammerstones are made from rhyolite. Two examples were made from the aphyric variety and one was made from the plagioclase-quartz porphyritic variety. The presence of flake scars partially obliterated by battering suggests that they may have originally been cores that secondarily functioned as hammerstones. They range in weight from 61 g to 161 g.

It should be mentioned that hammerstones, as well as other cobble tools, may be under-represented in the assemblage. Coe (1964:79), for example, noted that while hammerstones were quite common on the surface (n=536) they were quite scarce in the excavated levels (n=30). Baker (1978:290) has suggested that this may be the result of the "size effect," where the disproportionate occurrence of large artifacts on site surfaces are likely the result of tool reuse through time. That is, large artifacts are less likely to be buried by depositional processes or more easily exposed due to erosional processes than smaller artifacts. Thus, where sites are repeatedly reoccupied, the higher visibility of larger artifacts might increase their potential for reuse. Binford (1979) has observed this process among the Nunamiut.

> One process which I have observed with regard to site furniture has been discussed as the "size effect" .... Upon arrival at a known site, one generally searches for the "furniture" and pulls it "up" out of its matrix for reuse. This means that large items of site furniture get continuously translated "upward" if a deposit is forming [Binford 1979:264].

It is likely that a similar process took place at Hardaway given its repeated occupation. If so, then hammerstones and other large cobble tools described below may have been more numerous in the early component than now apparent.

Hammerstones/Anvils

Seventeen cobbles exhibit battering wear on their margins and percussion pitting or pecking on their flat faces (i.e., pitted cobbles) (Figure 4.47:b-c). Fourteen of these are quartz cobbles and three are greenstone cobbles. Only two quartz cobbles are whole, weighing 494 g and 596 g. The remaining broken pieces range in weight from 50 to 594 g. Two greenstone cobbles are whole, weighing 478 g and 558 g, while one is broken and weighs 346 g.

Given the two patterns of wear on these cobbles, these specimens presumably functioned both as percussors (similar to the hammerstones described above) and as anvils--as indicated by the pitting wear noted on the stones flat faces. This wear may be the result of use in bone, meat, or nut processing or in anvil-supported core reduction. This latter function is associated with bipolar core use discussed previously.

Hammerstones/Abraders

In addition to hammerstone wear on their edges, two quartz cobbles display grooves worn on their flat faces. Only one cobble is complete and weighs 520 g. Three shallow grooves are lightly discernible, criss-crossing one face of the cobble forming a star-like pattern (Figure 4.47:a). They are about 4 mm wide and 1-2 mm deep where measurable. Although no grooves are present on the reverse side, it exhibits some abrasion and a wide shallow depression across its face. The second specimen is a cobble fragment that displays hammerstone battering on its side and a portion of a groove on its flat surface.

Abraders are a noted part of the Dalton toolkit, however, those from Arkansas were made from sandstone (Goodyear 1974:69-73; Morse 1971:18). Similarly, grooved sandstone abraders have been recovered from an early context in Florida (Daniel and Wisenbaker 1987:90-92). Suggested activities for abraders include the manufacture of bone implements such as pins and foreshafts and in grinding the lateral edges of adzes. Although of different material, the specimens from Hardaway could have performed similar functions.

Grinding Stones/Anvils

Twelve flattened cobbles and tabular pieces of igneous rock were identified as combination grinding stones and anvils. These tools were defined by the presence of abrasion on the stone's flattened faces and sometimes were accompanied by light pecking. Furthermore, this class is almost always distinguished by a shallow concavity or basin on a working face (Figure 4.48).

Abrasion usually occurred in the form of striations or "scoring" of the stone surface that resulted in a light to moderate smoothing, although some portions of the altered surface remained roughened. A slightly polished surface was observed to accompany striations on the face of one specimen.

Two of the more complete examples were made of tabular pieces of greenstone and granite. They are roughly rectangular in shape, approximately 100 by 90 mm in size and weigh about 500 g; one is 30 mm thick while the other is 51 mm in thickness. Both flat surfaces on both specimens display grinding wear in the form of light to marked linear scratches or striations.

One stone also has a marked concavity along the center of one edge and a similar concavity on the reverse face. Some light pecking accompanies both concavities. Light pecking is also present on both flat surfaces of the other stone but it lacks any noticeable concavities. Extensive battering occurs on three corners of this

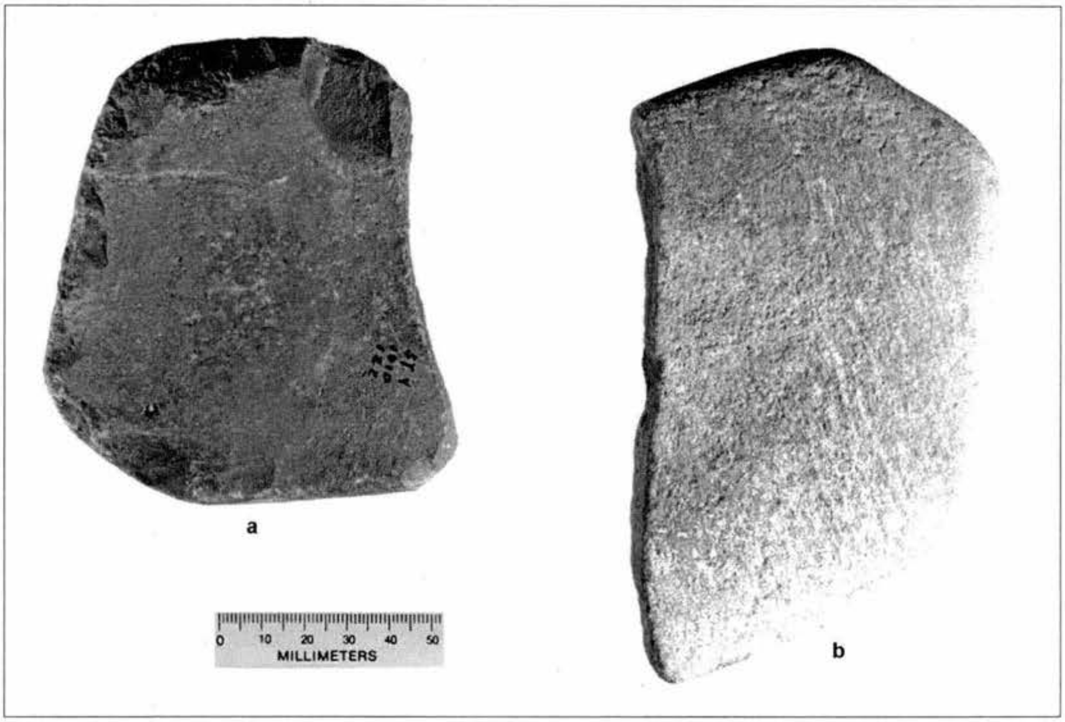


Figure 4.48. Grinding Stones/Anvils.

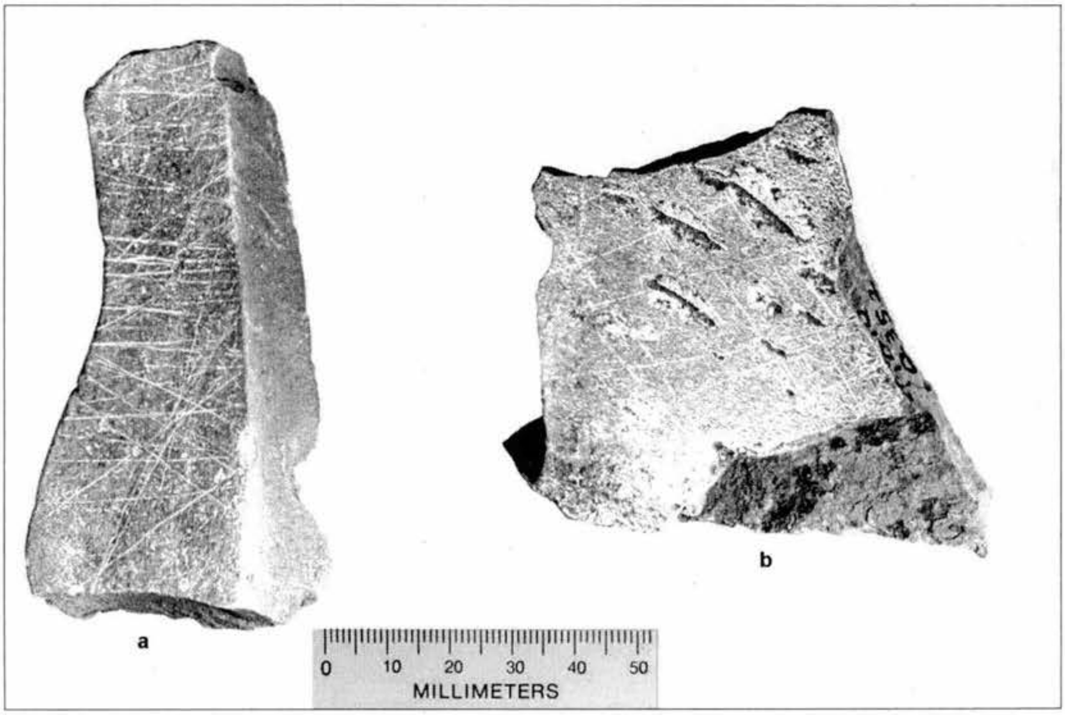


Figure 4.49. Engraved "Slate".

specimen which may be the result of shaping the stone or the result of hammerstone use.

One large (180 mm x 132 mm x 20 mm) piece of tabular greenstone also displays extensive anvil use in the form of heavy pitting (i.e., slits or gouges in the stone) on one flat surface and weighs 765g. In addition, a portion of one edge of this surface appears abraded with faint scratches running the length of the edge. A slight concavity is also present along this edge.

Four cobbles also display grinding wear. The first is a large igneous rock (probably greenstone) that weighs 1134 grams. One surface is relatively flat and appears smoothed with a small lightly pitted depression located just off center. The remaining three flattened quartz cobbles are broken. Two are very similar to each other displaying marked concavities associated with some light pecking. One displays marked concavities on two faces, while the other only has one worked face.

The remaining quartz cobble is plano-convex in shape with a somewhat different wear pattern. While its flat face displays an abraded surface with a pecked concavity similar to the previously described examples, its more convex reverse face displays abrasion and pecking localized on the top of its rounded surface. This wear may have been the result of anvil use, but the localization of this wear on a convex surface is also suggestive of a mano function. Furthermore, some extensive battering, suggestive of hammerstone use is also present along one edge.

Finally, the remaining five artifacts are all greenstone fragments that display some evidence of grinding. They range in weight from 27 to 296 grams.

The pecking damage observed on these artifacts may be the result of technological modification, or the result of some light pounding of food materials in the grinding process, or both. Suggested functions for these artifacts include grinding or pulverizing plant or nut resources. The more extensive pitting noted on the one greenstone specimen, however, may be the result of use on harder materials such as in bipolar core reduction.

Anvil

A single flattened broken cobble exhibits some extreme crushing and pitting on its flat surface suggesting that it was used as an anvil.

Engraved "Slate" and Pebbles

Several enigmatic pieces of what Coe (1964:81) referred to as "engraved slate" are present in the assemblage (Figure 4.49). Three of these are actually tabular fragments of argillite, and one plattey fragment of greenstone. They range in weight from 21 g to 90 g. Two other pieces include an engraved pebble and an engraved broken cobble. They weigh 25 and 202 g, respectively.

With one exception these artifacts display a series of fine incisions or scratches randomly placed across one or both flat surfaces of the stone. The single exception, however, displays a more deliberate design of simple cross-hatching (Figure 4.49:a).

While these specimens were quite numerous on the surface at Hardaway (213 engraved pieces of slate and 46 engraved pebbles), only 16 engraved slate fragments and 5 engraved pebbles were found in the excavated levels from Hardaway (Coe 1964:81). Although no exact distribution is given, they were apparently found in all levels at the site. Similar engraved specimens were also found in almost all levels at the nearby Doerschuk site, some with complicated geometric designs (Coe 1964:53).

The function of these artifacts is unclear. Coe (1964:53) suggested that they were used as cutting boards; however, as he also notes many of the more complex incised designs belie this interpretation. It may also be significant that this artifact class is not widespread in the Piedmont (Coe 1964:53) and is apparently unknown in any other Archaic period sites in the Southeast.

Other Worked Stone

This category includes crudely modified cobbles or pebbles whose functions are uncertain. Three of these are small, flat, elliptically shaped greenstone cobbles. They are about 85 by 45 mm in size and 11-15 mm in thickness. They exhibit crude flaking around their margins and somewhat resemble what Coe (1964:Figures 45, 70) identified as atlatl weight blanks. While the items Coe illustrated are clearly unfinished atlatl weights, the three specimens here are less certainly identifiable because of their small size and crude (early stage?) flaking. In addition, all of the previously excavated atlatl weights are from a Middle Archaic (i.e., Stanly) context, both at Hardaway (Coe 1964:81) and at Doerschuk (Coe 1964:52-53). These three specimens were all recovered from early contexts: two from Zone 4 and the other from the top of Zone 3.

The two remaining roughly shaped pieces are a thin oval pebble with one crudely flaked edge and a thin piece of marginally shaped phylite, similar in size and shape to the possible atlatl blanks described above. Given the raw material and its thinness (10 mm), it is unlikely that this was intended to become an atlatl weight.

Finally, this category also includes a broken portion of a large cobble with at least five lightly pecked and incised parallel lines that probably extended around the circumference of the cobble. Moreover, these lines give the appearance of being decoration rather than products of utilization. Four of the lines form a group and are regularly spaced 4-5 mm apart; the fifth line is separated from the group by a distance of 14 mm. Portions of the lines are obliterated by some battering that apparently are the result of anvil use, which may have been a secondary function after it was broken. There is no clear indication of what the original function of this specimen may have been.

Cobbles and Other Stones

This category (n=41) primarily includes whole cobbles, cobble fragments, and large pebbles, exhibiting no obvious use-wear damage. Both quartz and igneous stone are present among the cobbles and they may represent unused or minimally used specimens with undetected damage. Similarly, the fragments may be unused portions of utilized cobbles which fractured in use. This category also includes a broken piece of tabular quartzite and one relatively large piece of tabular argillite. The latter specimen is similar in size and form to the examples of "engraved slate" discussed earlier; however, it exhibits no evidence of incisions or other obvious modifications.

GROUND STONE ARTIFACTS

Only a single ground stone artifact is present in the assemblage. Such artifacts are extremely rare in Early Archaic contexts and, as mentioned below, the association of this artifact with the Early Archaic component should be viewed with caution.

Indeterminate Ground Stone

One very small (.8 gm) ground stone fragment was identified in the assemblage. Given its fragmentary condition, a precise identification cannot be made, however, it may have been part of a pendant. Although this artifact was found in the bottom of Zone 3, given its very small size it would be susceptible to vertical movement and could have migrated down from a later occupation.

FLAKE ANALYSIS

The lithic debitage was analyzed in terms of an hypothesized reduction trajectory. When coupled with the previous tool analysis, the flake analysis assisted in identifying at what stages tools and cores arrived at and left the site. This classification categorized the relative amounts of early and late stages of lithic reduction by monitoring the presence and absence of flakes exhibiting cortex. Flakes with cortex reflected the initial removal of material from the natural weathered surface of rock. Conversely, flakes without cortex signaled a later stage of reduction. Although somewhat simple, when combined with measurements of relative flake size, this technique provided some measure of the reduction activities undertaken at Hardaway.

Initially, all flakes from the 80 units containing the undisturbed Early Archaic component identified in Chapter II were sorted by raw material. All rhyolite and other metavolcanic and metasedimentary rock types were lumped into a single category labeled metavolcanic stone (Table 4.13). The flakes were subsequently screened through half- and quarter-inch hardware cloth to provide a rough measure of flake size. Despite the fact that only half-inch screen was used during the excavations, a substantial number of small flakes were still recovered (i.e., flakes small enough to pass through half-inch mesh) (Table 4.14). Very little material passed through the quarter-inch screen and what did appeared to be tiny fragments of debris resulting from bag storage. This material was collected and weighed but does not figure into the analysis here.

Once the flakes were sorted by raw material type and mesh size, a rather simple key of flake types was used for the analysis. Flakes were divided into five categories primarily upon the presence/absence of cortex and their condition (i.e., whole or broken): whole nondecortication flakes, broken nondecortication flakes, whole decortication flakes, broken decortication flakes, and shatter.

Flakes that exhibited any amount of cortex were classified as decortication flakes; those without cortex were classified as nondecortication flakes. Flakes were then divided into whole or broken categories principally based on the presence or absence of a striking platform. All flakes exhibiting a complete or partial striking

Table 4.13. Stone Flake Totals.

Raw Material Type	Counts n	Counts %	Weight (gm) n	Weight (gm) %
Metavolcanic	64,974	97.9	201,523	97.1
Quartz	856	1.3	4,020	1.9
Green Metasiltstone	351	.5	1,524	.7
Crystal Quartz	135	.2	294	.1
Chalcedony	18	<.1	29	<.1
Coastal Plain Chert	12	<.1	36	<.1
Ridge and Valley Chert	2	<.1	1	<.1
Jasper	4	<.1	4	<.1
Other Chert	1	<.1	1	<.1
Total	66,353	100	207,432	100

Table 4.14. Metavolcanic Flake Totals.

	Counts				Weight (gms)			
Flake Type	½" screen	¼" creen	Total	%	½" screen	¼" screen	Total	%
Whole	22,288	8,465	30,753	47.3	92,090	5,372	97,462	48.4
Broken	12,604	11,509	24,113	37.1	34,843	5,963	40,806	20.2
Whole Decortication	5,256	761	6,017	9.3	44,671	684	45,355	22.5
Broken Decortication	2,670	858	3,528	5.4	12,772	708	13,480	6.7
Shatter	424	139	563	.9	4,191	247	4,438	2.2
Total	43,242	21,732	64,974	100	188,567	12,974	201,523	100

Table 4.15. Quartz Flake Totals.

	Counts				Weight (gms)			
Flake Type	½" screen	¼" screen	Total	%	½" screen	¼" screen	Total	%
Whole	221	59	280	32.8	1,649	67	1,712	42.6
Broken	105	143	247	28.9	465	113	578	14.4
Shatter	202	126	228	38.3	1,586	144	1,730	43.0
Total	528	328	856	100	3,700	324	4,020	100

Table 4.16. Crystal Quartz Flake Totals.

	Counts				Weight (gms)			
Flake Type	½" screen	¼" creen	Total	%	½" screen	¼" screen	Total	%
Whole	47	25	72	53.3	161	18	179	60.7
Broken	16	21	37	27.4	68	10	78	26.4
Shatter	6	20	26	19.3	23	15	38	12.9
Total	69	66	135	100	252	43	295	100

Table 4.17. Chert Flake Totals.

	Counts		Weight (gms)	
Flake Type	½" screen	¼" screen	½" screen	¼" screen
Coastal Plain Chert:				
Whole	3	2	12	1
Whole Decortication	1	-	1	-
Broken	1	4	1	2
Broken Decortication	1	-	19	-
Ridge and Valley Chert:				
Whole	1	1	1	<1
Other Chert:				
Whole	-	1	-	1
Chalcedony:				
Whole	5	5	12	3
Whole Decortication	2	2	6	2
Broken	3	1	6	<1
Jasper:				
Whole	1	2	1	2
Broken	1	-	1	-

Table 4.18. Green Metasiltstone Flake Totals.

	Counts				Weight (gms)			
Flake Type	½" screen	¼" creen	Total	%	½" screen	¼" screen	Total	%
Whole	134	69	203	57.8	767	40	807	52.9
Broken	43	58	101	28.8	102	32	134	8.8
Whole Decortication	16	12	28	8.0	534	7	541	35.5
Broken Decortication	11	6	17	4.8	29	4	33	2.2
Shatter	1	1	2	.6	9	-	9	.6
Total	205	146	351	100	1441	83	1524	100

platform with relatively intact margins were classified as whole; all remaining flakes (excluding shatter) were classified as broken. Broken flakes tended to be relatively flat thin pieces that lacked any definable bulb of percussion or striking platform. Shatter, the final flake category, represents all the angular, chunky fragments (regardless of the presence of cortex) that do not exhibit the characteristic flat morphology of thinning flakes.

Although not systematically examined, the vast majority of the debitage could be classified as biface thinning flakes (House and Ballenger 1976:89-90). This identification was based on the relatively complicated dorsal flake scar patterns, faceted platforms, and flake curvature in profile. A very few flakes, however, were noted that could be described as uniface retouch flakes (Shafer 1970). That is, they exhibited a flat unfaceted striking platform which served as the ventral aspect of the unifacial tool from which they were struck. These flakes are believed to result from either unifacial tool manufacture or resharpening.

All lithic debitage was sorted according to the above categories and counts and weights were obtained for each raw material type by provenience. Summary totals for debitage by raw material and flake type are given in Tables 4.13-4.18.

At this point it should be remembered that only half inch screen was used during the excavations and this undoubtedly resulted in some bias in flake size recovery. Nevertheless, the analysis revealed that a substantial amount (n=22,290 or 34% of the total count) of small flakes were recovered in the quarter-inch mesh. The vast majority of these flakes, however, were recovered during the 1970s excavations (n=21,267).

Moreover, a clear difference exists in the frequencies of flake counts by mesh size between the 1950s and 1970s excavations. A significantly greater percentage of the quarter-inch flakes (n=21,267, 32.1% of the debitage total) were recovered during the 1970s as compared to the 1950s (n=1,023, 1.5% of the debitage total). While it is possible that this may reflect spatial differences (i.e., activity areas) within the site, I believe that it most likely reflects differences in the attitudes towards the importance of recovering lithic debitage between the two decades.

Metavolcanic and Metasedimentary Flakes

Lithic reduction was clearly an important activity at Hardaway. A total of over 66,000 flakes weighing over 207 kilograms is present in the debitage (Table 4.13). As with the tools, the vast majority of the debitage--between 97 and 98% by count and weight--is either metavolcanic or metasedimentary stone. Clearly, most of this is from nearby Morrow Mountain: it is a gray fine-grained aphyric metavolcanic rock with a slight flow-banding discernible on many specimens. A few other metavolcanic and metasedimentary stone types were also observed in the debitage, including porphyritic rhyolite, argillite, and a green metasiltstone. These other raw materials were only minority types, however. With the exception of the green metasiltstone the presence of the other metavolcanic types was not systematically recorded.

That the majority of the these flakes lack cortex (n=54,866, n=84.4%) would suggests late stage reduction predominated the tool manufacturing sequence at Hardaway (Table 4.14). Nevertheless, a substantial number by count (n=9,546, 14.7%) and even more by weight (58,835 gms, 29.2%) are decortication flakes (Table 4.14), suggesting that the stone was transported to Hardaway in only partially reduced form.

Further indicating not all of the stone production was conducted at the quarry can be seen in the tendency for decortication flakes to be large and heavy--presumable completing cortex removal at Hardaway. For example, among whole decortication flakes, the vast majority (n=5,256, 87.4%) are large (retained in the .5" screen). Moreover, this group accounts for only 8.1% of the metavolcanic debitage count but 22.2% of the total debitage weight. (These results assumes that the bias against small flakes in the assemblage is not affected by cortex type.)

The Remaining Debitage

The discussion here will focus on the identification of the nonmetavolcanic minority raw material types represented in the debitage. Among these, the most abundant is quartz, although it accounts for only about 1% of the debitage. The remaining stone types include several varieties of cryptocrystalline stone and all constitute only a fraction of the debitage total (Table 4.13). Furthermore, they tend to be small nondecortication flakes, virtually all of which are biface thinning flakes.

Despite there small frequency, it may be of some significance that most of the cryptocrystalline materials probably originated from distant sources located outside the Piedmont. In fact, some of these same materials are also represented in the tools (which are discussed in the following chapter), although no refits between any flakes and tools could be made. Nevertheless, the chalcedony flakes match a tan chalcedony biface so closely in color and texture that the flakes could have been knapped from the same biface. If true, it is interesting to note the spatial relationships between the flakes and the biface. That is, most of the flakes clustered in one part of the site while the biface was located about 40 ft away (see discussion in Chapter VI). The geologic source of this chalcedony is unknown.

At least two varieties of chert, however, appear to have their sources outside the Piedmont. Two dark bluish-gray chert flakes are likely Knox chert (Larry Kimball, personal communication 1992), while another 14 flakes appear to be from the Allendale sources (Albert Goodyear, personal communication 1992). The only other "chert" specimen in the debitage is a translucent bluish-green somewhat grainy stone that actually may be a variety of quartz from Virginia (Larry Kimball, personal communication 1992). It has been placed in the "Other Chert" category in Tables 4.13 and 4.17.

Jasper is also present in the debitage; its source is unknown, but it may have originated in the Piedmont (Table 4.16). Three of the four flakes are a dark brown very homogeneous stone that could have come from the same specimen. The fourth item is a waxy, mottled brownish-green material.

Finally, the flake analysis also offers some insight into the source of the unique green metasiltstone mentioned earlier. Although this material was not particularly numerous in the assemblage, a relatively high frequency by count (12.8%, n=45) and by weight (37.7%, 574 g) exhibit cortex (Table 4.18). In fact, the percentage by count of this material is very close to that of cortex flakes in the metavolcanic debitage (14.7%) while the percentage by weight of the metasiltstone flakes is even greater than the metavolcanic flakes (29.2%). Thus, if cortex frequencies reflect distance from source, a relatively close source is indicated for this metasiltstone. A similar conclusion was reached in Chapter III with regard to the local geology of the site.

SUMMARY

The sample of stone artifacts from the Early Archaic component at Hardaway constitutes one of the largest such assemblages recovered from a single site in the Southeast. The lanceolate and side-notched Daltons, as well as corner-notched Palmer and Kirk points, document repeated occupation at Hardaway throughout the Early Archaic. A wide variety of other tool types including both expedient and curated unifacial tools are also present. And while these tools are made from a variety of raw materials, the assemblage is dominated by a single rhyolite type--aphyric rhyolite. Thus, the Early Archaic complex at Hardaway is characterized by a diversity of tools made of a distinctive stone procured from a nearby outcrop. These two assemblage characteristics have important implications for site function at Hardaway and that topic is addressed in Chapter V.

Chapter V

THE ORGANIZATION OF AN EARLY ARCHAIC TECHNOLOGY: ASSEMBLAGE COMPOSITION AND SITE FUNCTION AT HARDAWAY

Thus far I have detailed the classification of the chipped stone tools found at Hardaway. I now turn to two additional aspects of the tool analysis which affected assemblage composition: blank production and tool use-life. After treating each of these factors, I discuss the implications of this tool analysis for understanding site function at Hardaway. Finally, I consider how the technology at Hardaway was organized within the broader context of settlement adaptation.

BLANK PRODUCTION

The tool descriptions in Chapter IV emphasized blank size, shape, and modification. Here I will consider how these tool blanks were derived. That is, were these blanks struck from block or bifacial cores? One of the clearest indicators of core type on a flake blank is the striking platform. Biface-derived blanks usually exhibit a faceted platform (i.e., retain remnants of the edge of the biface) along with platform preparation remnants such as grinding or other modification usually required for proper bifacial thinning. Moreover, bifacial flaking also results in relatively small lipped platforms with relatively acute striking platform angles. They also have relatively more acute striking platform angles than block-derived blanks. Biface-derived blanks also display more complicated dorsal surface flake scar patterns resulting from previous flake removals. Finally, bifacially derived flakes tend to have rounded cross-sections with pronounced ventral surface curvatures.

Block-derived blanks, on the other hand, have relatively larger and flatter striking platforms with more obtuse striking angles; blanks in the later stage of reduction can also exhibit some platform faceting. Similarly, block-derived blanks have less complex and more unidirectional dorsal surface flake scar patterns than biface-derived blanks. Finally, the thick angular nature of block cores yields blanks with relatively thicker cross-sections and more diverse shapes than bifacially derived flakes.

Unifacial tools in the assemblage were placed into either a biface- or block-derived category (or indeterminate) based on the above criteria. In addition, one additional attribute was systematically recorded that also related to blank derivation: striking platform angle.

An examination of blank type and platform angle is illustrated in Figure 5.1. Striking platform angles on tools with measurable platforms displays a bimodal distribution with peaks at 70-75° and 80-85°. Moreover, individual histograms for block- and biface-derived blank platform angles reveals the separate nature of these two populations. In fact, boxplots of these data (Figure 5.2) indicate a significant difference exists in median striking platform values between block- and biface-derived blanks (80° and 65°, respectively).

Block-derived blanks are far more common, comprising 67.7% of the unifacial tools in the Hardaway assemblage as compared to only 8.4% for biface-derived blanks (Table 5.1). While a substantial number (23.9%) of tools could not be confidently assigned to a blank type, the boxplot in Figure 5.2 suggests that most of those with measurable platform angles were probably block-derived as well.

Due to their more reduced state, blank remnants were not as readily observed on bifaces including projectile points. Although this precluded the sort of analysis that was performed on the unifacial tools, some tentative conclusions concerning the derivation of biface blanks can be drawn based on cursory observations made within

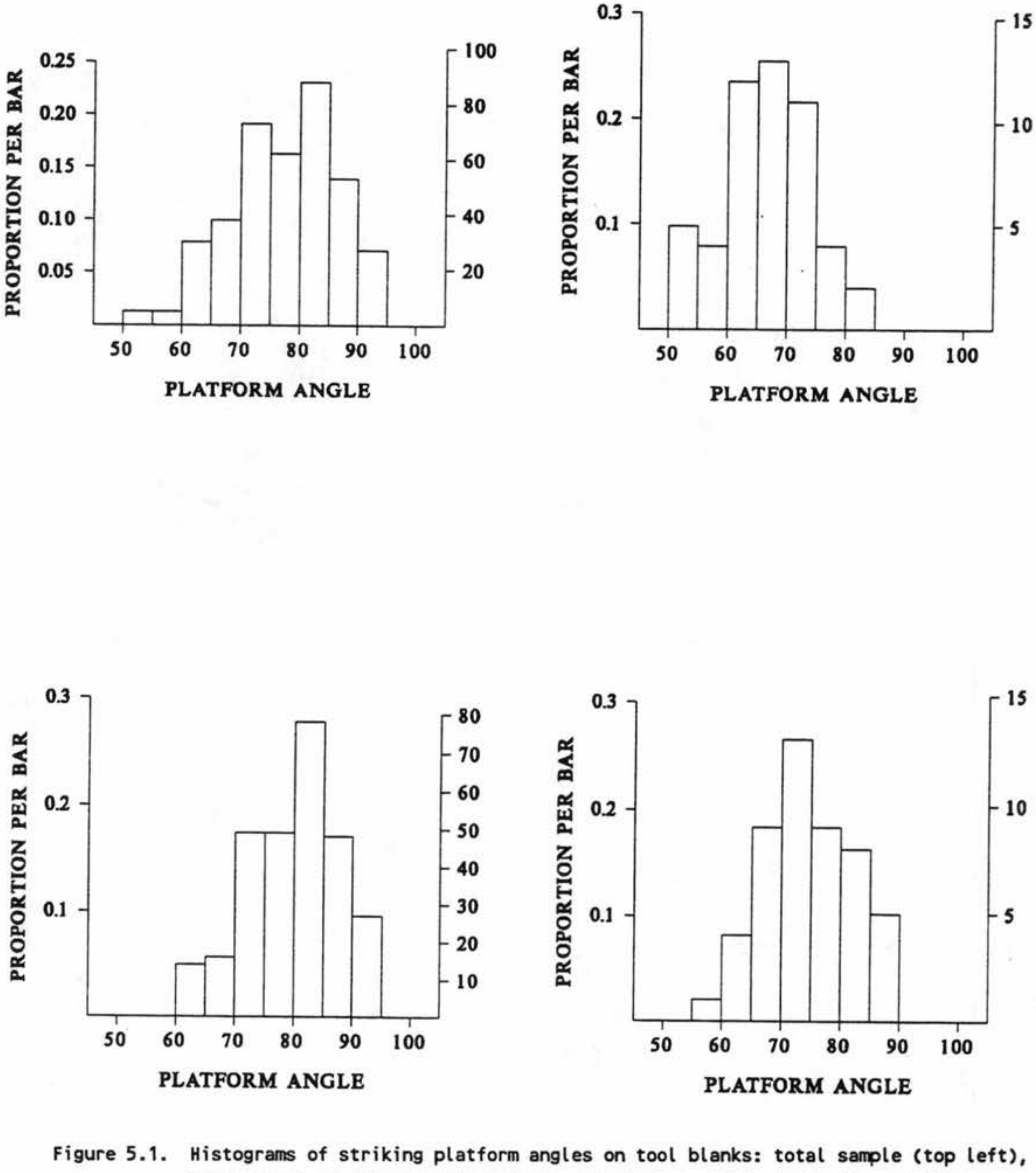


Figure 5.1. Histograms of striking platform angles on tool blanks: total sample (top left), biface-derived blanks (top right), block-derived blanks (bottom left), indeterminate blank specimens (bottom right).

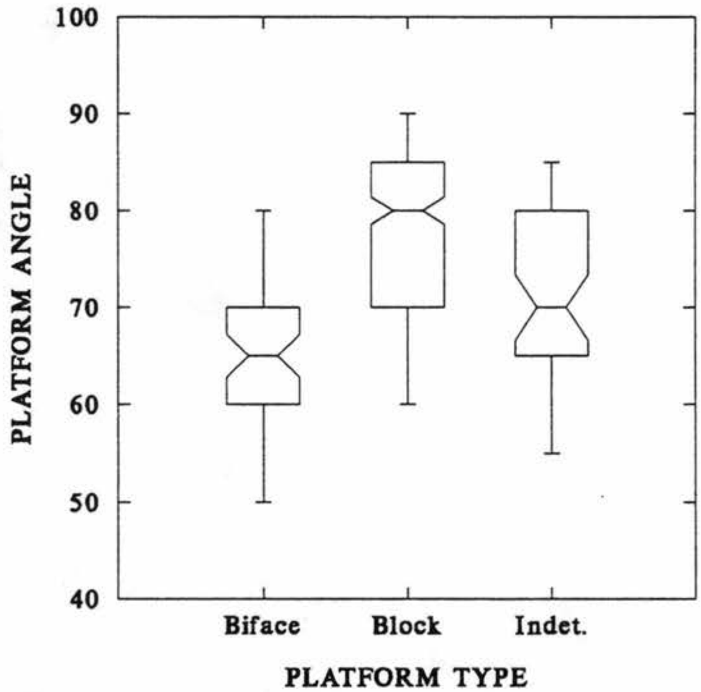


Figure 5.2. Boxplots comparing platform angles of bifacial, block, and indeterminate derived blanks.

Table 5.1. Frequency of Block Derived Versus Biface Derived Blanks Among Unifacial Tools.

Tool Type	Block		Biface		Indeterminate		Total
	n	%	n	%	n	%	
End Scraper Ia	57	41.9	9	6.6	70	51.5	136
End Scraper Ib	13	31.7	-	-	28	68.3	41
End Scraper IIa	67	77.0	1	1.1	19	21.8	87
End Scraper IIb	38	86.4	2	4.5	4	9.1	44
End Scraper III	6	66.7	-	-	3	33.3	9
Side Scraper I	19	95	-	-	1	5	20
Side Scraper IIa	177	80.1	23	10.4	21	9.5	221
Side Scraper III	94	76.4	17	13.8	12	9.8	123
Side Scraper IV	16	70	-	-	7	30	23
Pointed Scraper Ia	3	100	-	-	-	-	3
Pointed Scraper Ib	3	50	1	16.7	2	33.3	6
Oval Scrapers	3	60	-	-	2	40	5
Denticulate	1	50	-	-	1	50	2
Perforator/Drill	5	55.6	-	-	4	44.4	9
Graver	6	31.6	2	10.5	11	57.9	19
Other Scrapers	9	52.9	1	5.9	7	41.2	17
Hafted Spokeshaves	2	100	-	-	-	-	2
Waller Knife	1	100	-	-	-	-	1
Total	607	67.7	75	8.4	214	23.9	896

the Biface class discussed in Chapter IV. That is, Bifaces appear to be produced most often from large block derived flakes and less frequently from relatively large angular masses. Yet, many Type I Bifaces appeared to have their origin in the latter group. This inference is made primarily based upon their relatively thick, blocky cross-sections. Some Type I and virtually all of the Type II and III Bifaces, however, were probably could easily have been produced from large block derived flakes. Portions of an unflaked ventral surface on some specimens verified their flake origin, and their relatively large dimensions probably precluded a bifacial derivation.

In sum, these results indicate block cores were the primary source for deriving tool blanks in the Hardaway assemblage. In fact, only one tool type--Side Scraper IIb--had higher frequencies of biface-derived than block-derived blanks (Table 5.1). As previously discussed, these are fairly small tools that may have been largely the result of the opportunistic use of debitage produced during biface manufacture.

Given that most of the tool blanks from the Hardaway assemblage were derived from block cores, it seems unlikely that blank production took place at Hardaway itself. Rather, I suggest such production tool place at the quarry. If block cores were being brought to Hardaway in appreciable amounts, greater numbers of exhausted specimens and core remnants would be expected. These simply do not exist. Three related behaviors, however, need to be considered that might have masked the former presence of block cores at Hardaway. First, it is possible these cores may have suffered from the "size effect" described earlier. That is, a relatively large item such as a block core may have been repeatedly scavenged as a result of site reoccupation in the same manner as postulated for the hammerstones. Second, rather than being reduced until exhausted, block cores may simply have been recycled into large tools such as the core/scraper form described in

Chapter IV. Third, block cores may have been only partially reduced at Hardaway and transported from the site for use elsewhere.

While the first two explanations--scavenging and recycling--are plausible, they are still not sufficient in themselves to account for the virtual absence of block cores at Hardaway. The need for scavenging or recycling stone is more likely to occur at locations where raw material is scarce; this, of course, was not the case at Hardaway.

Finally, the third explanation--transporting block cores from Hardaway--seems least likely to account for their absence at the site. The use of block cores are only economical when stone sources are abundant. As has been often noted, the use of block cores (i.e., mostly unmodified angular masses, rectangular to squarish in shape, with little regard for platform preparation and removal of subsequent flakes) generally produce much more waste than usable blanks (e.g., Goodyear 1979; Kelly 1988; MacDonald 1968:66; Parry and Kelly 1989). For mobile groups who spend considerable time away from stone sources, bifacial forms are a much more economical source of raw material than block cores and are thus more likely to be transported. Therefore, if block cores were present in any significant amount at Hardaway, they should have stayed there.

Given the general absence of block cores at Hardaway, it seems reasonable to suggest that tool blanks were produced at the quarry in the form of large flakes and transported to Hardaway in unmodified or minimally retouched form. Furthermore, since some of the scrapers in the assemblage are relatively large (e.g., Type IIa End Scrapers and Type V Side Scrapers) and would have required a fairly large core as a parent material, this would have increased the likelihood that this activity would been done at the bedrock source.

This procurement strategy has been observed ethnoarchaeologically as indicated by the following description of two Alywara men at work in a stone quarry.

> It was explained that shaping the core was the "big job," and was always done in the quarry, where all the big chunks and "mistakes" could be thrown away before one had to carry anything. Jacob noted that once one got a "good one," that is, a well-prepared core, "everybody hit 'em off as many as you can get before you make mistakes" .... The comments by the informants made it clear that the manufacture of blades as demonstrated by Sandy was normally done in the quarry. The resulting blanks would then be introduced to the residential site as manufactured items [Binford and O'Connell 1984:415].

In addition to large flake blanks, I suggest that the numerous bifaces at Hardaway were likely initially prepared at the quarry and then brought to the site for further reduction. This interpretation is also consistent with the predominance of biface thinning flakes present in the debitage. These bifaces were either finished into points or adzes or, further reduced to core form.

The idea that bifaces served as portable cores is a common theme in many models of hunter-gatherer technology (Goodyear 1979; Keeley 1980:161; Kelly 1988). The preponderance of bifaces at Hardaway indicates that this was the raw material form in which other portions of the settlement region were provisioned. As is commonly noted, bifaces provide the maximum amount of flake return for the amount of stone carried and thus serve as an ideal portable source of raw material; although this does not preclude the biface from being a long use-life tool itself (e.g., Kelly 1988).

In short, this production strategy of manufacturing tool blanks and roughing out bifaces at the quarry would have reduced the amount of stone to be carried to Hardaway and would have allowed the luxury of the preferential selection of only the most suitable tool blanks and bifaces. That is, this strategy prevented the transport of material with hidden flaws that would not have been detected until reduction had started. For instance, I have observed thin quartz veins in some rhyolite that would have obviously presented knapping problems.

TOOL USE-LIFE

The question of tool use-life has been an important theme of this analysis and is particularly relevant to several archaeological issues. Among these, tool use-life is tied directly to the concept of curation: the manufacture and maintenance of tools in anticipation of their use among different settlements. Originally advanced by Binford (1973, 1977, 1979) the notion of curation is an important organizational concept of many lithic studies. Following arguments by Binford (1979:267-268) and elaborated upon by others (e.g., Bamforth 1986; Keeley 1982; Shott 1989a), tool curation has been inferred in archaeological assemblages based upon factors such as the relative rarity and high quality of stone types (e.g., Goodyear 1979), formalized tool morphologies (e.g., Keeley 1982), and the staging of tool manufacture and use (e.g., Goodyear 1974). Recently, however, more objective methods based upon experimental replication (Dibble and Whitaker 1981; Kuhn 1990) have been introduced to quantitatively measure tool use-life and have been applied to archaeological assemblages (e.g., Dibble 1987; Kuhn 1992; Shott 1989b).

These methods assign case-specific rates of tool reduction to archaeological specimens along a continuous scale. Following these methods, two measures of tool reduction were used here. The first method follows Kuhn's (1990) experimentally derived geometric index of scraper reduction. The second method is a measurement based upon the ratio of flake surface area to striking platform area (Dibble 1985; Dibble and Whittaker 1981; Speth 1972, 1975, 1981).

Kuhn's (1990) index is a ratio between the maximum centerline thickness of the tool and thickness of the tool bit. This ratio is based a simple assumption concerning the cross-section geometry of flake tools: the center of a flake blank is thicker than its edges. Given this, bit thickness (i.e., thickness of a retouched edge) approaches tool centerline thickness as a tool is more intensively reduced; hence, the index theoretically ranges between near 0 (unretouched) to 1 (heavily retouched). (In practice, however, some values slightly exceed 1.0 due to vagaries of tool blank cross-section thickness [see also Kuhn 1992:119]).

These tool reduction indices are compared by type in Figure 5.3. The results support the inferences regarding tool curation presented in Chapter IV. For example, among end scrapers, the classes with the three highest median values are Type Ib (.87), Type III (.86), and Type Ia (.79). (In fact, the Type Ib End Scraper value is significantly higher than any other end scraper value except Type III). These three scrapers were all proposed to be curated (and hence more intensively used) tools. Similarly, the three lowest median values belong to specimens identified as more expedient scrapers: Type IIb (.66), Type IV (.66), and Type V (.47) (Figure 5.3). In fact, the Type V End Scraper exhibits a median value that is significantly lower than any other end scrapers.

The middle rank of the final end scraper--Type IIa--is interesting in light of the discussion in Chapter IV concerning its potential use-life and the ambiguity concerning a determination whether this tool type was ever hafted. Although it exhibits a value of .76--midway among the seven end scrapers--this index is not significantly different from the values of some curated (e.g., Type Ia End Scrapers) or some expedient (e.g., Type IIb End Scrapers) specimens. This middling value illustrates nicely the nature of the curation continuum. For instance, it was suggested in Chapter IV that this end scraper exhibited technically different hafting modifications than the smaller forms and likely represented a response to more situational contexts related to specific tool designs needed for tasks at Hardaway. Thus, its index midway among the end scrapers might suggest its use-life was intense relative to the site occupation (i.e., relatively longer than Type IV and V End Scrapers) but probably was not transported and employed beyond its use at Hardaway (as opposed to the Type I and III End Scrapers.)

Similar trends are noted in the reduction values for side scrapers (Figure 5.3). Type I and Type IV Side Scrapers display the highest indices, .57 and .65 respectively, among all the side scrapers. These values are, in fact, significantly higher than those from any other side scraper forms. The values for the remaining side scrapers range from .31 to .41 (for both left and right bits) with no significant differences among these values. Thus, these results also support the conclusions concerning tool use-life discussed in Chapter IV. That is, it appears that the Type I and Type IV Side Scrapers were used more intensively than the other side scrapers at Hardaway, which is consistent with their interpretation as hafted tools. As such, these specimens might have been curated items.

Somewhat mixed results were obtained with the second measure of reduction--the flake area:platform area ratio. It will be recalled from Chapter IV that the amount of relative blank reduction can be estimated by comparing the remaining surface area of the tool (the product of length times width) with the surface area of the intact platform (platform width time platform thickness). These ratios have been used with success on measuring tool reduction in Mousterian assemblages (e.g., Dibble 1987a; 1987b) and were employed here.

The boxplots comparing flake area:platform area ratios indicate virtually no difference among the end scrapers types (Figure 5.4). Moreover, the median values for both Type Ia End Scrapers (19.3) and Type Ib End Scrapers (25.1) as well as Type III End Scrapers (26.1) would suggest that these curated tools had undergone less reduction than their expedient counterparts, Type IV (18.5) and Type V (14.4) End Scrapers. However, a closer examination of the data and certain assumptions concerning the ratio measurement indicates why these may be spurious results.

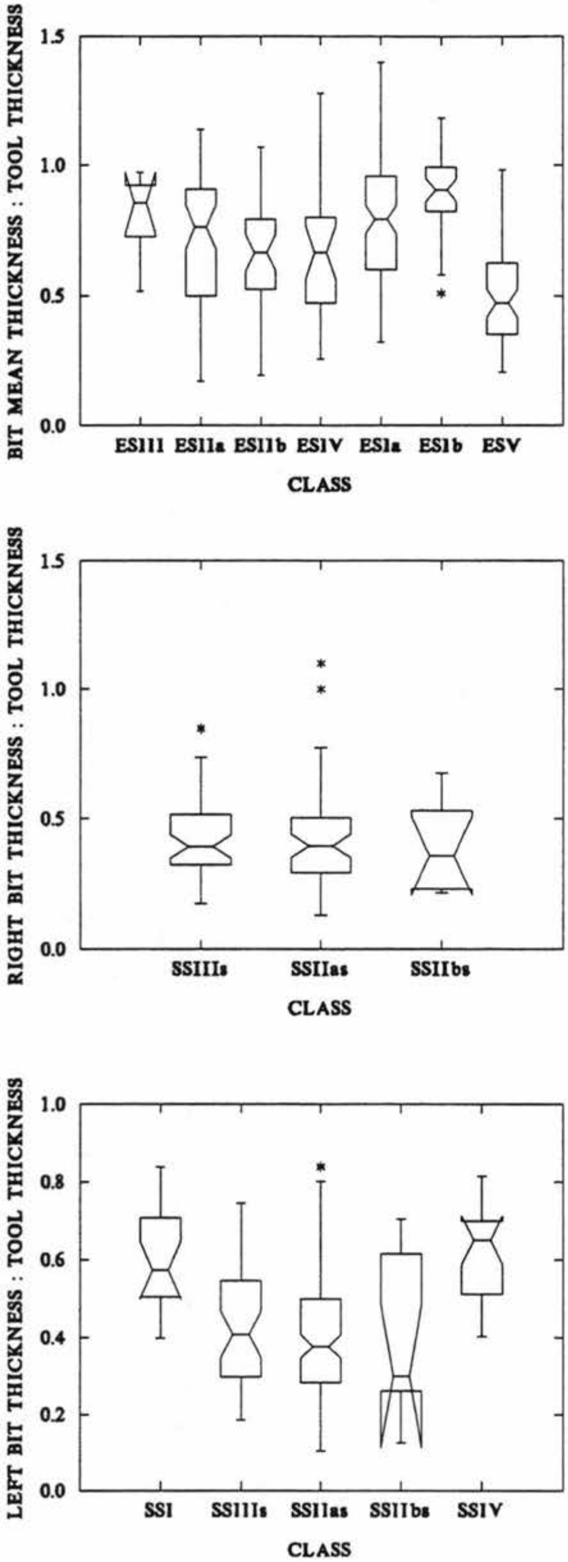


Figure 5.3. Boxplots comparing tool reduction indices (bit thickness:tool thickness) among end scrapers (top), side scrapers (middle and bottom).

The area-ratio method assumes that the platform area of the tool remains relatively constant while flake area (i.e., tool length and/or width) is reduced. As previously discussed, hafting modifications (in the form of proximal thinning) has undoubtedly reduced original platform size on some of the hafted end scraper forms, obviously violating an integral assumption of the method. This modification has likely resulted in greater platform area reduction relative to flake area reduction. Hence the higher ratios for these end scrapers is not surprising.

A further examination of the outlying values in Figure 5.4 illustrates this point. All of the specimens represented by outliers were inspected revealing substantially modified striking platforms. Moreover, only end scraper types that are thought to have been hafted exhibit outliers. Thus, I believe that the first index discussed above is a more reliable measure of tool reduction among end scrapers.

The area-ratio rankings for side scrapers, on the other hand, are more consistent with the geometric index rankings (Figure 5.4). Type I Side Scrapers exhibit the lowest median value (6.0) which is significantly lower (i.e., more reduced) than other side scrapers. The Type I Side Scraper is followed by Type IIa (16.6) and Type IV Side Scrapers (18) respectively, although there is no significant difference between their median values. Finally, Types IIb (27.1) and IIb (36.2) Side Scrapers exhibit the highest median values (i.e., are the less reduced), which is consistent with their interpretation as expediently used tools.

The relatively high ranking of the Type IV Side Scrapers would appear inconsistent with the geometric index rankings, but is likely spurious. As with the hafting modifications on the end scraper types discussed above, the bifacial modification of the platform area of Type IV Side Scrapers probably accounts for its relatively high value. Similarly, platform modification also largely accounts for the five outlier values for the Type IIa Side Scrapers in Figure 5.4. Three of these speci-

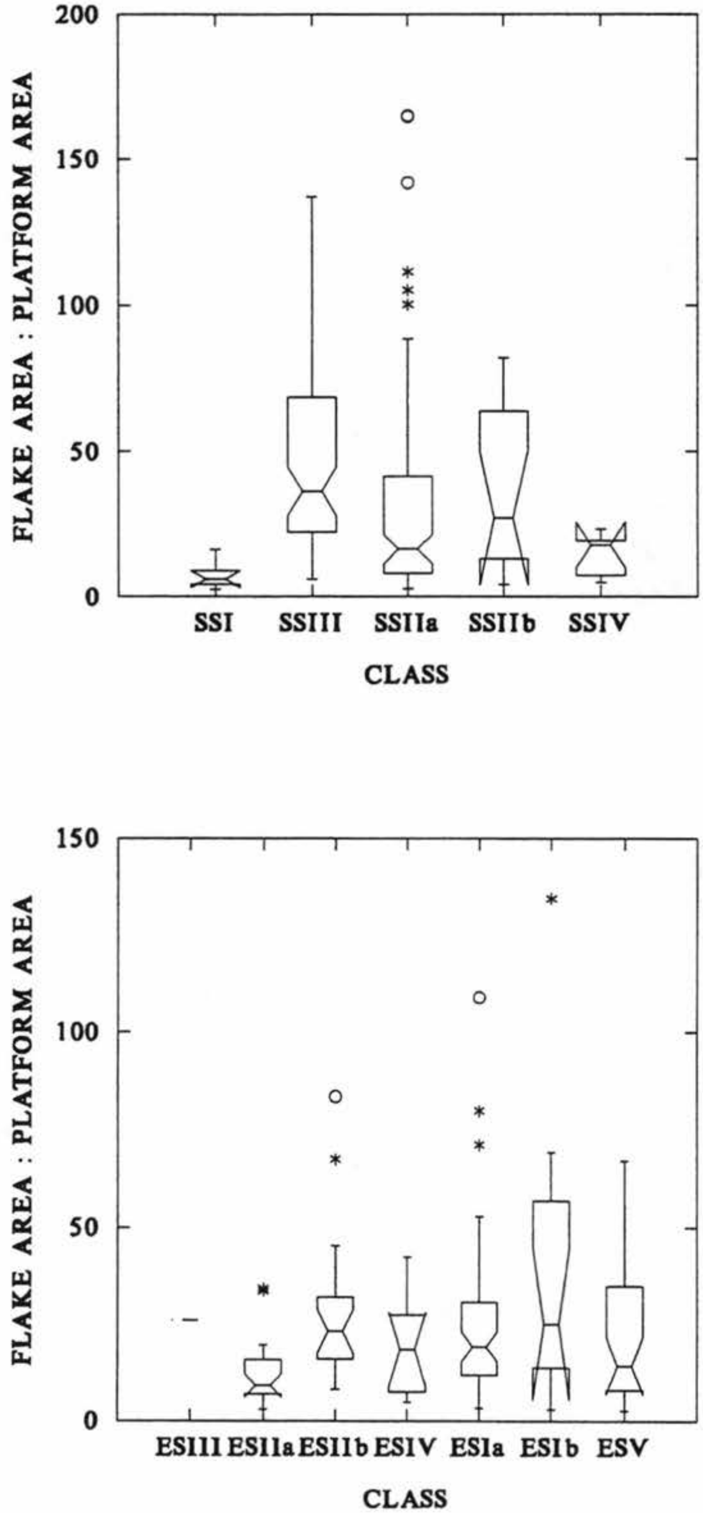


Figure 5.4. Boxplots comparing tool reduction indices (flake area:platform area) among side scrapers (top) and end scrapers (bottom).

mens have their platforms reduced by lateral (i.e., bit) retouch while the remaining two simply have very small striking platforms.

In sum, this quantitative analysis has tended to support the conclusions advanced concerning tool use-life based upon the qualitative consideration of morphology. The small, formalized, Type I End Scrapers were generally the most intensively used unifacial tool in the assemblage. The results of these analyses also identified more expediently made and used end scrapers as well. Side Scrapers were the least reduced unifacial tools and were expediently used. Two exceptions, however, may be noted. Types I and IV Side Scrapers were more intensively used than the other side scraper forms, but exhibit values that suggest that they were within the range of the expedient end scrapers. While these tools were likely hafted it remains unclear if they were curated much beyond their use at Hardaway.

Primarily due to small sample size, no attempt was made to examine the other flake tools in a similar manner. However, except for hafted spokeshaves and drills, the remaining tools are morphologically similar to the unhafted side scrapers and thus were probably expedient tools. It remains uncertain to what degree the hafted spokeshaves and drills were curated.

ASSEMBLAGE COMPOSITION AND SITE FUNCTION

Three interrelated factors were examined in interpreting assemblage composition as it related to site function. These factors included: (1) the relative frequencies of functional groupings of tool types; (2) the organizational roles (e.g., curated vs. expedient) of individual tool types; and (3) the proximity of Hardaway to stone resources.

Tool types in the Hardaway assemblage were sorted into nine functional groups based upon their inferred predominate function as outlined in Chapter IV (Table 5.2). While some inferred tool uses were fairly precise and assigned to

Table 5.2. Summary of Proposed Functional Classes at the Hardaway Site.[a]

Functional class: Artifact class	Organizational Context	n	%
Hunting and Butchering			
Projectile Points[b]	personal gear	280	11.0
Hide Scraping			
End Scraper Ia	personal gear	136	
End Scraper Ib	personal gear	41	
End Scraper IIa	situational gear	87	
End Scraper IIb	personal gear	44	
End Scraper III	personal gear	9	
End Scraper IV	situational gear	25	
End Scraper V	situational gear	79	
Subtotal		421	16.5
Light Scraping and Cutting			
Side Scraper III	situational gear	123	
Side Scraper IIb	situational gear	24	
Denticulates	situational gear	2	
Waller knifes	situational gear?	1	
Pointed Scrapers	situational gear	9	
Subtotal		159	6.2
Heavy Scraping and Cutting			
Choppers	site furniture	14	
Side Scraper I	personal gear	20	
Side Scraper IV	personal gear		23
Side Scraper IIa	situational gear	221	
Hafted Spokeshaves	personal gear	2	
Oval Scrapers	situational gear	5	
Core Scrapers	situational gear	6	
Miscellaneous Scrapers	situational gear	17	
Subtotal		306	12.0
Heavy Chopping			
Adzes	personal gear	2	.1
Boring and Scoring			
Drills	personal gear	3	
Perforaters	situational gear	5	
Gravers	situational gear	20	
Subtotal		28	1.1
Tool Manufacture			
Hammerstones	site furniture	53	
Hammerstones/abraders	site furniture	2	
Hammerstones/anvils	site furniture	17	
Anvils	site furniture	1	
Bifaces	personal gear	900	
Cores	situational gear	84	
Pièce Esquillées	situational gear	4	
Subtotal		1061	41.7
Plant Food Processing			
Grinding Stones/Anvils	site furniture	12	.5
Indeterminate			
Ground Stone indet.	?	1	
Engraved Stones	?	6	
Indeterminate Scrapers	situational gear	224	
Other Worked Stone	situational gear	6	
Unmodified Cobbles	site furniture?	41	
Subtotal		278	10.9
Total		2547	100

[a]Data tabulated from Tables 2.1, 2.3, and 2.4.
[b]Data for Early Archaic point totals tabulated from CBM, Zones 3 and 4.

specific functional groups (e.g., hunting and butchering, or hide scraping), other tools were assigned to more broad functional categories (e.g., light and heavy scraping and cutting).

In addition to their functional tasks, each tool type in the Hardaway assemblage was considered in one of three possible organizational roles: personal gear, situational gear, or site furniture (Table 5.2). This scheme was used to reflect the fact that tools were designed to meet not only the functional requirements of particular tasks, but were also organized to fulfill certain roles within a settlement system (Binford 1977, 1978, 1979). The distinction between personal gear and situational gear, for example, is based largely upon the idea that tools were organized with variable use-lives which condition various aspects of their manufacture, use, maintenance, and discard.

Personal gear is that part of the technology carried by each individual in anticipation of future conditions or activities (Binford 1979). Personal gear is heavily curated; implements are recycled, reused, and many maintenance expenditures are made on them (Binford 1977:33-34). Examples of such gear includes bone cutters, discoidal cores, axes, flints for fires, needles, a bow and arrow quiver, and flake knives (Binford 1979:262-263).

The second category, situational gear, consists of items put together to carry out specific activities on an ad hoc basis. Situational gear is expediently made and used and usually limited by the available raw material (Binford 1977). Raw material is acquired from caches, personal gear modified for reuse, material resources from the immediate environment, or material scavenged from previous occupations.

The last organizational category, site furniture, refers to items that are site specific and generally cached awaiting reuse (Binford 1978:339; Binford 1979:263-264). Common examples of these items include relatively large or bulky objects such as hearth-stones, anvils, and lithic raw material (Binford 1979:264).

This organizational scheme has important implications for understanding assemblage composition. The distinction between personal (curated) gear and situational (expedient), for example, suggests that while assemblages should reliably reflect tool-use involving expedient tools, this may not be the case for curated tools. Since curated tools are transported from site to site, frequencies of this item in an assemblage may not accurately reflect the intensity of its use at any one site. Indeed, curated tools should enter the archaeological record more often where they are replaced, which is not necessarily where they were used (Binford 1977:34).

The final factor considered in the interpretation of the Hardaway assemblage was raw material availability (Bamforth 1986). In fact, it is difficult to consider the presence of curated or expedient tools at Hardaway apart from their source. That is, given the abundance of nearby rhyolite and the mix of both curated and expedient tools at Hardaway, most of the curated tools recovered there may not have been used at the site but rather they may have been discarded and replaced by newly manufactured ones.

It should be clear from the functional categories listed in Table 5.2 that a variety of activities were probably undertaken at Hardaway. Moreover, given the preceding discussion, it should also be apparent that basing a determination of site function at Hardaway solely on a traditional qualitative and quantitative analysis of tool frequencies might be misleading. For example, end scrapers account for 16.5% of the assemblage total and based on this measurement alone, hide scraping would constitute the second most abundant functional category at Hardaway (Table 5.2). However, given that this functional group consists largely of curated tools, and given Hardaway's proximity to major quarries, an alternative interpretation must be considered. As personal gear, the curated end scrapers recovered at Hardaway were probably used elsewhere in the settlement system and brought to Hardaway in anticipation of being replaced. Thus, the presence of these end scrapers in the assemblage may reflect retooling activities as much as they do hide scraping. The actual degree of hide working undertaken at Hardaway is probably better reflected in the expedient end scraper tool types which only constitute 6.1% (n=157) of the total--less than half the initial hide-scraping frequency.

Likewise, additional tool classes classified as personal gear at Hardaway may have been discarded as a result of retooling (Table 5.2). In particular, retooled artifact classes would have included points and adzes. Points, of course, reflect hunting and butchering activities and constitute 11% of the assemblage total. While such activities probably were associated with the site occupation, point retooling probably was undertaken at Hardaway as well. The presence of exhausted and broken points as well as point preforms in the assemblage is also consistent with the notion of retooling. Similarly, the occurrence of adz preforms in the assemblage is also suggestive of adz replacement at Hardaway.

More direct evidence of retooling (or at least gearing-up) can be found in the assemblage by the presence of hammerstones, anvils, and cores which, along with bifaces, comprise the tool manufacturing group (41.7%). Tool manufacture is the dominant activity represented in the assemblage, with bifaces (35.3%, n=900) making up the vast majority of items assigned to this functional group. As discussed earlier in the chapter, bifaces make efficient portable cores and thus were probably manufactured at Hardaway to be used elsewhere in the region.

Despite this emphasis on retooling, a variety of other activities took place at Hardaway which suggests that the occupation of the site was not limited to tool manufacturing or hide scraping. These activities are reflected in the situational gear present in most of the functional tool groups in Table 5.2. Tools categorized as situational gear are abundant in the light scraping and cutting (6.2%) and heavy scraping and cutting (12.0%) functional groups; quite possibly these activities would have included wood and bone working and even butchering (Table 5.2). Finally, the processing of plant food is also suggested by the presence of site furniture in the form of grinding stones (.5%). Plant food processing, however, is probably under represented in Table 5.2 since the use of either perishable materials or cobble tools (e.g., hammerstones/anvils) may also have been used for this activity.

While an emphasis was placed on tool manufacturing at Hardaway, the presence of hide working, a bone and wood working industry, butchering activities, and plant processing indicates that the site occupation was not limited to tool-kit replacement. Taken together, these activities presumably reflect routine maintenance tasks associated with a residential base camp. Therefore, it appears that Hardaway can be characterized as a quarry-related base camp. In fact, refurbishing tool-kits is most often undertaken during longer-term occupations within a settlement system (Keeley 1982:804).

Thus, given the abundance of nearby rhyolite outcrops, the mix of both curated and expedient tools at Hardaway is consistent with the model of expedient tools being used at sites near stone sources, while curated tools were made and conserved for use elsewhere.

> if a group is occupying a site near a source of lithic raw material, they may prefer to employ expedient implements while conserving or even ignoring hafted tools. The assemblage at such a site would contain large amounts of waste and a relatively large number of big, minimally retouched tools .... In addition, a group about to leave a site with abundant lithic raw material may extensively retool in anticipation of future shortages of suitable stone at sites occupied next in their seasonal round [Keeley 1982:803-804].

As a quarry-related base camp, Hardaway probably performed a unique role in the settlement system. Early Archaic groups probably visited Hardaway as a regular part of their settlement round. These visits were scheduled to replace expended toolkits; and camping at Hardaway provided access to the best quality stone in the region. Rhyolite was procured and initially processed at Morrow Mountain and then brought to Hardaway primarily in the form of bifaces and flake blanks. Some of this stone was made into expedient tools used to sustain a group while living at the site. Other tools were produced and stockpiled for future use elsewhere in the region without easy access to stone sources. This latter assemblage--including points, bifaces, and hafted unifacial tools--replaced the remnants of depleted toolkits brought to the site and then discarded in anticipation of gearing-up at Hardaway. In addition, relatively large unmodified flake blanks were probably also transported with the finished toolkit, as insurance against situational contingencies not initially anticipated in the toolkit inventory.

Finally, although retooling may have been the primary economic activity undertaken at Hardaway, social or ritual functions may have been carried out at the site as well. This possibility is raised by the presence of three unusual tool classes: quartz crystal *pièce esquilleés*, bipolar quartz crystal cores, and engraved stone. The exact functions of these tool classes remains unknown, but I speculated earlier that were not used in utilitarian tasks. The unique nature of the crystal itself may have prompted its use in some social or ritual functions. Engraved stone also represents another unusual artifact category; it too may have some social or ritual significance.

DISCUSSION

Stone tool assemblages reflect more than simply the tasks they were designed for. As such, archaeologists are now viewing stone tool assemblages as reflecting the organized use of prehistoric landscapes. That is, stone tool assemblages reflect the larger contexts of the locations and conditions under which they were produced, used, maintained, and discarded. Moreover, the perspective of technological organization--the concept that stone tool technologies were spatially, temporally, and functionally organized--is now being utilized as a method of understanding nonmaterial aspects of cultural systems such as settlement adaptations (e.g., Binford 1977, 1978, 1979).

With respect to the Hardaway assemblage, tool types were designed to fulfill certain *roles* in the settlement system as well as certain functional *tasks*. That is, tools were made to be used not only for a particular function (or range of functions) but they were designed with respect to long- versus short-term usage, to be used at specific times and places in the settlement system. In fact, this form of organization resulted in tools designed for different roles in the assemblage being used for the same tasks.

This distinction between roles and tasks is nicely illustrated with regard to the various end scrapers identified at Hardaway. As described in Chapter IV, edge rounding was observed on the bits of virtually every type of end scraper in the assemblage. Assuming that this use-wear trait largely reflects a single function (i.e., hide-scraping) then this function cross-cuts tool form. While these end scrapers were created to be used in similar functions, they were designed to be used under different conditions. Expedient end scrapers were manufactured for immediate use at Hardaway, while the curated forms were primarily made to be transported and used elsewhere in the region. Binford has anticipated this variability in the context of tool use:

> We can expect many such tool-design parallels, that is tools of very different design being used for identical tasks; but this is not to say that they are functionally isomorphic, since they are clearly designed for very different intended roles within the technology [Binford 1979:269].

This organizational strategy was not without adaptive significance for the Early Archaic inhabitants of the Piedmont. In fact, it was vital to survival in the region once the group left Hardaway. That is, the organization of the technology at

Hardaway was an adaptive response by mobile Early Archaic groups who essentially focused on Uwharrie rhyolite as an economic source for stone tools, but otherwise employed a geographically wide-ranging settlement round that necessitated spending considerable distance and time (or both) away from knappable stone.

Chapter VI

INTRASITE SPATIAL ANALYSIS

The analysis of the spatial distributions of artifacts has led to important insights concerning the spatial structure of several early prehistoric hunter-gatherer sites in North America. In particular, the analyses of the spatial distributions of stone artifacts on northeastern Paleoindian sites have been successful in identifying discrete clusters of artifacts. Moreover, these artifact clusters have been interpreted to represent the remains of short-term habitation episodes by small social groups (e.g., Gramly 1982; Grimes et al. 1984; Lothrop 1988; MacDonald 1968). In fact, the evidence of refitted broken artifacts among these clusters supports the possibility of contemporaneous occupation of different areas on the same site.

The identification and interpretation of spatial patterning on early sites in the Southeast, however, has been more problematic. This difficulty may be related, in part, to longer-term habitation or greater site reoccupation in the Southeast. In any event, spatial analyses have been conducted on only two Paleoindian sites in the Southeast: Thunderbird (Gardener 1974) and Harney Flats (Daniel and Wisenbaker 1987). Several Dalton and Early Archaic sites, however, have received attention including Brand (Goodyear 1974), Haw River (Claggett and Cable 1982), Rucker's Bottom (Anderson and Schuldenrein 1983), George S. Lewis (Anderson and Hanson 1988) and Rose Island (Kimball 1981). These attempts at spatial analysis have involved both visual inspection of artifact distributions as well as more formal, quantitative techniques. Following along these lines, I examine the spatial distributions of stone artifacts at Hardaway in this chapter.

ANALYTICAL APPROACHES

The spatial analysis in this chapter consists of two parts. First, I compare simple density distributions of various artifact groups across the site. These artifact distributions include various tool groups (i.e., "functional classes"), as well as debitage and raw material classes. The primary purpose of this analysis is to provide a visual representation of how artifacts are patterned across the excavated block, and provide some basis for identifying potential activity areas.

Second, I analyze spatial distributions of the same functional classes utilizing Whallon's (1984) "unconstrained clustering" technique. This technique detects significant spatial variation and patterning in assemblage composition among grid squares across the site and avoids many of the questionable assumptions for which other techniques have been criticized for (see Whallon 1984).

To facilitate the analysis I have lumped all the artifact types described in Chapter IV into eight "functional" categories. It is important to note, however, that while tool types with similar presumed functions have been combined into single categories, the term "functional" is not defined solely on specific tool uses. Instead, the term is employed in a broad fashion to include other factors (such as curation rates) that affect conditions under which a tool was made, used, and discarded. In this regard, the organizational categories outlined in Chapter V have been used to create the functional groupings. The resulting classes are described below.

All point types and unidentifiable point fragments have been combined under *Projectile Points*. (Since temporal distinctions can be made among this group, maps have also been generated based upon individual point types to examine variation in site use through time.) Biface manufacture was clearly an important activity at Hardaway and all biface and preform types were lumped into a single *Bifaces* category. All hafted end scrapers (Types Ia, Ib, IIb, and III) and side scrapers (Types I and IV) were combined into a category called *Hafted Scrapers*. The two adzes were also included in this group since they too were once hafted. These curated tools were combined here since they were probably discarded on the site where they were replaced rather than where they were used (see Keeley 1982). In contrast, expedient tools probably accumulated at or closer to the place of their last use (Binford 1979) and several expedient tools in the assemblage were combined to reflect this discard pattern. Given their presumed functional differences several expedient end and side scraper types were combined into two general classes: *Expedient End Scrapers* (Types IIa, IV, V) and *Expedient Side Scrapers* (Type IIa, IIb, and III). This latter category also included all indeterminate scraper fragments.

Miscellaneous Flaked Tools is a residual category comprised of the remaining minority chipped-stone tools, representing a variety of functions. This group includes gravers, drills, core scrapers, hafted spokeshaves, pointed scrapers, oval scrapers, other scrapers, denticulates and Waller knives; most of these classes represent expedient tools.

The category *Site Furniture* includes artifacts identified as such in Table 5.2: hammerstones, hammerstones/abraders, hammerstones/anvils, anvils, grinding stones/anvils, choppers, and unmodified cobbles. In addition, I have somewhat arbitrarily included the unidentified ground stone fragment, and the engraved "slate" in *Site Furniture*. Since the engraved slate has rarely been identified in sites beyond Hardaway, an argument could be made for its being site specific. Finally, the category *Cores* includes all core types and *pièces esquilées*.

ARTIFACT DENSITY DISTRIBUTIONS

The computer program SURFER was used to generate contour maps based upon artifact counts for each unit; artifact counts were totaled for Zone 3 (or CBM) and Zone 4 for each 5-ft square. These data were smoothed using a cubic spline interpolation algorithm (SURFER 1987) and essentially depict artifact densities across the excavated block. Because zone thickness varied, the density maps were generated based on artifact counts per cubic foot of excavated soil. Of course, many of the units from the 1970s excavations were disturbed due to pothunting. Therefore, artifact counts were computed based on the undisturbed portion of the square. These estimates, along with the procedure used to derive them are presented in Appendix C.

A contour map of the total tool count indicates that tools are well distributed across the excavated block with several tool concentrations 5-10 ft (1.5-3 m) in diameter of greater than three tools per cubic foot (Figure 6.1). Moreover, these tool concentrations are all connected by a less dense but continuous tool scatter. The most distinct concentration lies near the center of the block; using a density contour of 3 tools/ft^3 as a boundary, it is about 15 ft (4.5 m) in diameter.

While it is tempting to view each of these tool concentrations as activity areas (i.e., locales of refuse deposited as a result of domestic or communal activities), this interpretation is suspect for at least two reasons. First, the question of site formation, which remains to be resolved, has some bearing on the interpretation of artifact concentrations at Hardaway. For example, a comparison of the contour map of tool density with a similar map of soil volume reveals that concentrations of tools roughly parallel the volume of excavated soil (Figure 6.1). This comparison suggests that tool density is at least partially related to soil volume at Hardaway. In Chapter II, I suggested that natural processes may have played a more significant role in site formation than originally thought. If true, then artifact densities may not be completely related to cultural processes.

Regardless, the behavioral interpretation of at least one tool concentration--the large dense tool cluster noted above--can be questioned since it is related to two features (Feature 40 and Feature 41), both of which have questionable cultural

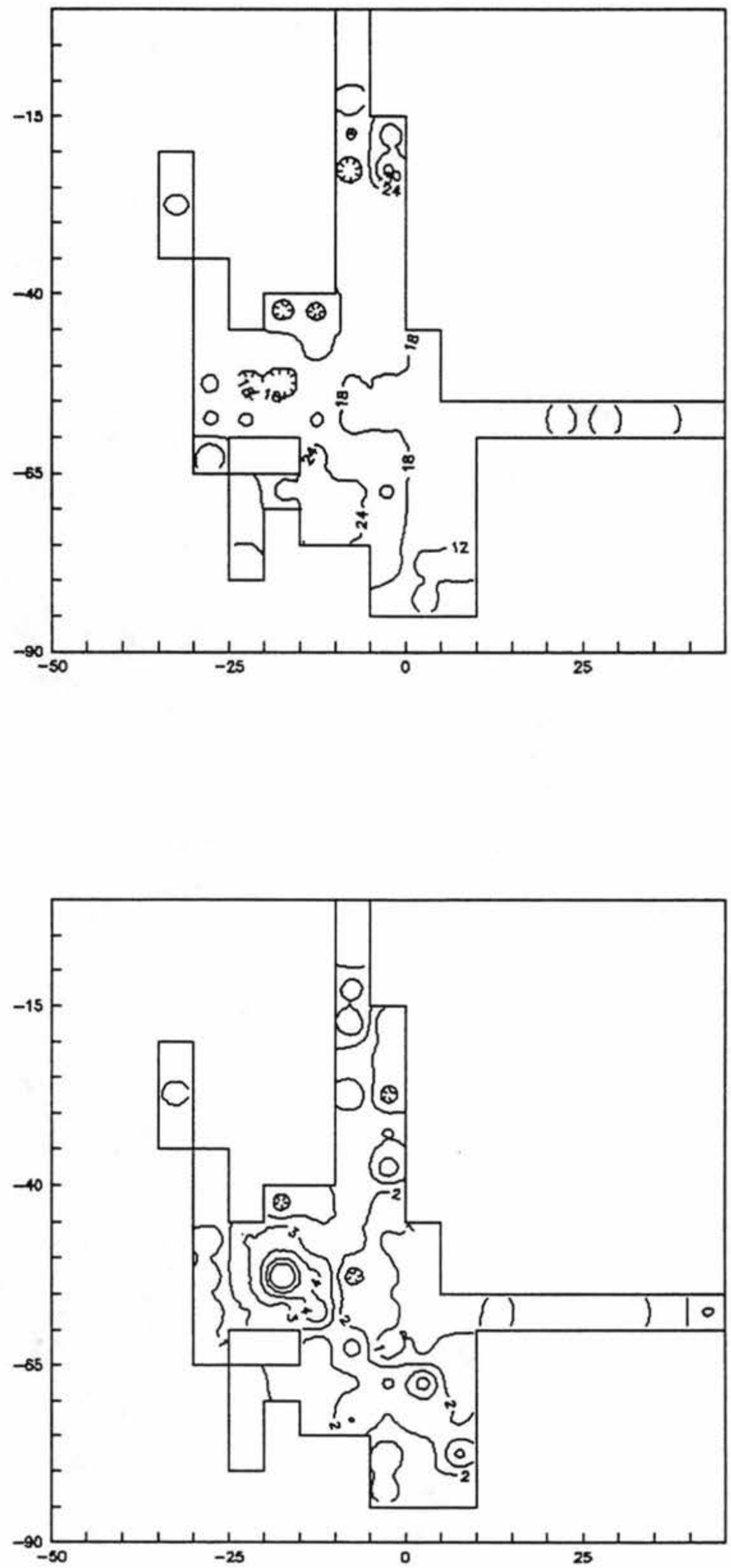


Figure 6.1. Contour map comparing soil volume (ft^3) for CBM, Zone 3, Zone 4 (top), with total tool density (count/ft^3) (bottom).

origins. That is, both of these features were probably naturally filled depressions (see Chapter II). If true, this would obviously belie any interpretation of this artifact concentration as an activity area.

But even if the question of site formation is disregarded, no readily interpretable pattern is evident. Moreover, these concentrations are unlike other material clusters that have been identified as activity areas either archaeologically (e.g., Gramly 1982; Grimes et al. 1984) or ethnoarchaeologically (e.g., Binford 1983; O'Connell 1987; O'Connell et al. 1991; Yellen 1977) in hunter-gatherer campsites. Material clusters in these ethnoarchaeological sites are often characterized by artifact concentrations that are spatially discrete from one another. Instead, spatial patterning at Hardaway exhibits a relatively large continuous artifact distribution containing smaller areas of relatively high artifact densities. Such a pattern suggests numerous and perhaps intense reoccupations created by a series of overlapping tool deposits.

Site reoccupation, of course, is consistent with the range of Early Archaic point types recovered from Hardaway. And while some loose clustering of point types is present--represented by groups of contiguous squares containing similar point types--the occurrence of several point types from the same square is just as common (Figures 6.2-6.6). In short, this evidence suggests that site structure manifested by several temporally discrete artifact clusters may not have existed or may not have survived at Hardaway as a result of site reuse through the millennia.

A similar conclusion can be drawn from an examination of the spatial distribution for each of the functional tool groups described above (Figures 6.7-6.12). That is, almost every functional class exhibits several relatively high concentrations connected by a continuous, less dense scatter of tools. In short, no "functionally" discrete artifact clusters are discernible in the spatial patterning at Hardaway either.

Turning to the spatial patterning of flakes, one also sees a few small areas of relatively high densities scattered among a continuous area of lower densities (Fig-

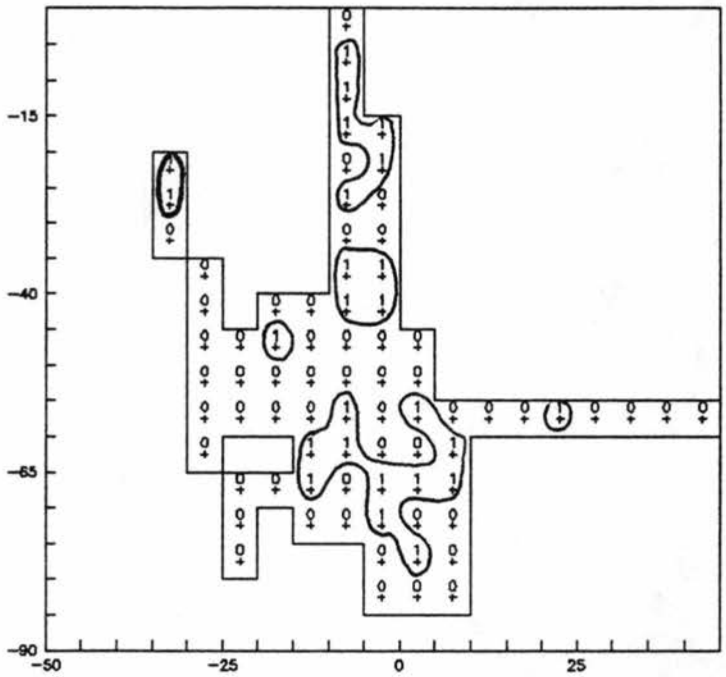


Figure 6.2. Spatial distribution of units containing Hardaway-Dalton points.

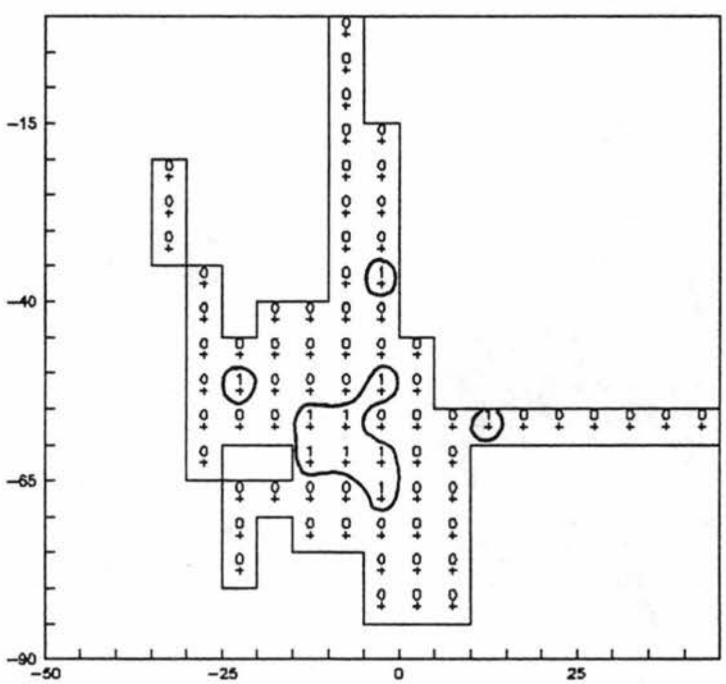


Figure 6.3. Spatial distruibution of units containing Hardaway Side-Notched points.

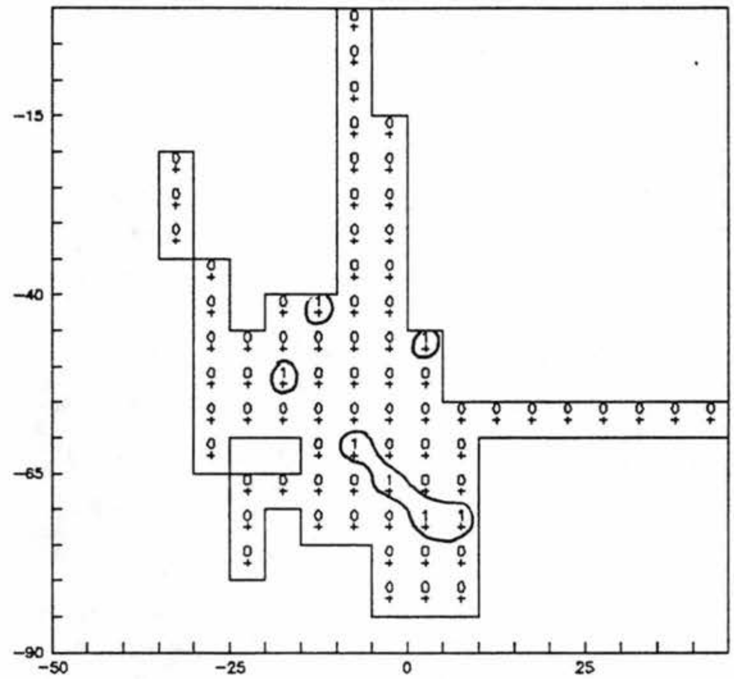


Figure 6.4. Spatial distribution of units containing Small Dalton points.

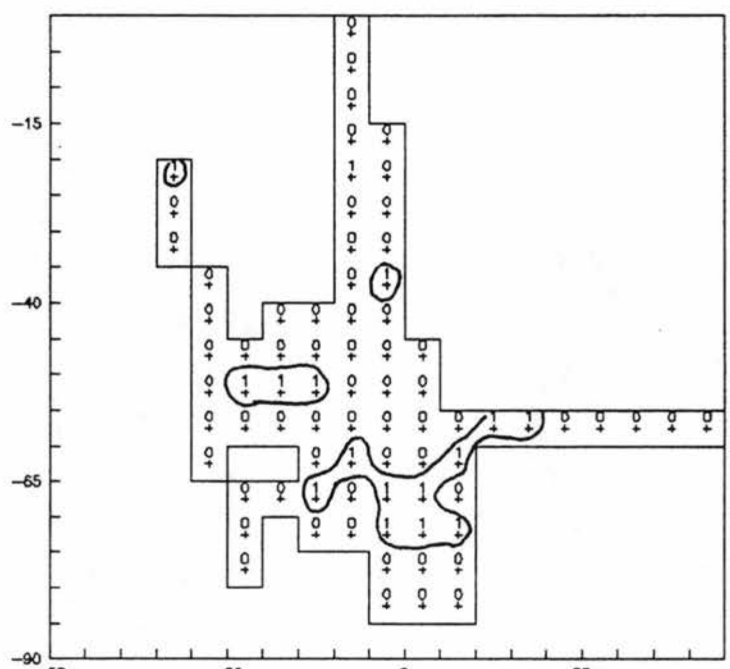


Figure 6.5. Spatial distruibution of units containing Palmer Corner-Notched points.

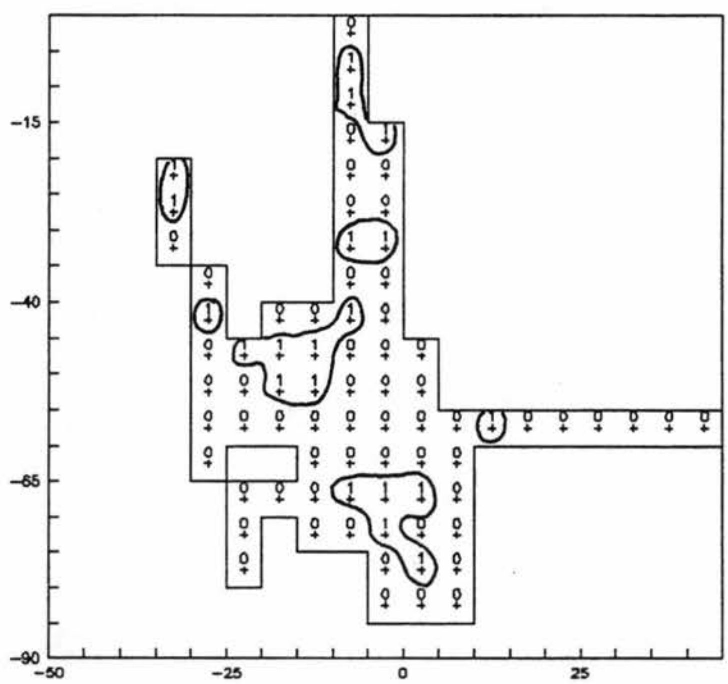


Figure 6.6. Spatial distruibution of units containing Kirk Corner-Notched points.

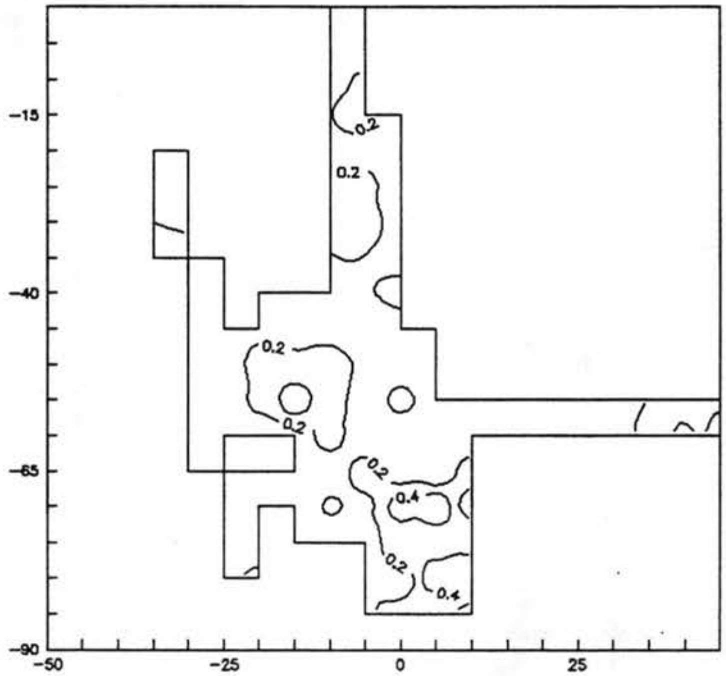


Figure 6.7. Density maps for Points (count/ft^3).

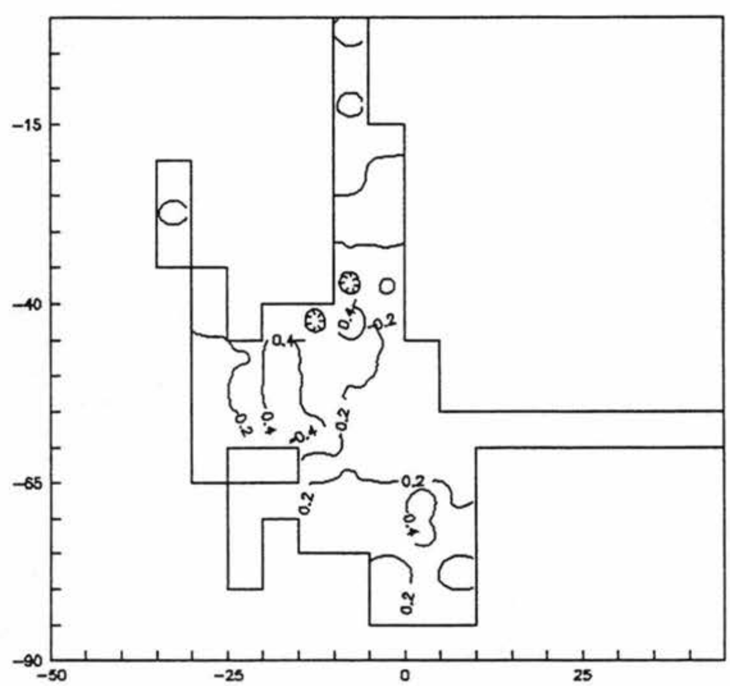


Figure 6.8. Density maps for Hafted Scrapers (count/ft^3).

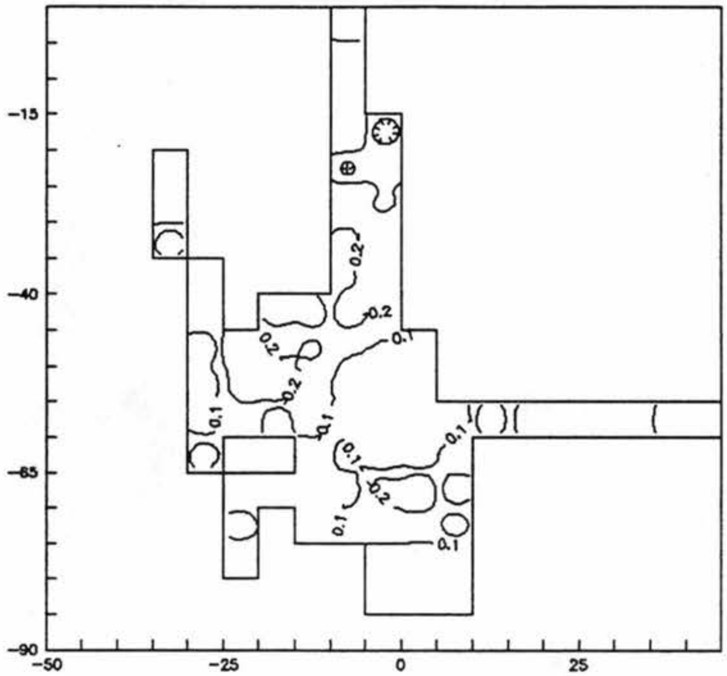


Figure 6.9. Density maps for Expedient End Scrapers (count/ft^3).

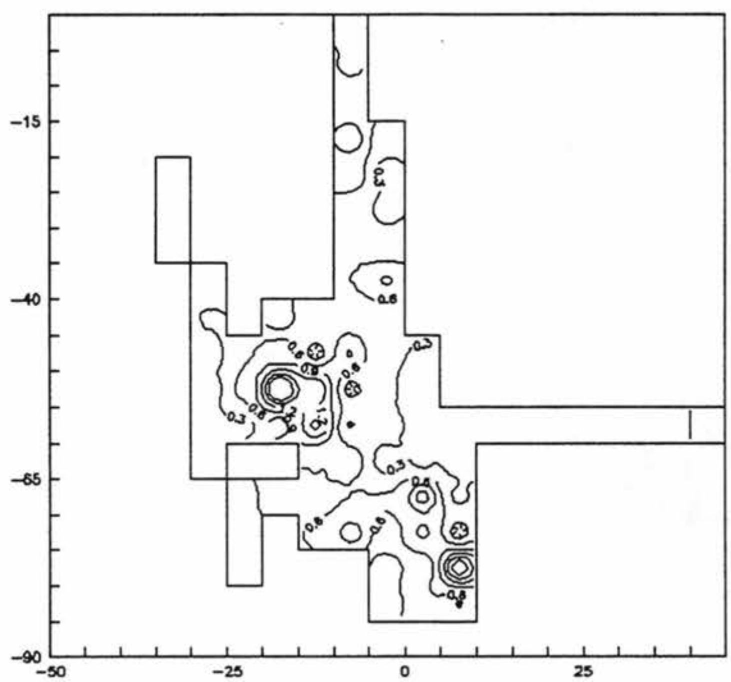


Figure 6.10. Density maps for Other Side Scrapers (count/ft^3).

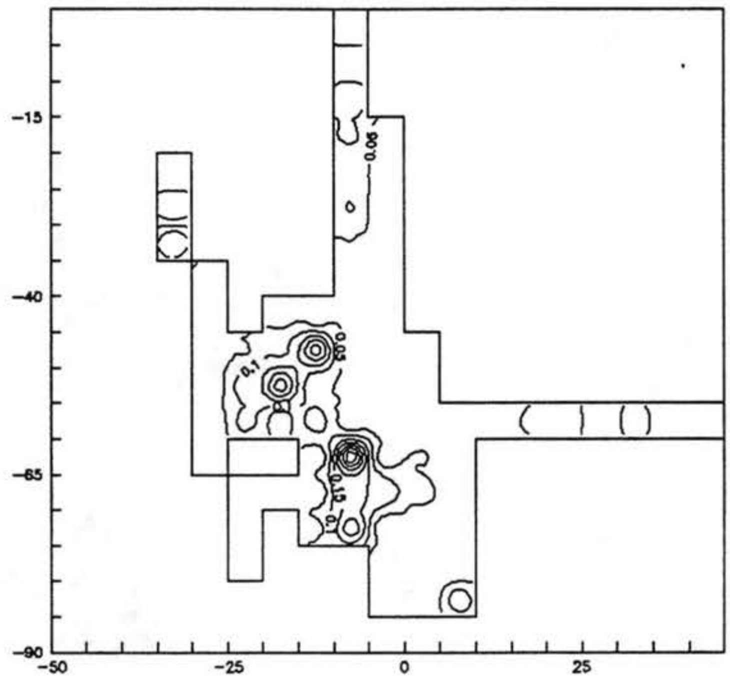


Figure 6.11. Density maps of Miscellaneous Expedient Tools (count/ft^3).

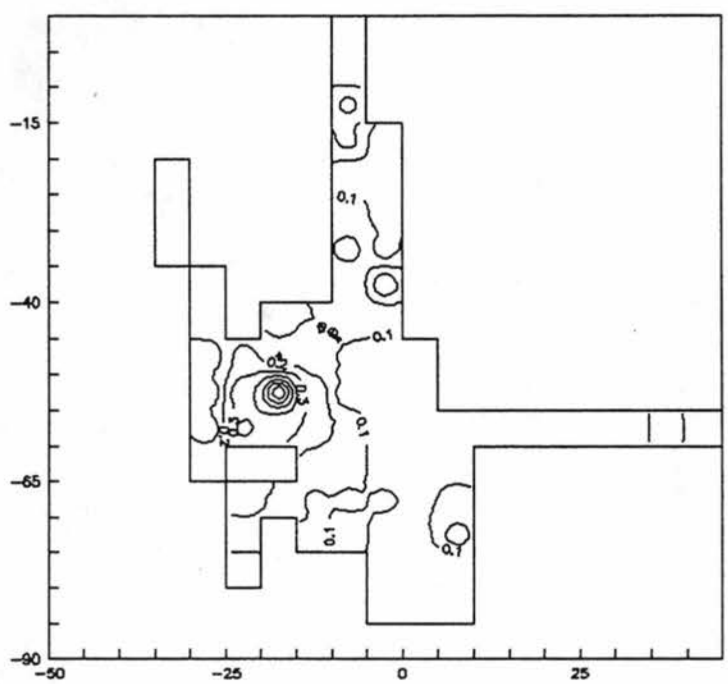


Figure 6.12. Density maps of Site Furniture (count/ft^3).

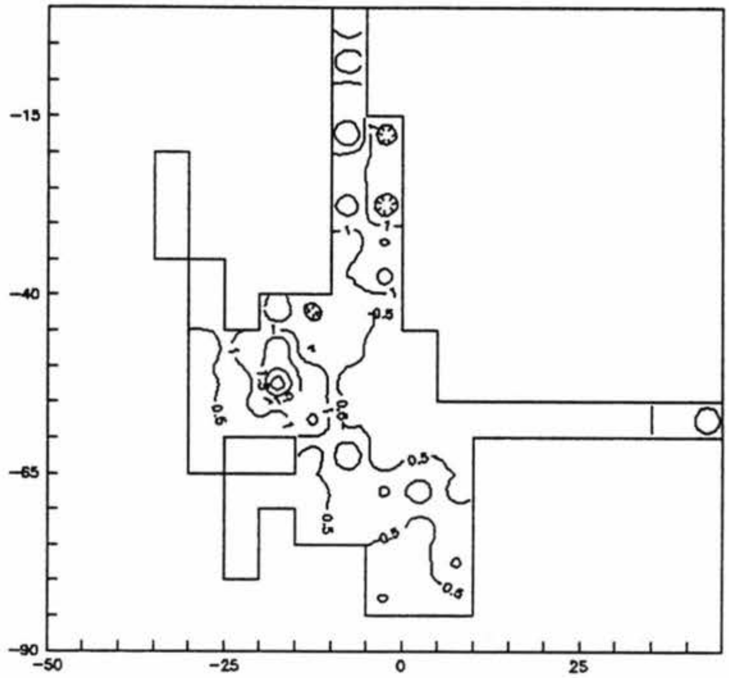


Figure 6.13. Density maps of Bifaces (count/ft^3).

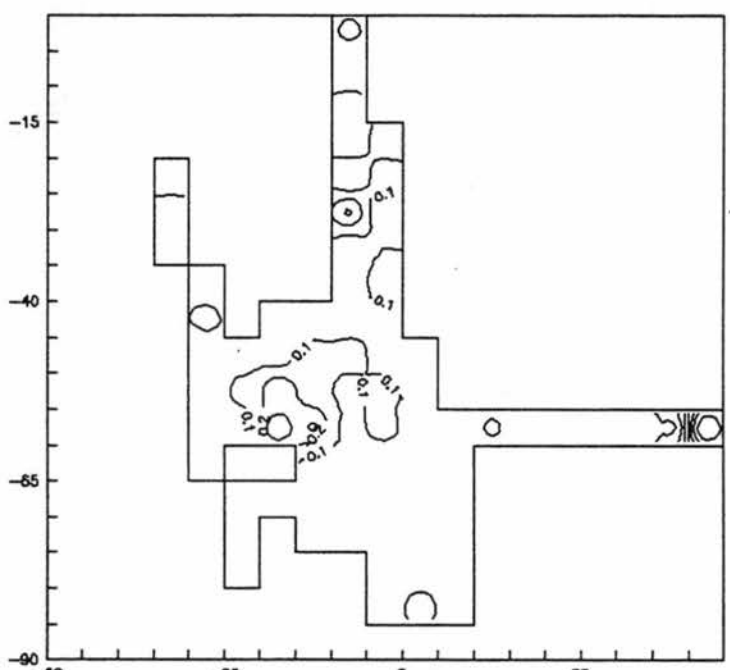


Figure 6.14. Density maps of Cores (count/ft^3).

ures 6.15-6.16). Moreover, the highest flake densities consistently occur south of the -45 line (Figure 6.15). It is unlikely, however, that this pattern has any spatial significance. Rather, the higher flake densities in the southern half of the block are almost certainly related to the greater emphasis given flake recovery in the 1970s excavations (see Chapter IV).

Also occurring south of the -45 line is a noticeable concentration of flakes both by count (from 100 to more than 200 flakes/ft^3) and weight (from 200 to 700 g/ft^3). This flake cluster coincides with the tool concentration discussed previously that was associated with Features 40 and 41. As in the case of the tool distribution, it is unlikely that any distinct activity areas can be identified in the flake distributions. Rather, even accounting for the biases in flake recovery, the pattern of small areas of flake concentrations scattered among a continuous distribution of flakes suggests that the flake distribution at Hardaway was also influenced by site reoccupation.

In an attempt to minimize the effects of site reoccupation, the spatial distributions of the frequencies of nonrhyolitic stone (i.e., quartz, crystal quartz, green metasiltstone, and chert) were examined in the assemblage. Given the low frequencies of these raw materials, it was reasoned that their output on the site was more likely to be associated with relatively short-term episodes that might be more easily identified spatially in comparison with the more ubiquitous rhyolite.

As expected, the densities of these raw materials are uniformly low (often less than 1/ft^3). Some clustering is present, however, that indicates tool and flake concentrations often do not overlap. While the spatial distributions of these minority raw materials are provocative, any interpretations assigned to them must be tempered by the variation in flake recovery methods noted earlier. This is especially true since most of the minority raw material flake clusters were located in the southern half of the block.

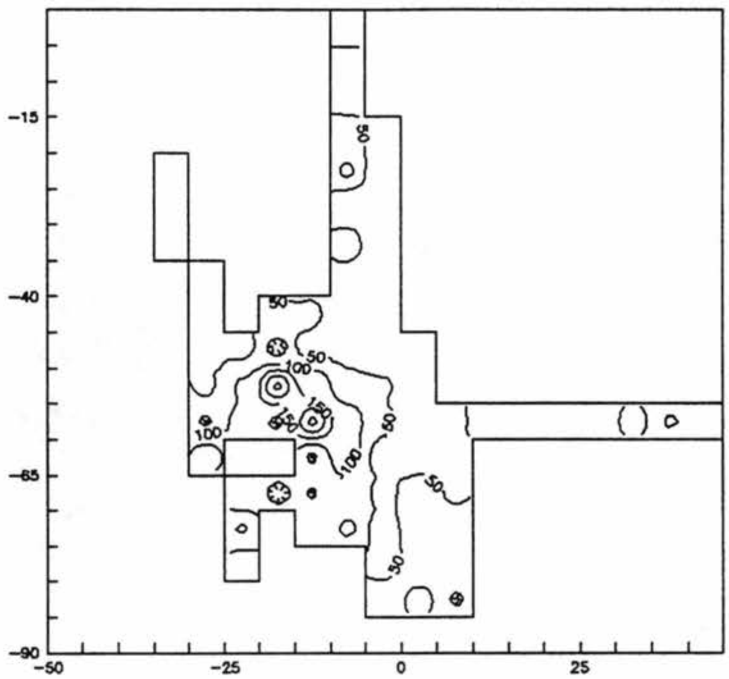


Figure 6.15. Density maps of total flake counts (count/ft^3).

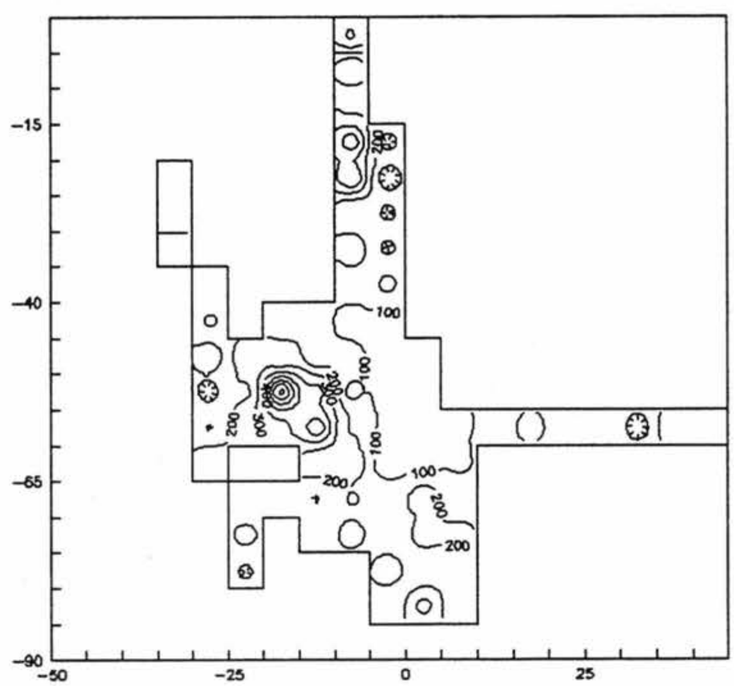


Figure 6.16. Density maps of total flake weight (count/ft^3).

This bias notwithstanding, such patterning might suggest tool reduction (i.e., tool manufacture and/or maintenance) was spatially separately from the location of tool discard. For example, green metasiltstone flakes and tools are continuously scattered across the excavated area but there is only one location where clusters of both tools and debitage overlap (in the west-central portion of the block) (Figure 6.17). There is even less spatial correspondence between tools and debitage of crystal quartz (Figure 6.18). Similarly, quartz flakes are concentrated in the southern and particularly the southwestern portion of the excavated block, while concentrations of quartz tools are primarily located in the northern portion of the block (Figure 6.19)

Lastly, another marked separation exists between chert flakes (i.e., chalcedony, jasper, and all other cherts) which are highly clustered in the east central and southern portion of the excavated block, and chert tools which are also highly clustered to the south and somewhat clustered to the north (although some overlap is present between tools and debitage in the southern part of the block) (Figure 6.20). It is interesting to note that although this category includes a variety of cryptocrystalline raw materials, these stone types are clustered together. This close spatial association might reflect some temporal association among the use of these cherts at Hardaway.

In any event, the question of separate but contemporaneous use of selected areas at Hardaway can be further addressed by an artifact refitting study (e.g., Cahen et al. 1979). If tools were made or maintained in areas separate from where they were discarded, then some artifacts should have cross-mends or flake refits from different areas of the site. Although no serious attempts at refitting were done in this study, a group of chalcedony flakes were found in the east-central chert cluster in Figure 6.20 while a chalcedony biface was recovered about 40 ft (12 m) to the northwest. Unfortunately, no refits could be made among the flakes and biface, but

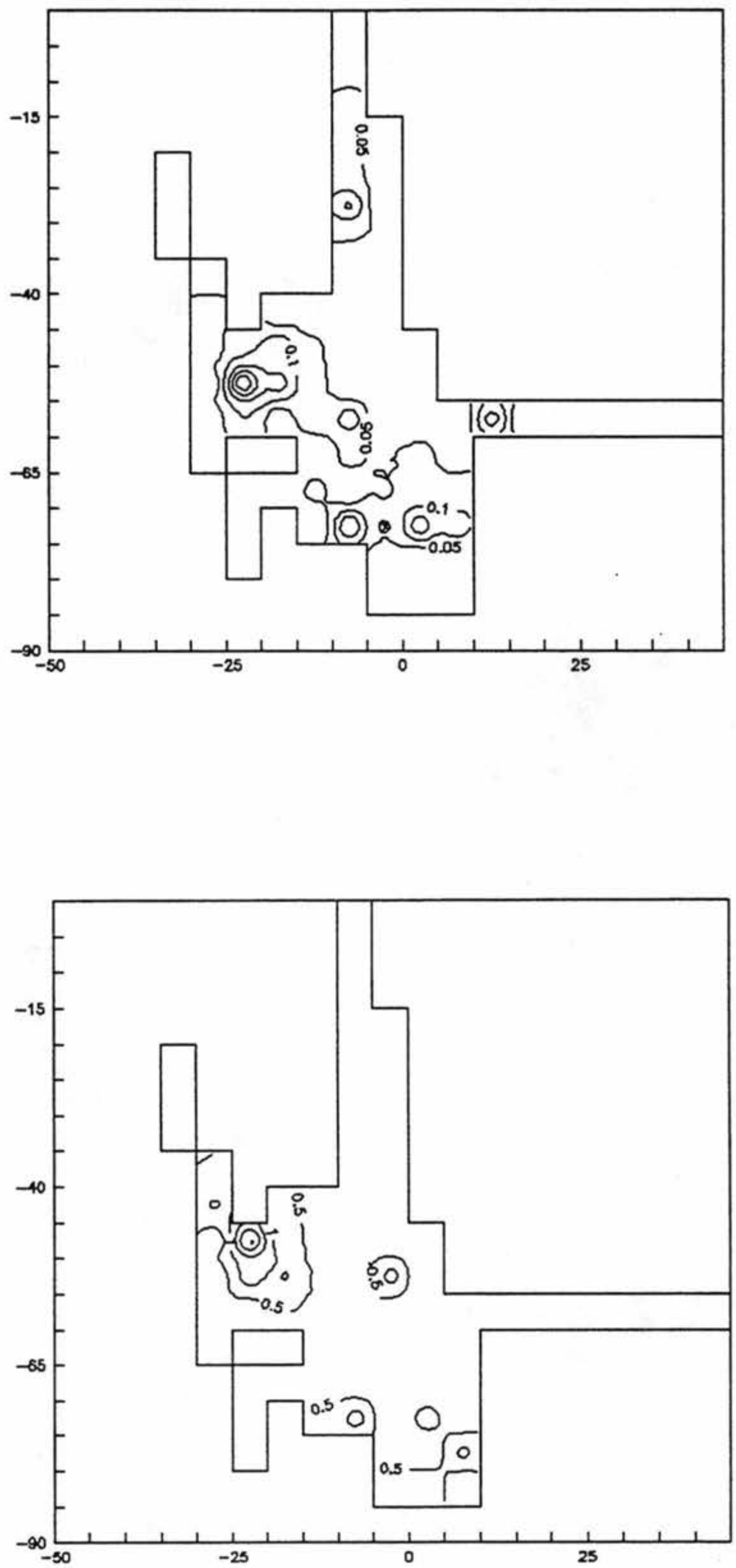


Figure 6.17. Density map of green metasiltstone: (top) tools; (bottom) flakes (count/ft^3).

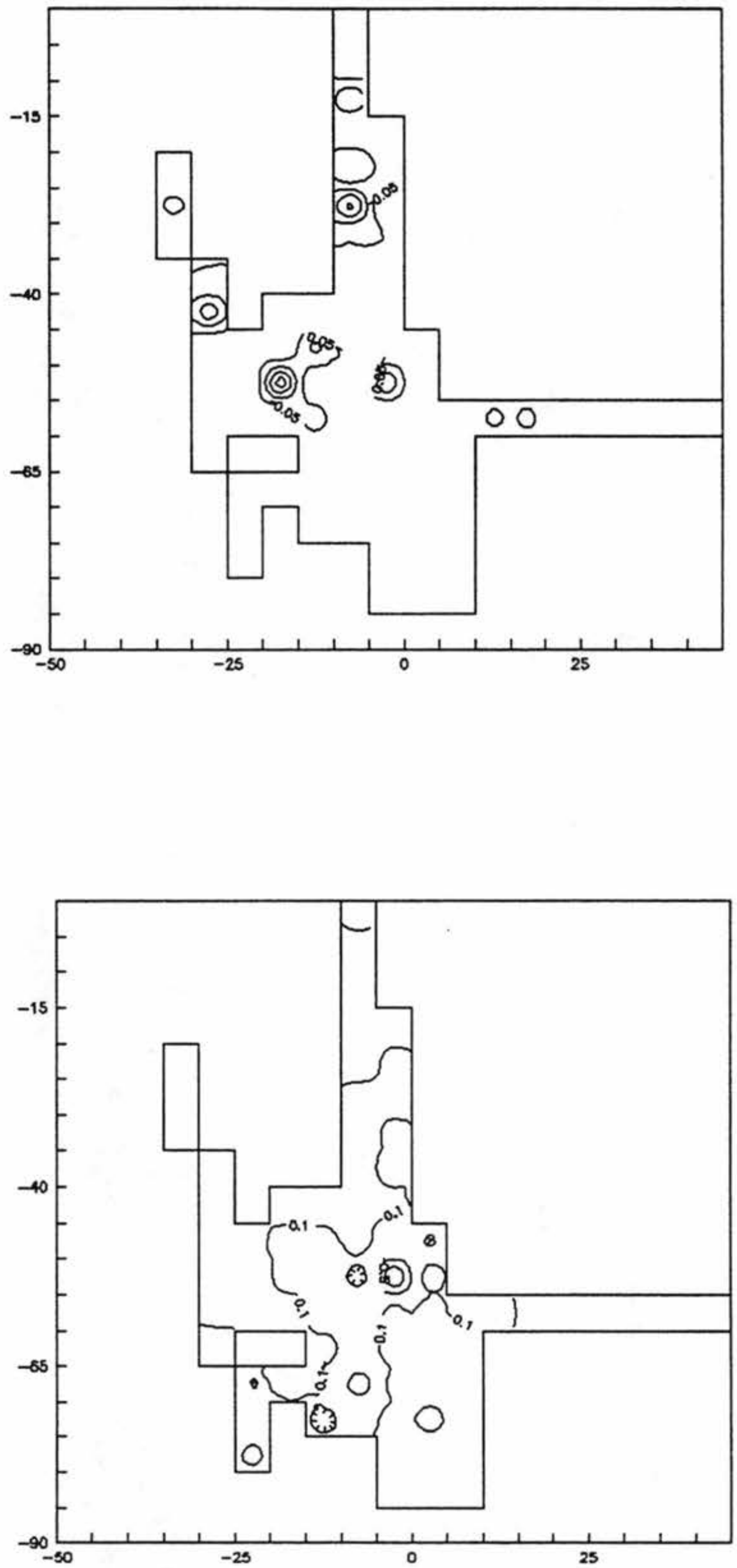


Figure 6.18. Density map of quartz crystal: (top) tools; (bottom) flakes (count/ft^3).

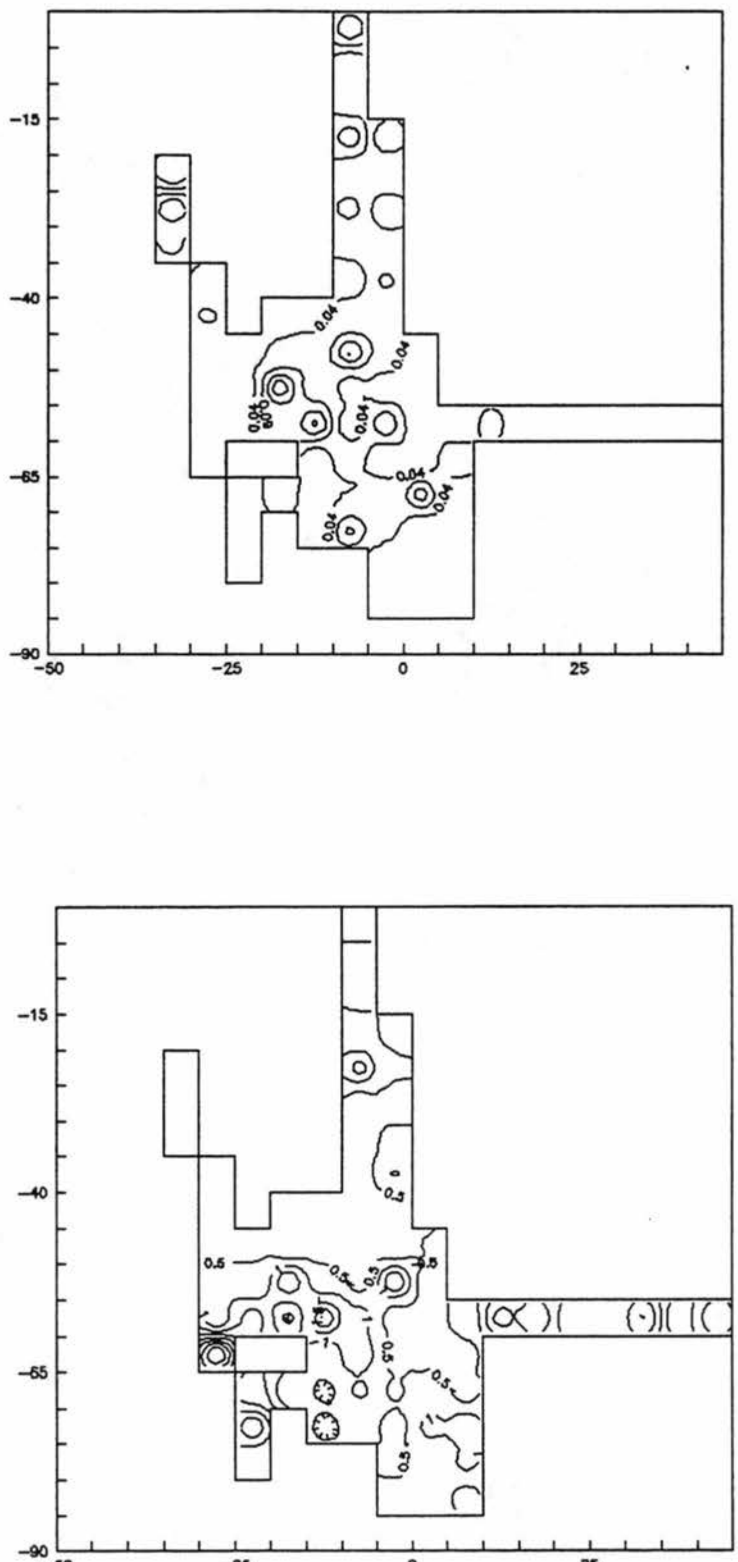


Figure 6.19. Density map of quartz: (top) tools; (bottom) flakes (count/ft^3).

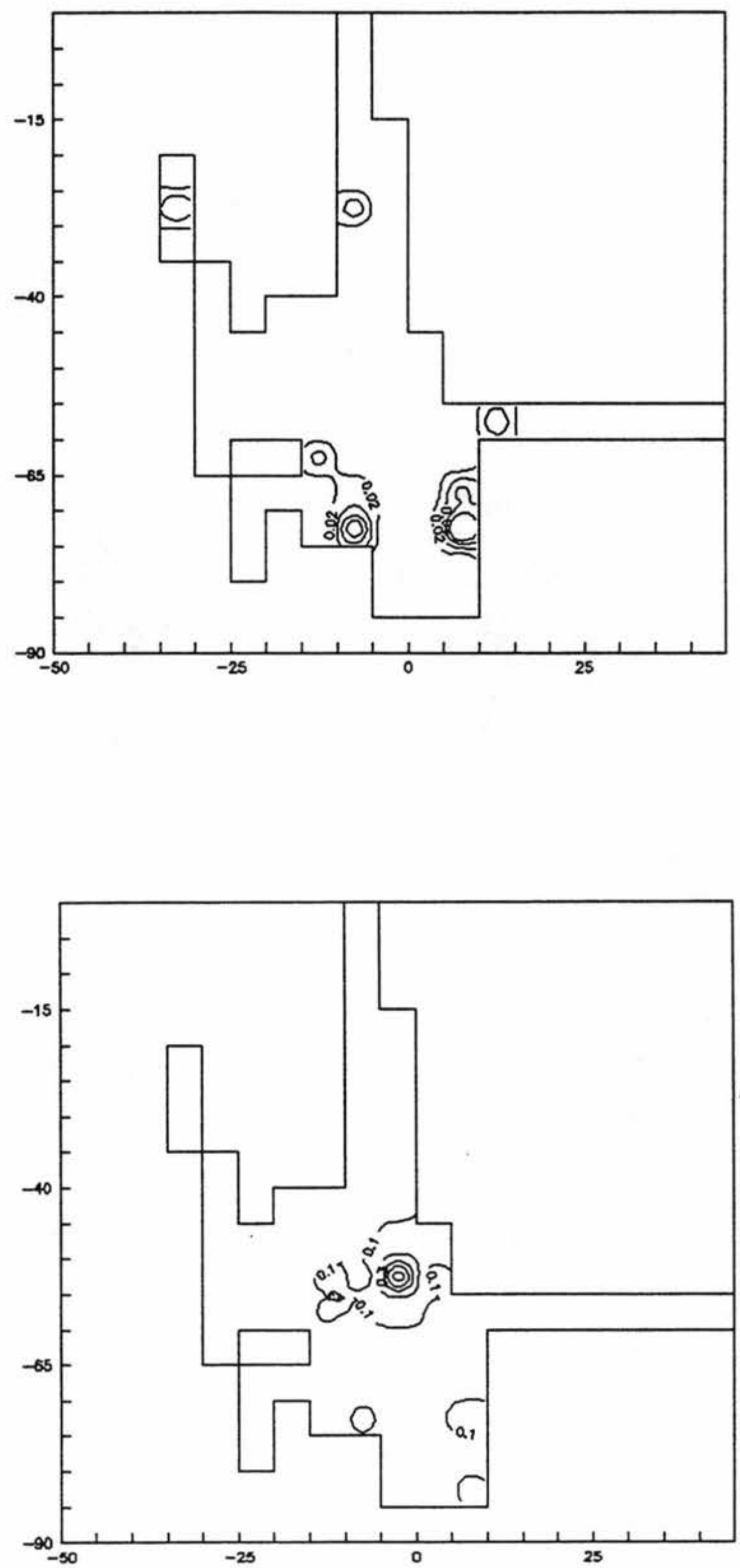


Figure 6.20. Density map of chert: (top) tools; (bottom) flakes (count/ft^3).

the distinctiveness and rarity of this raw material strongly suggests that these flakes were derived from the biface. Of course, refitting among the rhyolite artifacts could also provide additional insight into site structure. (Although given the amount of material, I can't think of a more tedious task.)

In sum, an attempt has been made to identify site structure at Hardaway by examining patterning in artifact density distributions. At least one conclusion can be drawn from these patterns: no readily distinguishable activity areas can be identified at Hardaway. The continued reuse of Hardaway appears to have produced a palimpsest of artifact distributions essentially masking any clear signs of spatial structure. While an emphasis has been placed on the complicating effects of site reoccupation, other factors undoubtedly contributed to the artifact distributions at Hardaway including the size and composition of the resident group, length of occupation, and aspects of technological organization such as raw material availability, curation, and discard rates. Given this complexity, the absence of clear spatial patterning apparent in a visual examination of artifact densities should not be surprising. Therefore, another more quantitative technique was also used to detect spatial patterning at Hardaway. As is discussed below, however, this analytical technique essentially supports the conclusions reached here.

CLUSTER ANALYSIS

There has been a rapid increase in the number of quantitative techniques available to archaeologists for spatial analysis during the last decade (e.g., Hietala 1984; Kent 1987; Kroll and Price 1991). Along with this technical sophistication, there has been an increased understanding of the processes, both cultural and natural, that are involved in the formation of spatial patterning on archaeological sites. At the same time, however, there has also been an increased awareness of the problem of congruence between the application of these analytical methods and the processes which are believed to form the archaeological record. Whallon (1984), for example, has noted that activity areas can vary in size, shape, densities, and assemblage composition and that many quantitative techniques (e.g., nearest neighbor) are not congruent with such expectations.

Fortunately, Whallon (1984) has also designed an approach that avoids the above assumptions. This approach, known as "unconstrained clustering," determines if clearly definable differences in assemblage composition exist across a site. If so, the distribution and composition of these groups are plotted and provide the basis for the interpretation of spatial patterning.

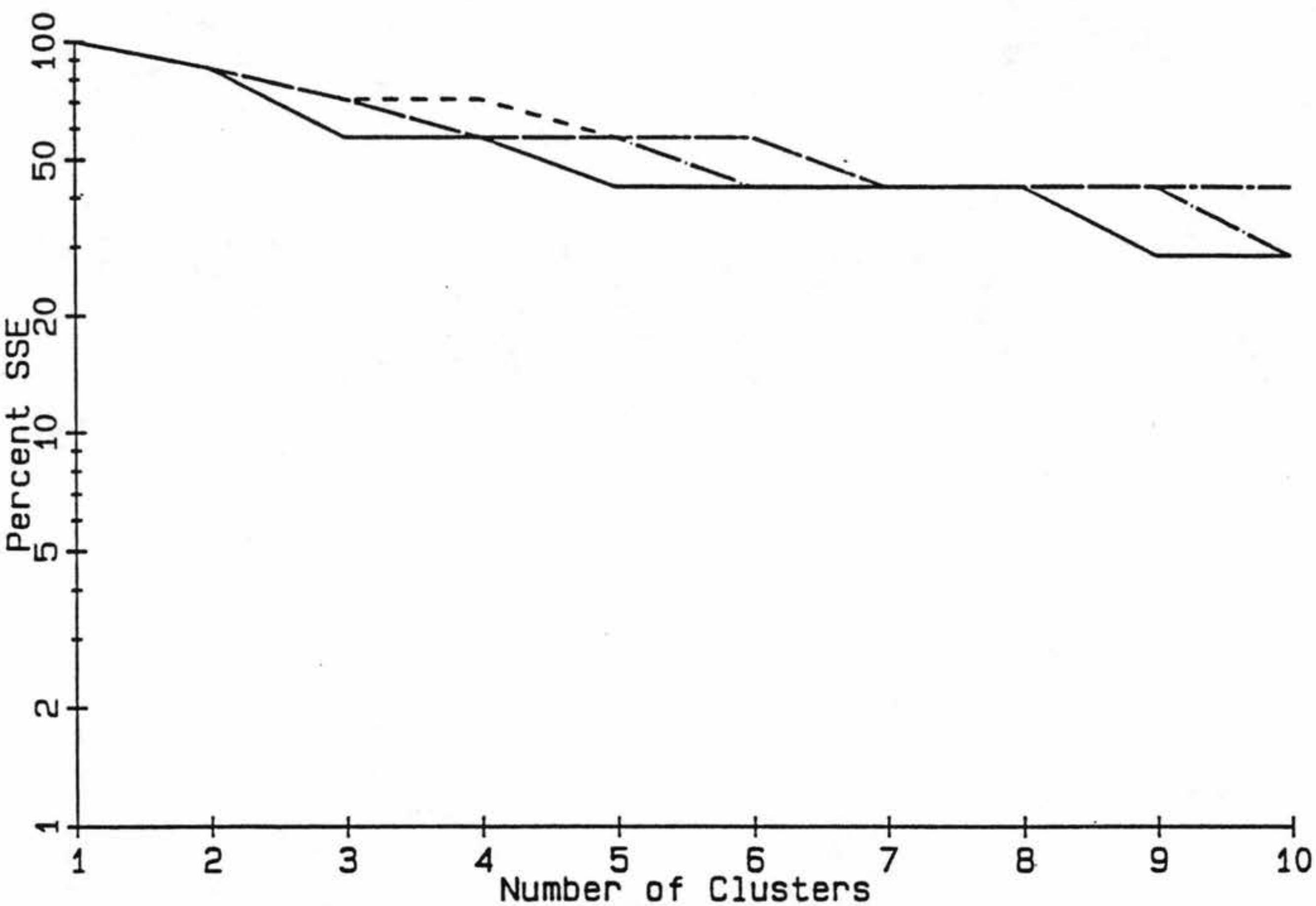
This method uses cluster analysis to find activity areas by examining the variation in the relative frequencies of artifact classes across a site. As applied here to grid count data, individual grid units comprise the observations while the proportions of different artifact types within each unit form the variables to which the clustering algorithm is applied.

A k-means clustering algorithm was chosen because of its nonhierarchical nature. That is, clusters formed at one level can be independent from clusters joined at another. The specific cluster program used was the k-means procedure discussed by Kintigh and Ammerman (1982; Kintigh 1991). The k-means analysis attempts to minimize the sum-squared-error (SSE) statistic, which is used in interpreting the k-means results. The SSE is a measure of within-cluster variation: the sum of the squared distances between each point in the cluster and its centroid. As the number of clusters increases the SSE decreases. Moreover, the better clustered the points are, the more rapidly the measure drops.

Using this statistic, Kintigh's (1991) program also provides a method by which the degree of data clustering can be evaluated. Although the analyst determines the maximum number of clusters, the procedure allows one to compare the degree of clustering observed in the actual data with clustering observed with comparable randomized data. In essence, this procedure proposes a "significant" cluster level or levels for closer inspection by the analyst. This determination is made by plotting the percent SSE from both the actual and random data runs against clustering stage. In this case, the SSE is expressed as a percentage of the total SSE of a single cluster divided by the SSE of any particular cluster configuration (Kintigh and Ammerman 1982:44-46). If the SSE based on the actual data fall within the range of the SSE generated by the randomized runs, then no significant clustering is indicated. On the other hand, if there is a strong difference between the actual and random SSE plots, then significant clustering is indicated.

For the Hardaway data, the plot of percent SSE against number of clusters for assemblage composition indicates no significant difference between plots of the actual data and five randomized data runs (Figure 6.21). Nevertheless, a slight divergence is present at 3, 5, and 9 clusters and each of these groups was more closely examined for evidence of spatial patterning. Both the mapping and composition of each of these solutions, however, revealed no clear evidence of interpretable clustering.

A discussion of the 3-cluster solution will serve to illustrate this result. The assignment of each of the grid units to the 3-cluster solution is given in Figure 6.22. The vast majority of the units belong to either Cluster 1 or Cluster 3; only two units comprise Cluster 2. Spatially, Clusters 1 and 3 are uniformly spread across the excavated block. Cluster 3 forms an amorphous area covering most of the center block but is heavily interfingered with Cluster 1 units. Some isolated Cluster 3 units are also present along the edge of the excavated area. The two isolated Cluster 2 units lie in the southern and southwest corner of the block. In short, no clustering can be detected here.



Hardaway Site Spatial Clustering

Figure 6.21. Plot of percent sum squared error for k-means clustering comparing runs of input data (solid line) and randomized data (dashed lines).

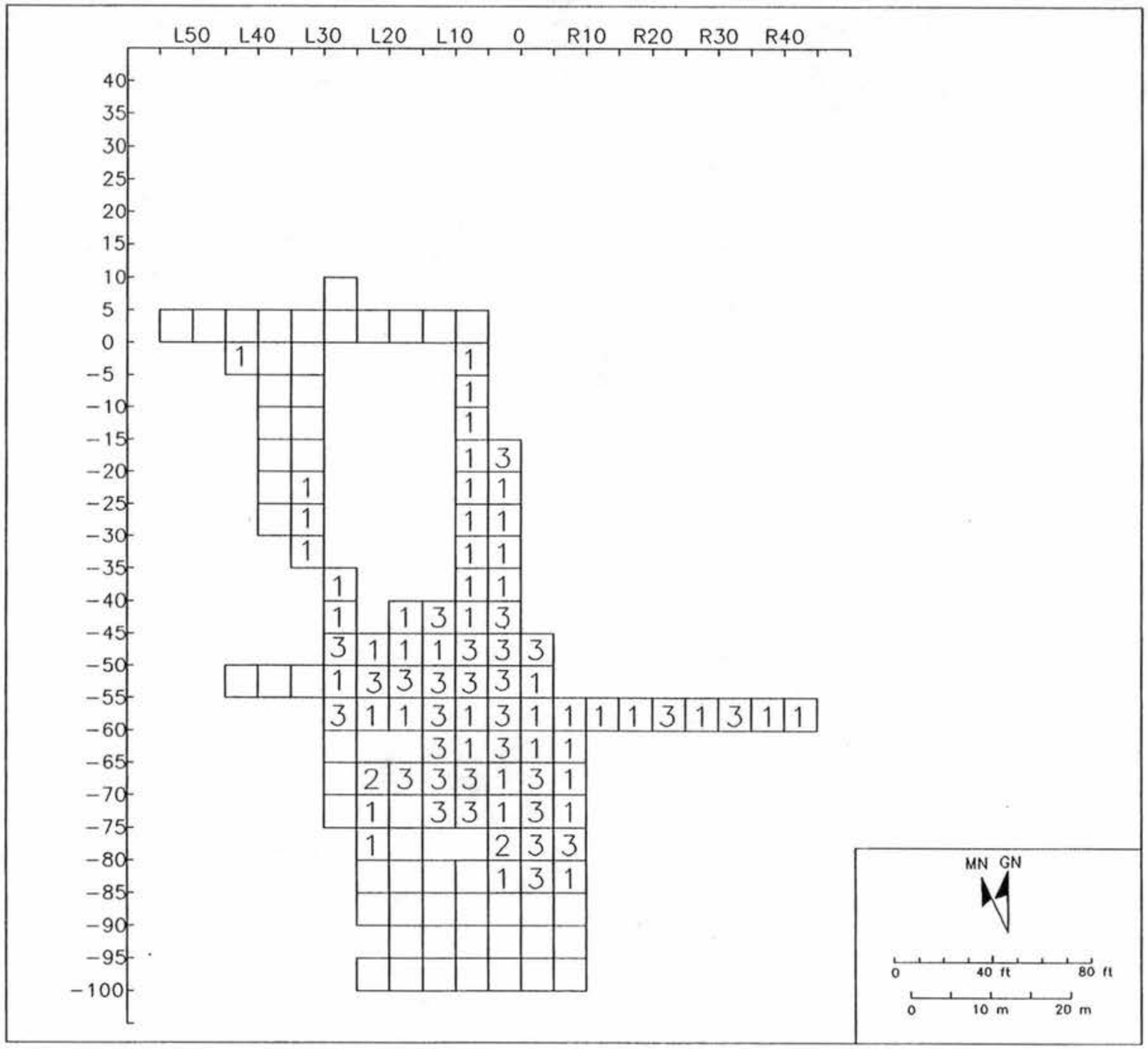


Figure 6.22. Distribution of three-cluster k-means solution.

This lack of patterning is reinforced by an examination of the material composition of each cluster (Table 6.1). The assemblage composition of each defined cluster is expressed by the means and standard deviations of the relative densities of all material classes over the item included in each cluster.

Cluster 1 constitutes almost 60% of all the units in the analysis. In composition, it represents an assemblage made up of mostly of Bifaces (42%) followed by lesser amounts of Expedient Side Scrapers (16%), Hafted Scrapers (12%), and Points (10%). In the latter two types the standard deviations are near the mean score suggesting some variability of occurrence. The remaining functional classes are represented to a minor extent (i.e., less than 10%), although in almost every case their standard deviations are greater than their means, indicating extreme variability in their proportions.

The above characterization is generally true of Cluster 3 as well. The major difference between Cluster 1 and Cluster 3 is that the ranking of bifaces and other side scrapers are reversed with a slight change in their mean densities. Otherwise, the two clusters are similar in content, although there are slight differences in the rank order of some of the other items as well.

Finally, Cluster 2 represents two isolated units that are made up of only two functional classes: Site Furniture (79%) and Expedient Side Scrapers (21%). These two squares could represent small specialized activity areas, but it is difficult to say what such an activity or activities might be given the unusual assemblage composition. Nevertheless, it should be pointed out that these relatively small, low artifact density areas are potential examples of activity locations that are overlooked using "global" techniques (e.g., searching for high-density areas) such as in the previous analysis.

Although the above discussion focuses on the actual relative frequencies within the 5-ft units, a similar analysis was also performed on a smoothed version of

Table 6.1. Means and Standard Deviations of Relative Densities by Unconstrained Cluster for the Hardaway Site.

	Cluster					
	1		2		3	
Type	mean	s.d.	mean	s.d.	mean	s.d.
Bifaces	.42	.12	-	-	.25	.11
Hafted Scrapers	.12	.11	-	-	.11	.09
Expedient End Scrapers	.08	.07	-	-	.04	.07
Cores	.04	.06	-	-	.03	.04
Miscellaneous Expedient Scrapers	.02	.03	-	-	.02	.04
Points	.10	.09	-	-	.12	.13
Other Side Scrapers	.17	.08	.21	.21	.38	.10
Site Furniture	.06	.07	.79	.21	.05	.05

these data. The smoothed version was produced by a two-dimensional running median, smoothed over a 10 x 10 ft area at 5 ft intervals. In order to facilitate this procedure a few peripheral units were removed from the analysis. Smoothing was done in order to remove the effects of local variation in artifact frequencies (see Gregg et al. 1981:158). In addition, relative frequencies were also standardized to prevent the most common classes (e.g., Bifaces and Side Scrapers) from having disproportionate influence on cluster solutions. The results of both smoothing and standardizing produced no difference between actual and randomized data in plots of percent SSE versus the number of clusters.

DISCUSSION

Both the density distributions and cluster analysis failed to reveal any significant patterning. Essentially, the pattern displayed in both spatial analyses is one of uniform material distribution. With respect to the cluster analysis, all functional classes occur with virtually the same relative frequencies locally and are uniformly spread over the block. In fact, the most striking feature of both the composition and distribution of the clusters is their overwhelming homogeneity. Moreover, the cluster analysis indicates that little difference exists in assemblage composition between the concentrations identified previously in the density maps and the artifact distributions in the remaining block area. Thus, even though artifact concentrations can be identified on the basis of high tool density, the proportions of tool types within these areas are no different than those in areas of low tool density (at least at the 5-ft scale). The ubiquitous distribution of stone artifacts exhibiting within it localized areas of higher densities, then, could be the result of refuse outputs followed by a "smearing and blending" (Ascher 1968) of such clusters by human (or natural) processes through time, partially obscuring the discreteness of the clusters.

While the following ethnoarchaeological description of Alywara settlements refers to relatively intense occupations, it is not difficult to imagine the same effect resulting from repeated habitations.

> Because refuse accumulation is continuous, and because hearths, roasting pits, and structures are frequently repositioned, clusters of facilities (i.e., hearths, roasting pits, structural remains) and refuse should grow in size through time. In general, the longer a site is occupied, the more likely clusters of facilities and refuse will have begun to coalesce, gradually becoming indistinguishable as separate entities ... this process may occur within a relatively short time, no more than a few months after a site is first occupied ... Under such circumstance, the clustered distribution of hearths, roasting pits, and refuse is likely to be preserved only in less intensively occupied areas, generally along the margins of the site (O'Connell 1987:90-91).

While intensity of occupation was probably a factor in site formation at Hardaway, its exact nature can only be guessed at based upon the density of lithic material. The evidence for site reoccupation, on the other hand, is less ambiguous given the recovery of a wide range of Early Archaic point types spanning some 1,500 years of intermittent occupation. Regardless, the cluster analysis could be interpreted as reflecting summations of multiple, spatially overlapping occupations.

Finally, while the search for spatial patterning within archaeological sites is often an end in itself, the analysis here has been particularly important because of its implications for interpreting site function. While the results have been more suggestive than conclusive, I believe that the apparent absence of clear site structure in combination with the high artifact density is best explained as a result of repeated residential occupations, probably for extended periods of time. This interpretation is also consistent with the base camp interpretation inferred from the assemblage analysis in Chapter V.

Chapter VII

UWHARRIE RHYOLITE AND EARLY ARCHAIC SETTLEMENT RANGE IN THE CAROLINA PIEDMONT

An important aspect of this study has been the identification of the sources of rhyolite so abundant at Hardaway (Appendix A). In this chapter, the results of a an extensive artifact collections survey documents the widespread movement of rhyolite beyond the Hardaway site. Given the quarry-related function of Hardaway, tracing the movement of Uwharrie rhyolite from its source allows the site to be viewed from a regional perspective.

PROBLEMS ADDRESSED

An Early Archaic point and raw material collections survey was undertaken as a part of this research to test the watershed-based settlement adaptation posited in the Band-Macroband model for the Yadkin-Pee Dee River (Anderson and Hanson 1988:Figure 3). In a manner similar to the study of the frequencies of stone raw materials along the Savannah River (Anderson and Hanson 1988:280), the distributions of raw materials among Early Archaic points were examined both along the Yadkin-Pee Dee and across several drainages through the eastern Piedmont. In addition, comparisons of the geographic patterns of Hardaway-Dalton and Hardaway Side-Notched point distributions were made with Palmer and Kirk Corner-Notched point distributions. Although Anderson and Hanson's (1988) study focused on Palmer and Kirk Corner-Notched point distributions, including earlier points from the Hardaway complex allowed possible temporal changes in raw material distributions to be documented.

Particular attention was paid to comparing the archaeological distributions of Uwharrie rhyolite both along and across the Yadkin-Pee Dee. If Early Archaic settlement adaptation was largely confined to the Yadkin-Pee Dee drainage, then the use of Uwharrie rhyolite should have been restricted primarily to that river valley. That is, relatively high frequencies of Uwharrie rhyolite should extend from its source in the Piedmont along the river down into the Coastal Plain. Moreover, this pattern should be associated with a significant decrease in the occurrence of Uwharrie rhyolite across the Yadkin-Pee Dee. On the other hand, if no significant differences exist in the occurrence of Uwharrie rhyolite along the Yadkin-Pee Dee verses across the eastern Piedmont, then group adaptation may have encompassed more than a single drainage.

COLLECTIONS SURVEY

Data on the raw materials used to make Early Archaic points (i.e., Hardaway-Dalton, Hardaway Side-Notched, Palmer Corner-Notched, and Kirk Corner-Notched) were recorded in collections from counties forming two transects: the first (cutting across several major drainages including the Yadkin-Pee Dee) is referred to as the "Eastern Piedmont Transect," and the second (roughly paralleling the course of the Yadkin-Pee Dee River) is referred to as the "Yadkin-Pee Dee Transect" (Figures 7.1-7.4). The minimum level of provenience recorded was county location, although specific site locations were noted for many artifacts.

A total of 3,140 points from 25 counties in both North and South Carolina form the sample for this analysis (Appendix D). Approximately 50% (n=1,580) of these artifacts came from the extensive North Carolina collections curated by the Research Laboratories of Anthropology. The remaining portion of the sample was obtained from private collections in both states. Of this portion, I recorded 609 (20%) points from 27 private collections in both states. The remaining 951 (30%)

points were recorded by Charles's inventory of private collections in South Carolina (Charles 1981, 1983, 1986); this material comprises an additional 25 collections from six counties along the Pee Dee River which Charles has graciously allowed me to incorporate into this analysis.

Data from Appendix D are summarized in Tables 7.1-7.4 and illustrated in Figures 7.1-7.4. Prior to discussing these figures, however, some comments need to be made concerning their construction. For the purposes of this analysis, point types were combined into two groups: Hardaway-Dalton and Hardaway Side-Notched form one group, Palmer Corner-Notched and Kirk Corner-Notched form a second group. For the Hardaway point group (n=197), the Eastern Piedmont Transect included 13 counties that covered a linear distance of approximately 300 km (Figure 7.1). Similarly, the Eastern Piedmont Transect for the Palmer and Kirk Corner-Notched group (n=1,015) encompassed 11 counties covering a linear stretch just under 300 km. The Yadkin Pee-Dee Transect for the Hardaway group (n=263) included 15 counties while the Palmer Kirk Corner-Notched (n=1,925) group included 16 counties. These counties bordered both sides of the river and covered approximately 290 linear kilometers (Figure 7.2).

Each figure was generated by calculating and plotting the percentages of raw material types by county, using the linear midpoint of each county along the transect as the graphical reference point. In some instances, adjacent counties were combined to increase sample size and the graphical midpoint was adjusted accordingly.

Furthermore, several raw material types previously discussed in Chapter III were combined into five categories for the sake of clarity (Tables 7.1-7.4). These groupings were based upon typological similarity or similarity in their source location. Generally speaking, a range of raw materials similar to that in the Hardaway assemblage was observed in the collections survey. Unlike in the Hardaway assemblage, however, highly weathered metavolcanic points were often encountered in the

Table 7.1. Frequencies of Hardaway Points by Raw Material Across the Eastern Piedmont.

State: County	Aphyric Rhyolite	Porphyritic Rhyolite	Other Metavolcanic	Quartz	Chert	Total
North Carolina:						
Union/Mecklenburg	4	-	-	6	-	10
Stanly	31	-	6	-	1	38
Montgomery	11	1	1	-	-	13
Randolph/Moore	48	1	4	2	1	66
Chatham/Alamance	20	7	1	-	-	28
Durham/Orange	31	3	-	-	-	35
Granville/Vance/ Warren	4	-	-	3	-	7
Total	159	12	12	11	2	196

Table 7.2. Frequencies of Hardaway Points by Raw Material Along the Yadkin-Pee Dee River.

State: County	Aphyric Rhyolite	Porphyritic Rhyolite	Other Metavolcanic	Quartz	Chert	Total
North Carolina:						
Forsythe	8	-	2	-	-	10
Davie/Davidson	9	2	3	-	-	14
Stanly/Montgomery	42	1	7	-	1	51
Anson/Richmond	48	4	2	8	1	63
South Carolina:						
Chesterfield/Marlboro	80	4	2	4	1	91
Dillon/Marion/Florence	13	3	2	6	2	26
Williamsburg/Georgetown/ Horry	6	-	-	1	1	8
Total	206	14	18	19	6	263

Table 7.3. Frequencies of Palmer and Kirk Corner-Notched Points by Raw Material Across Eastern Piedmont

State: County	Aphyric Rhyolite	Porphyritic Rhyolite	Other Metavolcanic	Quartz	Chert	Total
North Carolina:						
Union	152	11	7	42	4	216
Stanly	61	1	3	-	3	68
Montgomery	123	13	2	1	2	141
Randolph	53	13	7	5	-	78
Chatham/Alamance	116	11	15	8	-	150
Durham/Orange	182	14	21	8	1	226
Granville	51	8	10	6	-	75
Vance	5	6	8	-	-	19
Warren	19	7	2	11	3	42
Total	762	84	75	81	13	1015

Table 7.4. Frequencies of Palmer and Kirk Corner-Notched Points by Raw Material Along The Yadkin-Pee Dee.

State: County	Aphyric Rhyolite	Porphyritic Rhyolite	Other Metavolcanic	Quartz	Chert	Total
North Carolina:						
Forsythe	160	11	27	4	5	207
Rowan/Davie/Davidson	242	25	29	1	9	306
Stanly/Montgomery	184	14	5	1	5	209
Anson/Richmond	95	18	6	10	1	130
South Carolina:						
Chesterfield/Marlboro	379	15	8	212	19	633
Dillon/Marion/Florence	225	33	12	84	21	375
Williamsburg/Georgetown/ Horry	17	11	-	17	20	65
Total	1302	127	87	329	80	1925

collections survey. These artifacts displayed a grayish-white to buff colored surface that made more specific identification problematic. I listed these artifacts as *weathered metavolcanic* in Appendix D, but it is highly probable that these items were weathered specimens of *aphyric rhyolite*. I believe this to be the case since numerous examples of these artifacts displayed breaks that, almost without exception, exposed fresh surfaces revealing a dark gray fine-grained metavolcanic stone virtually identical to Morrow Mountain rhyolite. Therefore, *weathered metavolcanics* have been included with the category *aphyric rhyolite* (Tables 7.1-7.4).

In any event, it is unlikely that these weathered specimens were porphyritic rhyolites because phenocrysts weathered differently than the surrounding groundmass and thus remained visible. In fact, weathered porphyritic specimens were often easier to identify than unweathered specimens because this process often increased the contrast between the groundmass and phenocrysts. With regard to the three types of porphyritic rhyolites identified in Chapter III, they have all been combined in a single category called *porphyritic rhyolite*.

The category *other metavolcanic* includes a variety of raw materials. This category primarily includes the rhyolitic tuffs described in Chapter III, but it also includes a few examples of rhyolitic breccia, green metasiltstone, and some specimens Charles called argillite, basalt, and "unidentified metavolcanics." Even though the green metasiltstone and argillite are more correctly identified as a metasedimentary rock, all of these materials are grouped together because of their presumed Piedmont origin.

Similarly, I have included quartz, quartzite, orthoquartzite, and crystal quartz under the category *quartz*. The exact sources of these raw materials are also unknown but they would have been available either in the Piedmont or Coastal Plain (see Chapter III). The milky white quartz dominates this category and presumably has a Piedmont origin.

Finally, all the cryptocrystalline rocks have been included under the label *chert*, most of which probably have their origins outside the Piedmont. Virtually all of the cherts present in the Coastal Plain counties are made from Coastal Plain chert, presumably from the Allendale sources (Appendix E). The chert points found in the Piedmont, however, are made from Ridge and Valley chert or of chert from some other unknown location (Appendix D). Finally, isolated examples of jasper and chalcedony are also included under *chert*.

The results of the collections survey are discussed below. I will start by examining the raw material graphs generated for the Hardaway point group followed by a discussion of similar graphs for the Palmer and Kirk Corner-Notched point group.

RAW MATERIAL DISTRIBUTIONS FOR HARDAWAY-DALTON AND HARDAWAY SIDE-NOTCHED POINTS

The Eastern Piedmont Transect is dominated by aphyric rhyolite with frequencies between 70% and 90% (Figure 7.1). The highest rhyolite frequencies extend from Morrow Mountain in Stanly County (represented in the figures by a vertical line at distance 0) to the northeast covering a distance of about 150 km. Beyond this distance the occurrence of rhyolite drops rapidly to about 50% near 200 km. Southwest of the Uwharrie sources, the frequency of rhyolite decreases much more rapidly than it does to the northeast, falling to 40% just 60 km from the source.

Although the aphyric rhyolite curve exhibits a slight bimodality, this may not be particularly significant since it is only at either ends of the transect that frequencies drop below 70%. This transect, then, crosses at least five major watersheds (i.e., the Catawba, Yadkin, Cape Fear, Neuse, and to a lesser extent the Tar).

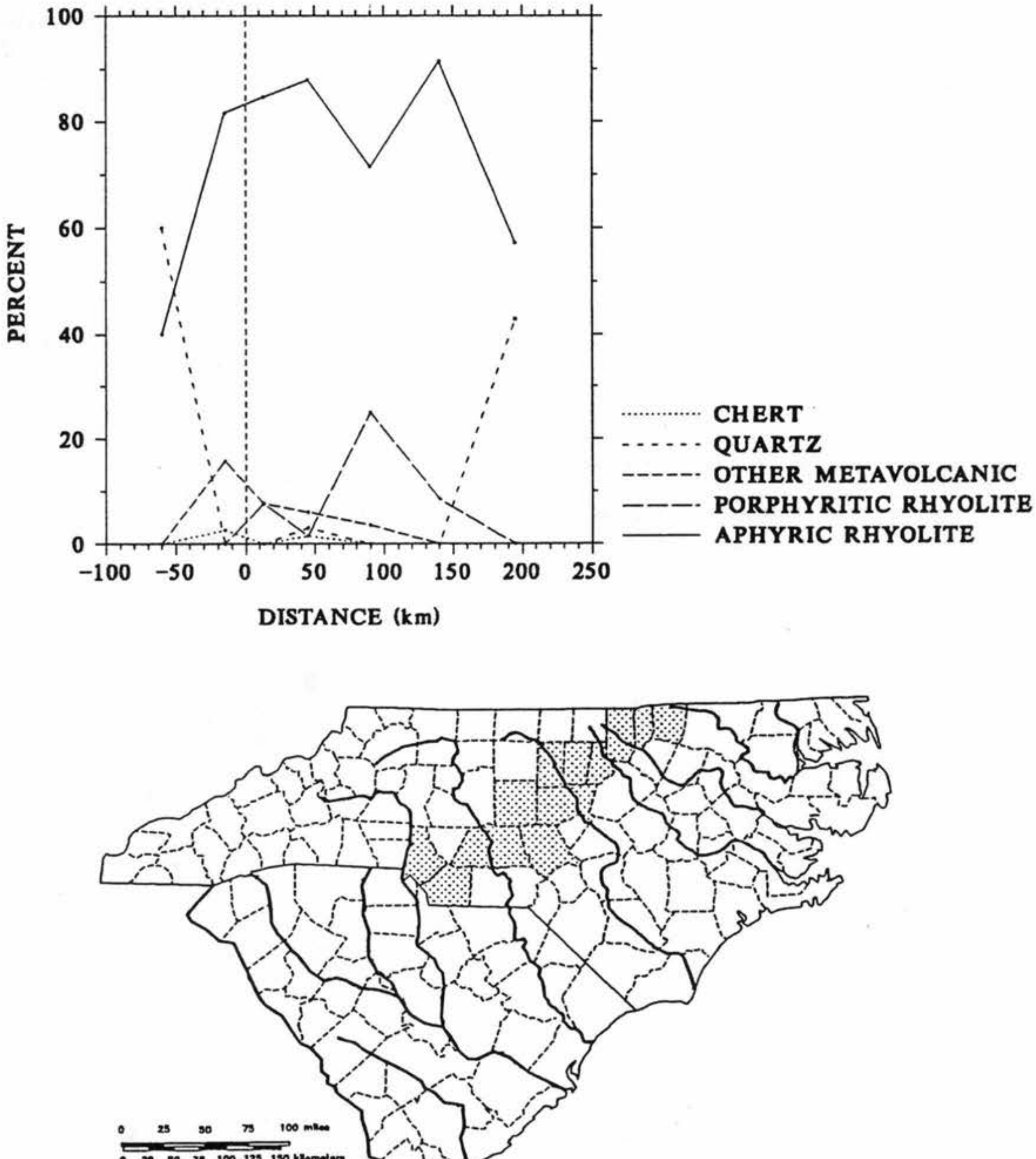


Figure 7.1. Raw material frequencies for Hardaway points across the eastern Piedmont. (Morrow Mountain is at distance 0. Distances are west [negative] and east [positive] of Morrow Mountain. Shaded areas on map represent the counties comprising the transect).

The remaining raw materials (porphyritic rhyolite, other metavolcanics, quartz, and chert) make up relatively minor proportions of all points along the transect. Excluding quartz, these minor raw materials constitute less than 10% of the assemblage over most of the transect and only exceed that frequency about 20 km west and 60-130 km east of the Yadkin. Quartz, on the other hand, is virtually absent along the transect, with the exception of marked increases at either end of the Piedmont.

Turning to the Yadkin-Pee Dee Transect, aphyric rhyolite dominates the raw materials in roughly the same frequencies as the Eastern Piedmont Transect; these frequencies generally range between 70% and 90% at distances of about 100 km both up and down the river from Morrow Mountain (Figure 7.2). This distance is probably even greater up river, but no collections north of Forsythe County, near the headwaters of the Yadkin, were examined. Another lesser peak is present near the coast, but this may be spurious since the sample of points is so small there (n=8) (Table 7.1).

The remaining raw materials all constitute less than 20% of the points along the river with the exception of other metavolcanics (ca. 21%) at the north end of the transect and quartz (ca. 23%) near the coast. Finally, cherts represent the least frequently used raw material along the Yadkin-Pee Dee Transect, although they are more frequent along the Yadkin-Pee Dee than across the eastern Piedmont. In fact, this group consists of virtually all Coastal Plain chert below the Fall Line with isolated examples of jasper in the Piedmont (Appendix D).

How then are these patterns to be interpreted? Presumably, the marked decrease in rhyolite at either end of the Eastern Piedmont Transect and the southern end of the Yadkin-Pee Dee Transect reflects an abrupt drop in use. Moreover, the relatively constant rhyolite frequencies across both transects probably reflect the direct acquisition of stone at its source by a group or groups and their subsequent use

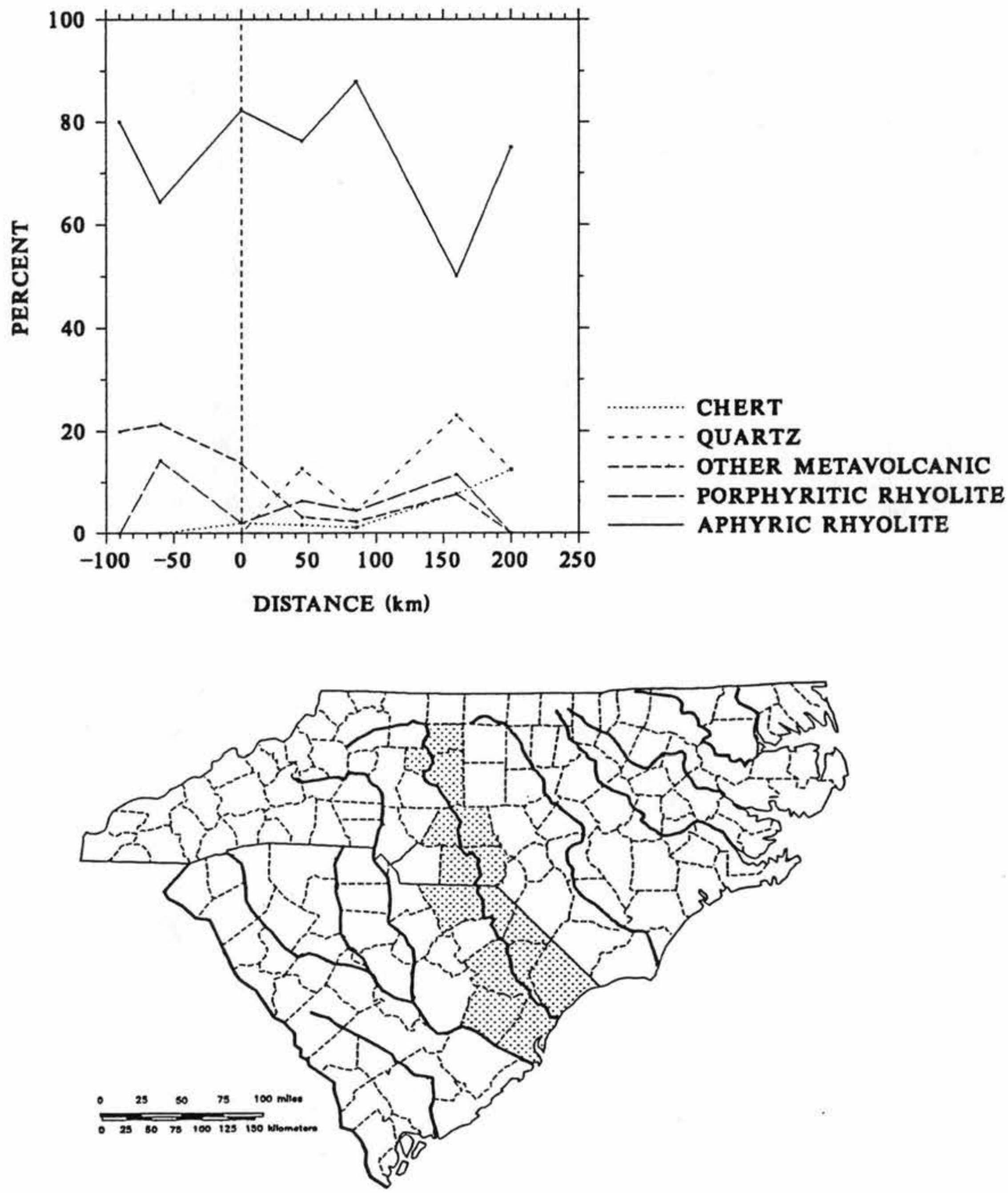


Figure 7.2. Raw material frequencies for Hardaway points along the Yadkin-Pee Dee drainage. (Morrow Mountain is at distance 0. Distances are north [negative] and south [positive] of Morrow Mountain. Shaded areas in map represent the counties comprising the transect).

of rhyolite as they move through the presumed territory. Thus, keeping in mind the overwhelming dominance of rhyolite along both transects, I believe the rhyolite curve outlines the territorial range of one or more bands focused on the exploitation of Uwharrie rhyolite.

This range probably included much of the Carolina Piedmont, extending about 300 km between the Broad and the Roanoke rivers. How far this range might have extended north into Virginia or south into the Coastal Plain is unknown. However, it presumably did not extend beyond the headwaters of the Yadkin. There the Yadkin is bordered by the Blue Ridge Mountains to the west and the Dan River to the east. The Dan River is part of the Roanoke drainage which conforms to the proposed eastern boundary.

At the southern end of the Yadkin-Pee Dee Transect, the range appears to have extended all the way to the coast: a linear distance of about 350 km along the length of the Yadkin-Pee Dee. Given lower sea levels during the early Holocene, band range may have extended even further beyond the present coastline. How far band range extended into the Coastal Plain of the other major Piedmont drainages cannot be determined from the present data. The southern extent of the territory is a minimal border, extrapolated by circumscribing the two ends of the Eastern Piedmont Transect and the southern end of the Yadkin-Pee Dee Transect (Figures 7.1-7.2).

Admittedly, an alternative interpretation of the above data is also possible. Since frequencies alone do not in themselves constitute conclusive evidence on the *mechanism* of stone movement (Meltzer 1989), a similar rhyolite curve could result if rhyolite were traded from one band in the Yadkin to two or more contemporaneous bands occupying separate drainages.

A similar fall-off pattern, for example, was used by Colin Renfrew (1972; 1975; 1977) to explain the distribution of obsidian on sites in the Near East via "down-the-line" exchange. That is, such a pattern may be produced if stone was initially supplied by one settlement and exchanged with neighboring groups; these villages, in turn, used a portion of the material and passed on the remainder to other neighboring groups who repeated the process "down the line." Thus, in this interpretation, the relatively high rhyolite frequencies in the preceding figures would represent "supply zones" from which stone was initially exchanged to neighboring groups who subsequently supplied their neighbors.

Nevertheless, I view such an interpretation here as extremely unlikely based upon the assumption that the reliance by a group on exchange for a critical resource like stone--in quantities totaling about 70% of their tool assemblages--is a highly disadvantageous adaptive strategy (see Meltzer 1989:24). Moreover, an interpretation of exchange would also entail the unlikely assumption that a group at the socioeconomic level of a band society could supply such a resource in bulk to another group. In short, direct acquisition of Uwharrie rhyolite by a band or bands within a territorial range encompassing the area depicted in Figure 7.3 stands as a more plausible explanation.

The remaining raw materials, then, are interpreted to represent stone that supplemented the use of rhyolite across the Piedmont. With the exception of some chert, these minority materials presumably were acquired incidentally through group movement across the region. Furthermore, the frequency curves of these other stone types suggests some interesting possibilities as to how these raw materials were used to supplement rhyolite.

The quartz and other metavolcanic curves along the Yadkin-Pee Dee, for example, complement each other and suggest that when more than one alternate stone was available quartz was the least likely to be selected. This inference is based on the fact that quartz, which was present throughout the Piedmont in surface

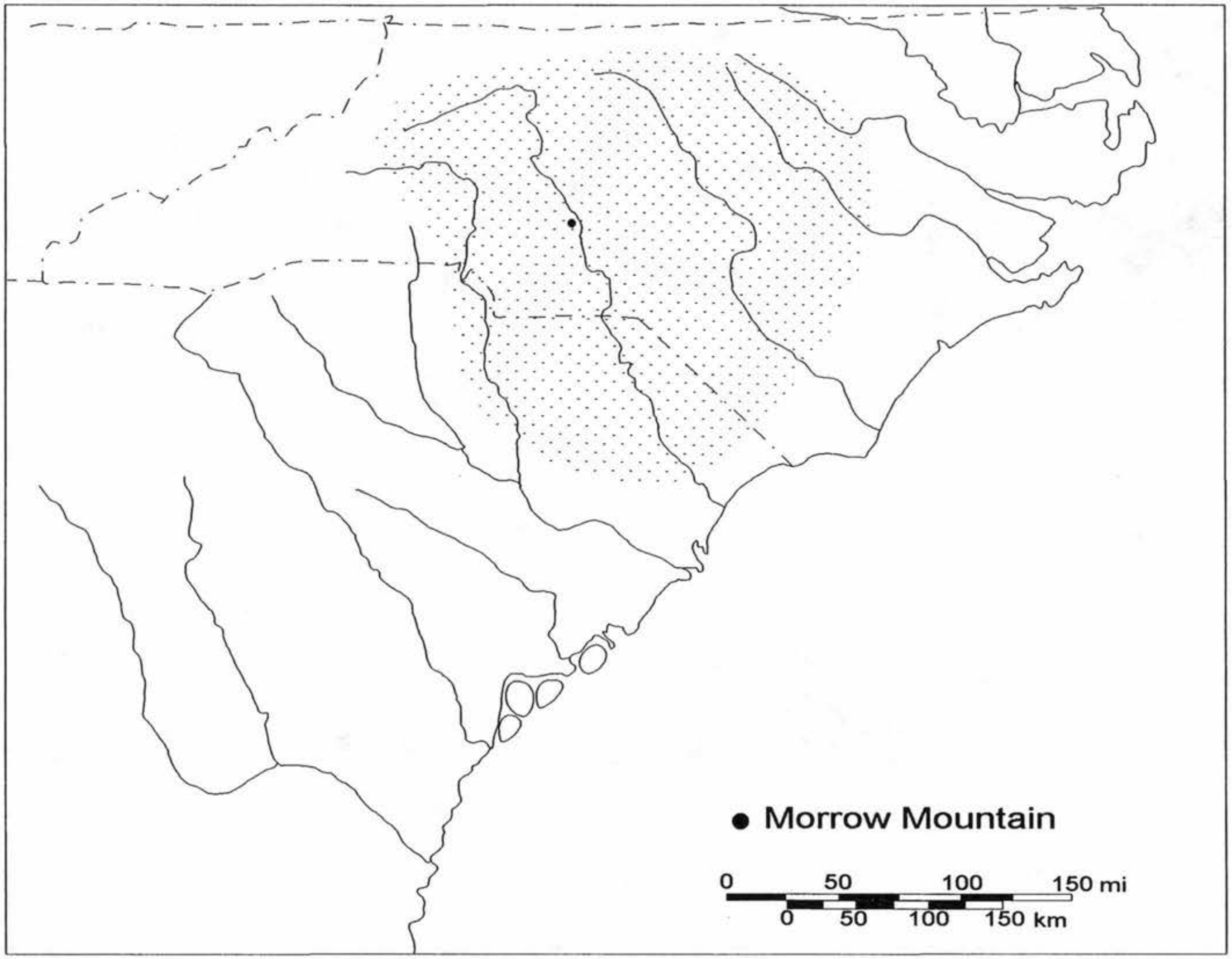


Figure 7.3. Geographic range of high frequencies of Early Archaic points made from Uwharrie rhyolite.

veins or river cobbles is virtually absent except at either end of the Eastern Piedmont transect. Similarly, quartz does not appear in large frequencies along the Yadkin-Pee Dee Transect until the Fall Line and then it appears regularly along the Coastal Plain. As mentioned in Chapter III, quartz was probably obtained from secondary sources in the form of river cobbles along the Pee Dee.

But quartz was not the only stone exploited in cobble form. Charles (1981:14) has noted the presence of porphyritic rhyolite cobbles in the Pee Dee and I have observed the presence of at least one such cobble (a plagioclase-porphyritic rhyolite) used as a core from a private collection in southern Marion County. Presumable, this cobble had its origins in the Uwharrie Mountains some 200 km upriver. Geologic mapping (Conley 1964) and the quarry survey undertaken as part of this project (Appendix A) indicates that plagioclase-porphyritic rhyolite is present at waters edge along the Yadkin. Thus, it appears that some Uwharrie rhyolite (i.e., porphyritic rhyolite) was obtained from secondary sources along the Pee Dee.

Two other locations exhibit slight peaks in the frequencies of porphyritic rhyolite that are more difficult to explain. The first is about 60 km up river from the Uwharries along the Yadkin-Pee Dee Transect, while the second is about 90 km east of Morrow Mountain across the Eastern Piedmont Transect. While this material was macroscopically similar to the porphyritic rocks from the Uwharries, its relatively high occurrence some distance from the Yadkin raises the possibility of another source outside the Uwharries.

Finally, the limited number and variety of cherts whose sources are known to lie outside the Piedmont may also have some significance with respect to the settlement range proposed here. If these "exotic" cherts do provide tantalizing glimpses of mobility or exchange beyond the Piedmont then the absence of any Ridge and Valley chert suggests that the geographic range of Early Archaic Piedmont groups did not extend into the mountain region.

The presence of limited frequencies of Coastal Plain chert, on the other hand, do suggest some form of interaction with the South Carolina Coastal Plain. Although their presence along the Pee Dee is probably related to the river's proximity to the Allendale sources, the exact mechanism by which the chert arrived in the Pee Dee is unclear.

Nevertheless, the occurrence of this chert also coincides with a marked decrease in rhyolite frequencies southwest of the Yadkin (i.e., Morrow Mountain), unlike the more gradual decline in rhyolite frequencies east of the river. I speculate this asymmetrical fall-off pattern may indicate an Early Archaic social boundary separating a predominantly Allendale-chert-using group from a predominantly Uwharrie-rhyolite-using group. This possibility is discussed in more detail below.

In sum, I believe the frequency of rhyolite use for Hardaway points reflects a territorial range focused on stone procurement from the Uwharrie Mountains. This range extended across the North Carolina Piedmont encompassing most of the major watersheds within the region. Furthermore, this range minimally included much of the Pee Dee and probably the Upper Coastal Plain portions of the Cape Fear and Wateree as well. Lastly, it is possible to see in these graphs the antecedents of a band range that is also reflected in the raw material frequencies for the Palmer and Kirk Corner-Notched points discussed next.

RAW MATERIAL DISTRIBUTIONS FOR PALMER AND KIRK CORNER-NOTCHED POINTS

As with the Hardaway points, the corner-notched point group is dominated by rhyolite. With aphyric rhyolite frequencies between about 70% and 90%, the Eastern Piedmont Transect curve is very similar that of the Hardaway group, although exhibiting less bimodality (Figure 7.4). The high rhyolite frequencies also cover the same distance across the Eastern Piedmont as the Hardaway group and

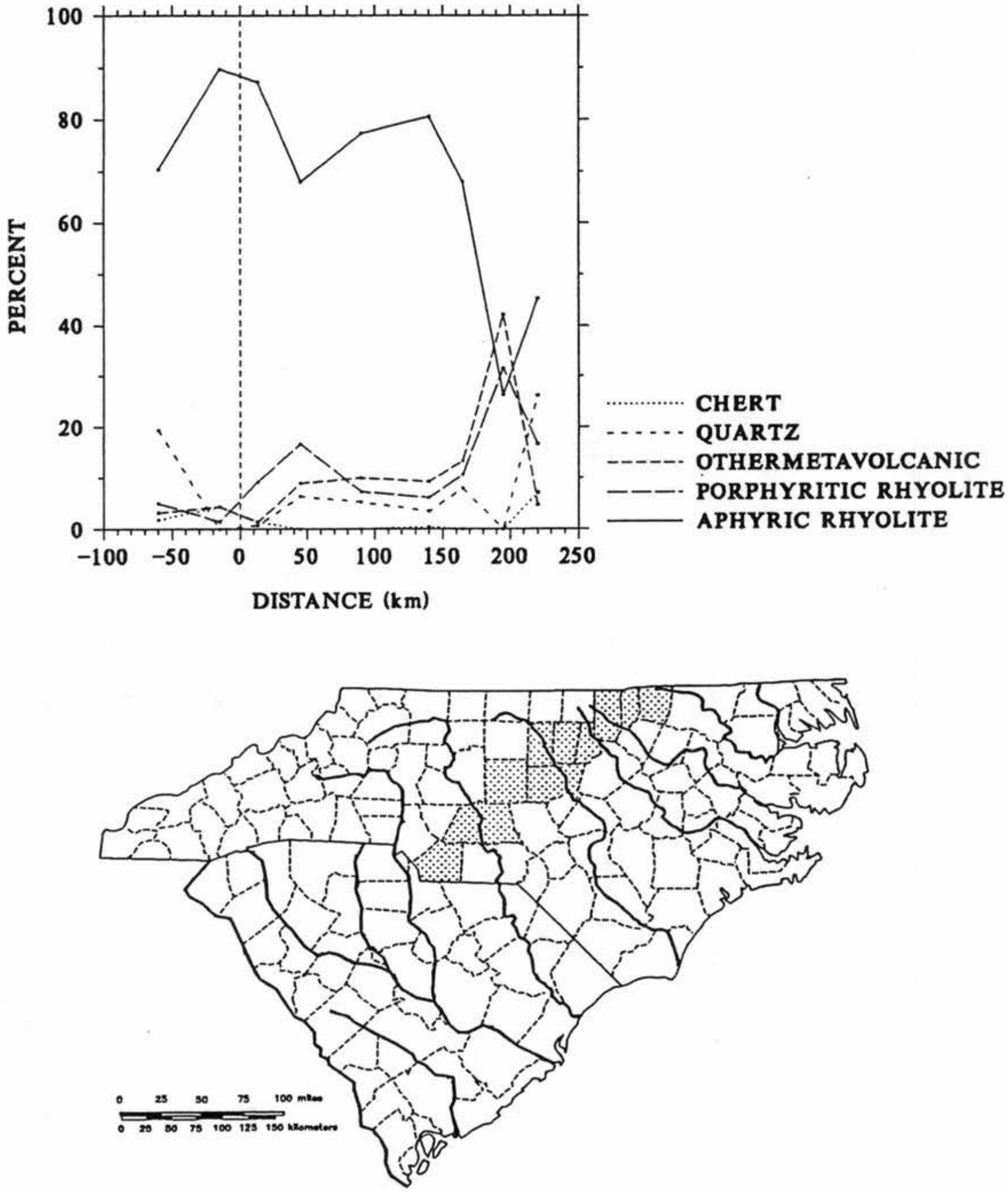


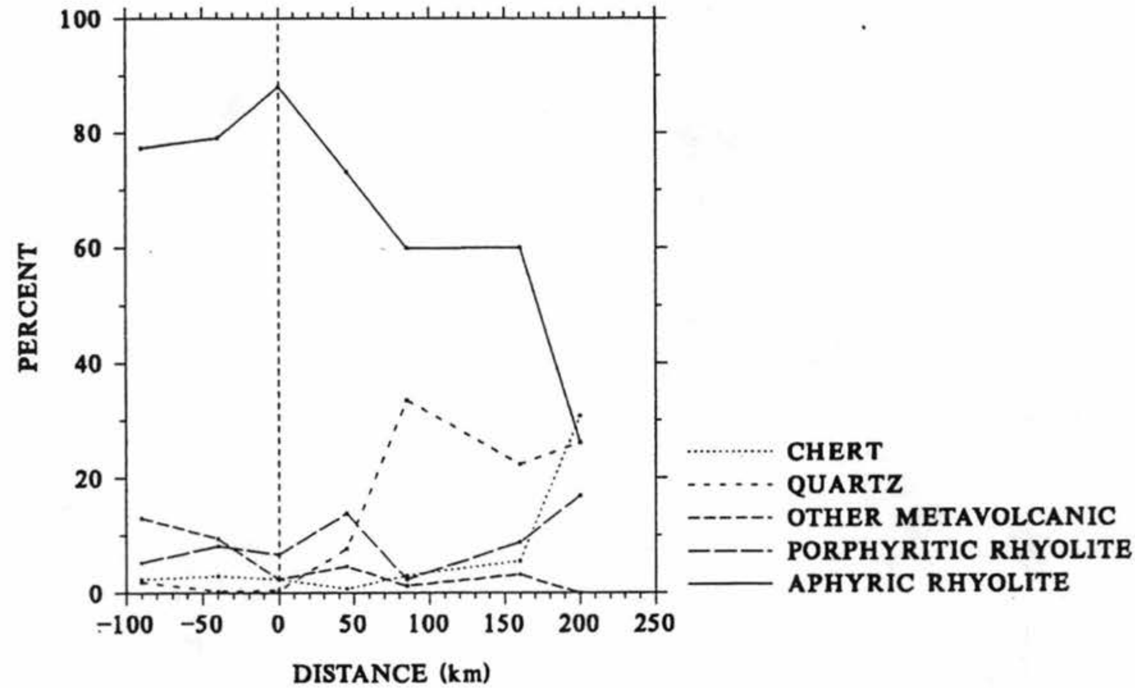
Figure 7.4. Raw material frequencies for Palmer and Kirk Corner-Notched points across the eastern Piedmont. (Morrow Mountain is at distance 0. Distances are west [negative] and east [positive] of Morrow Mountain. Shaded areas on map represent the counties comprising the transect).

then exhibit a steep decline. If this curve represent the limits of the geographic range for a rhyolite-using group as previously proposed, then it would appear there was little change in this range during the latter part of the Early Archaic.

A somewhat different pattern exists for the rhyolite frequencies along the Yadkin-Pee Dee Transect (Figure 7.5). While rhyolite is moving at least as far along the watershed as it is across the Eastern Piedmont, it exhibits a clinal decrease in frequencies rather than the relatively high (albeit slightly fluctuating) occurrence exhibited across the Piedmont. Frequencies of about 90% begin in the Piedmont near the source and gradually decrease to about 25% near the coast; this curve is punctuated by a step-like interruption occurring across the Fall Line and Upper Coastal Plain.

Given this pattern, the southern boundary of the postulated band range appears more vague than the proposed Piedmont boundaries. This ambiguity, however, may be more apparent than real for two reasons. First, a step-like decline in rhyolite takes place about 160 km downstream from the Uwharries, the same distance rhyolite moves prior to its sharp decline across the Eastern Piedmont. Second, both the Eastern Piedmont and the Yadkin-Pee Dee transects display virtually the same frequency (ca. 25%) of rhyolite about 200 km from the source. This distance was proposed to represent the northeastern Piedmont boundary and I suggest it represents the boundary along the Pee Dee as well. In addition, 200 km was also the proposed boundary along the Yadkin-Pee Dee transect for the Hardaway point group.

But if a band was exploiting rhyolite directly and moving both down river and across the Piedmont in a similar manner, why are the patterns so different? There is no straightforward answer but I will propose two possibilities. First, the different patterns of stone use between the two transects may be related to the interpretation of exchange that was discussed previously. That is, while the Eastern



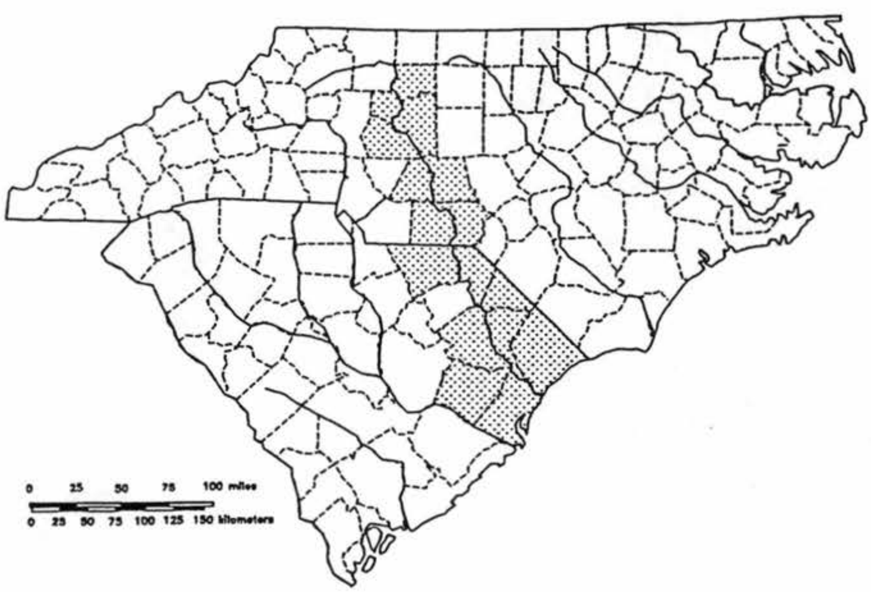


Figure 7.5. Raw material frequencies for Palmer and Kirk Corner-Notched points along the Yadkin-Pee Dee drainage. (Morrow Mountain is at distance 0. Distances are north [negative] and south [positive] of Morrow Mountain. Shaded areas on map represent the counties comprising the transect).

Piedmont curve may indicate direct acquisition and movement of rhyolite via group mobility, the Yadkin-Pee Dee curve may reflect the indirect movement of rhyolite by exchange. This interpretation, then, would suggest the existence of two distinct bands: one band occupying the Piedmont and a second in the Coastal Plain. Such an interpretation, however, is subject to the same objection noted earlier--the unlikelihood of one band supplying the bulk of a critical resource to another. Although the frequency of quartz is greater in the Coastal Plain than in the Piedmont, rhyolite still dominates the raw materials. Thus, while acknowledging that the interpretation of exchange is worthy of further investigation, it does not appear to present a very satisfying answer.

The higher frequencies of quartz in the Coastal Plain, however, suggests a second possibility: the increased availability of quartz. That is, the higher frequencies of quartz may reflect its increased availability in the form of river cobbles along the Pee Dee. Simply, rhyolite was conserved at the expense of quartz which was readily obtainable along the length of the river. Thus, band range is not as clearly delineated along the Yadkin-Pee Dee Transect as it is across the Eastern Piedmont Transect due to a greater emphasis on exploiting secondary stone sources along the Pee Dee than across the Piedmont.

In any event, the remaining minority stone types are interpreted in the same manner as for the Hardaway group: they largely reflect the incidental use of stone acquired in the region intended to supplement the use of rhyolite. There appear to be no dramatic differences among frequencies of quartz, other metavolcanics, and porphyritic rhyolite used within most of the Piedmont. Frequencies for these stone types rarely exceed 20% and are usually at or below 10%. Quartz, for example, varies from 0 to 8% along the Eastern Piedmont Transect until it increases to 19% near the Broad River and 26% near the Roanoke. Similarly, the incidence of porphyritic rhyolite (31%) is greatest near the Roanoke than elsewhere along the transect. Although this material looked very similar to the porphyritic rhyolites along the Yadkin, its peak here may reflect some as yet unknown porphyritic sources in northeast North Carolina or southern Virginia. I also interpret the relatively high frequencies of other metavolcanics (42%) here as reflecting stone sources local to the Roanoke. In fact, much of stone in this category consists of breccias that are unlike any I have seen elsewhere in the Piedmont (Appendix D).

It is also interesting to note that cherts, although extremely uncommon, were clustered at both ends of the Eastern Piedmont Transect: the first group clustered around the Yadkin River including Montgomery, Stanly and Union counties while the second group occurred in Warren county (Appendix D). At least three of these cherts appear to be from the Ridge and Valley province while isolated examples of jasper and chalcedony probably have more local sources (see Chapter III). Of the remaining eight examples, three occurred in Warren County near the Roanoke River and I speculate that they represent Virginia sources, used by another group in that region.

Turning to the Yadkin-Pee Dee Transect, the distribution of the minority raw materials probably reflects their availability in either the Piedmont or Coastal Plain. Except for the abundance of quartz in the lower portion of the transect and the occurrence of chert near the coast, the other stone types represent less than 20% of the raw material along the drainage and more often less than 10%. The relative increase in the frequencies of quartz in the Coastal Plain (about 30%) as compared to the Piedmont (near 0%) similarly reflects a pattern found in the Hardaway group. As suggested previously this pattern probably reflects a preference for other raw materials relative to quartz. Nevertheless, while it appears that quartz was not a primary raw material if other stone sources were available, there is some evidence to suggest that its use did increase through the Early Archaic. For instance, in the

Hardaway group approximately 7% of the points were made of quartz while in the Palmer/Kirk group this material's abundance increased to about 15%.

Similarly, the frequencies of porphyritic rhyolite and probably reflects its availability from both primary and secondary sources along the drainage. The slightly bimodal porphyritic rhyolite curve probably represents its exploitation in the Uwharrie Mountains and then some 200 km down river in cobble form. It is interesting to note that the peak near the coast is slightly higher than in the Uwharries.

Finally, as in the Hardaway case, chert points were found along the Pee Dee but in greater frequencies than for the Hardaway group. Unlike in the Hardaway case, however, isolated examples of Ridge and Valley chert are present in the Piedmont sample. What the presence of Ridge and Valley chert suggests about interaction with the Mountain region is unclear, but the presence of Coastal Plain chert again corresponds with the asymmetrical fall-off in rhyolite frequencies to the southwest of the Yadkin. As suggested previously, I interpret this decline in rhyolite use southwest of the Yadkin-Pee Dee to represent a social boundary separating two different settlement ranges for groups focused on the use of Uwharrie rhyolite and Allendale chert, respectively.

DISCUSSION

These results have important implications for the Anderson-Hanson model. At issue is whether band settlement was largely isomorphic with the Yadkin-Pee Dee drainage (Anderson and Hanson 1988). The absence of any significant difference in the occurrence of Uwharrie rhyolite along the Yadkin-Pee Dee versus its occurrence across the eastern Piedmont does not support such a notion. In fact, group settlement probably included some regular cross-drainage movement and appears to have been established very early in the Holocene (i.e., by Dalton times).

This region would have covered much of the North Carolina Piedmont and upper Coastal Plain--an area approximating 80,000 km^2 (Figure 7.3). While this area does exceed the annual ranges of most known hunter-gatherers, it needs to be examined from the diachronic perspective of hunter-gatherer land use. That is, the area encompassed by the high frequencies of rhyolite points represents a composite range, the product of several smaller territories exploited by groups that were probably "tethered" to the rhyolite outcrops of the Uwharrie Mountains throughout the Early Archaic. And while an Early Archaic band need not have traveled from the Broad to the Roanoke River within a seasonal cycle, a linear distance of 200-300 km is within the upper limits of annual ranges for some ethnographic groups (Kelly 1983:Table 1). Thus, when viewed diachronically, hunter-gatherer adaptation on the order of tens of thousands of square kilometers is not unrealistic (Binford 1983:144-117). The following description of hunter-gatherer land use illustrates this point nicely.

> Rather surprisingly, many hunters and gatherers do not reside exclusively in one territory, but--contrary to the assumptions of most archaeologists--exploit a series of discrete areas, occupying each one until the environment becomes degraded. Often after a period of years, the firewood or animal resources become depleted and, at the point of diminishing returns, the group simply moves to a completely different territory, where the resources have been allowed to regenerate [Binford 1983:114].

Finally, one additional inference can be made concerning the possibility of a former social boundary near the Broad River. An asymmetrical pattern of decline in rhyolite is clearly present along the Eastern Piedmont Transect for both the Hardaway and Palmer/Kirk groups. Although no data on raw material frequencies have been reported on Hardaway points in South Carolina, such data on Palmer and Kirk Corner-Notched points indicate that rhyolite (i.e., metavolcanic) frequencies continue to decline into South Carolina (Sassaman 1992). Data from South Carolina indicates that the highest occurrence of any metavolcanic material occurs along the Pee

Dee--suggesting the influence of Uwharrie rhyolite. For example, metavolcanic Early Archaic points constitute about 40% of the sample in Lancaster County, South Carolina, which borders North Carolina and is about 100 km from the Uwharries (Sassaman 1992:Figure 5). Moreover, the South Carolina data indicate that metavolcanic points are also present across the South Carolina Piedmont in roughly decreasing frequencies all the way to the Savannah River where they constitute about 10% of the sample anywhere along the drainage. This decrease in metavolcanic points correlates with an increase in Coastal Plain as one gets closer to the Savannah River.

In sum, the Uwharrie Mountains--and Morrow Mountain in particular--served as the principal source of stone used for making points in the Carolina Piedmont during the Early Archaic. That access to high quality knappable stone was a significant factor influencing Early Archaic settlement is also supported by the functional study of the Hardaway site. Hardaway played a unique role in Early Archaic settlement, functioning as a quarry-related base camp where toolkit refurbishment was a primary activity. This activity was largely accomplished by the procurement of nearby Uwharrie rhyolite. Accordingly, approximately 70% of Hardaway's tool assemblage was made from rhyolite obtained at Morrow Mountain just 8 km away. Toolkit refurbishment, including the manufacture of large quantities of bifacial cores and other tools at Hardaway, suggests an organizational strategy (Binford 1979) focused on the procurement of rhyolite to be carried and used some distance from its source--a distance well documented here.

Allendale chert probably represented an economic resource comparable to Uwharrie rhyolite. The possibility that settlement mobility was not restricted to drainage basins but tethered to stone outcrops forms the basis of a new Early Archaic settlement model which is outlined in the final chapter.

Chapter VIII

RETHINKING EARLY ARCHAIC SETTLEMENT

In this chapter, I reexamine current thinking regarding Early Archaic settlement. I begin by critically assessing certain assumptions underlying the Band-Macroband model. The results of this discussion, when combined with the preceding analyses, allow Hardaway to be placed in a regional context. Finally, the implications of this work are used to construct an alternative model of Early Archaic settlement.

THE BAND-MACROBAND MODEL REVISITED

The Band-Macroband model of Early Archaic settlement is characterized by a drainage-based band adaptation featuring seasonal residential shifts between the Piedmont and Coastal Plain. As the name implies, two levels of settlement organization are represented in the model. At a local level, individual bands are postulated to have occupied eight major river basins along the South Atlantic Slope, from the Ocmulgee River in Georgia to the Neuse River in North Carolina (Figure 8.1). Band populations for each of these drainages are believed to have been between 50 and 150 people. Furthermore, these bands were integrated at a regional level by periodic side trips to other drainages. These intermittent meetings, referred to as "macroband aggregations," formed the second level of settlement organization (Anderson and Hanson 1988).

Base camps were proposed for the winter since it was "a time of low plant availability and high deer aggregation, when resources were most patchy and unpredictable" (Anderson and Hanson 1988:266). Winter base camps were the most

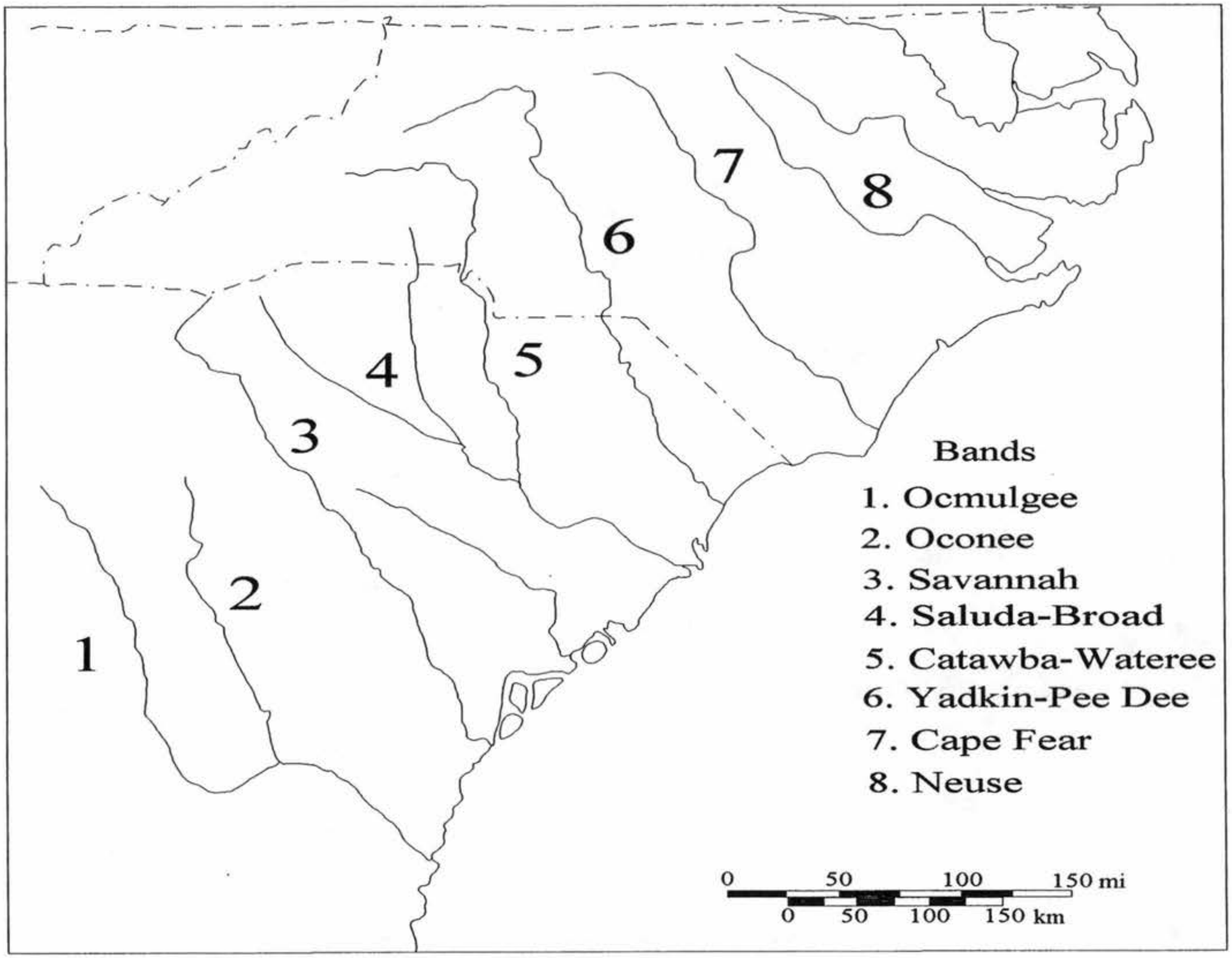


Figure 8.1. The Band-Macroband settlement model (adapted from Anderson and Hanson 1988).

intensively occupied sites (e.g., two to three months) during the settlement round being provisioned by small task groups sent out on special forays. Band adaptation is thus characterized as reflecting a *collector* settlement adaptation during the winter. In the Savannah River basin, winter base camps are believed to have been located in the Middle and Upper Coastal Plain, near the Allendale chert outcrops.

During the spring, with greater plant and animal availability, bands moved toward the coast. Movement by the entire group is posited, although Anderson and Hanson (1988:270) acknowledge that group dispersal into smaller family units is also a possibility. Regardless, settlement mobility was more frequent with less emphasis placed on provisioning by logistical task groups. Moreover, these *forager* camps are postulated to have been occupied for a much shorter time period than winter base camps. As weather warmed, groups moved back into the Upper Coastal Plain and eventually into the Piedmont by summer. Relatively short-term settlements continued to characterize the Piedmont during the summer and early fall, with a return to winter base camps by late fall (Anderson and Hanson 1980:270).

In contrast to extensive group mobility along drainages, band movement across drainages is believed to have been rare. When cross-drainage movement did occur, it was undertaken as part of multiband aggregation events. Such events are believed to have promoted regular contact among several bands from nearby drainages in order to exchange information and maintain mating networks (Anderson and Hanson 1988:271).

Attractive as this model may be, it does not hold up under close scrutiny. In particular, two aspects of the model can be questioned: the proposed mixed forager-collector settlement strategy and the drainage-based settlement range. I address each of these issues below.

Technological Organization and Settlement Adaptation

In the absence of any subsistence data, the only evidence Anderson and Hanson presented to support a mixed forager-collector settlement strategy is an interassemblage comparison in the form of a "curated-to-expedient tool index" calculated for each of the seven Savannah River sites. This comparison indicated that most of the sites had a low index (i.e., were dominated by expedient tools) which is asserted to provide "a measure of site use and group mobility strategy" (Anderson and Hanson 1988:278). This index was used previously on the Haw River sites where the degree of tool curation in an assemblage was purported to provide a measure of settlement adaptation (Claggett and Cable 1982:671-688). Simply put, a high frequency of curated tools is correlated with collector settlement systems, while predominantly expedient assemblages are associated with forager settlement systems. This link between curation level and subsistence-settlement organization is based on arguments by Binford (1977, 1979, 1980) who describes both tool curation and collector settlement organization as "efficient" behavioral strategies: "It should be clear that a logistic strategy in which foods are moved to consumers should be correlated with increases in curation and maintenance of tools, since both are organizational responses to conditions in which improving efficiency would pay off" (Binford 1977:35).

The assumption underlying this notion (and hence the curated:expedient index) is that assemblage composition (i.e., the level of tool curation) is determined at a settlement-subsistence level without regard to local patterns of stone raw-material availability. This assumption is clearly the case in the Band-Macroband model since local conditions of raw material availability are "not thought to have been an overly critical factor influencing settlement" (Anderson and Hanson 1988:270). Such an assumption, however, can be seriously questioned (Bamforth 1986, 1990). As I argue below, the relative level of tool curation among Savannah River sites is telling us less about logistical or residential mobility than it is about the differential use of raw material during the Early Archaic. A brief discussion of the Rucker's Bottom assemblage illustrates this point (Figure 8.2).

Rucker's Bottom was one of the Savannah River Piedmont sites that was characterized as having a low curated-to-expedient index and interpreted as a *forager* camp (Anderson and Hanson 1988:Table 1).

> The stone assemblage included projectile points, well-flaked bifacial core/tools, and a range of less well-executed, presumably expedient bifacial and unifacial tools. Formal unifaces, characterized by evidence for hafting and carefully retouched margins, were rare .... Taken together, the evidence suggests short-duration site use, by groups using a predominantly expedient technology, and characterized (given the incidence of extralocal materials) by a mobile, wide ranging adaptation [Anderson and Hanson 1988:274].

Significantly, most of the assemblage comprised local quartz (76.4%), with nonlocal Allendale chert (from some 175 km downstream) representing the dominant minority type (7.0%) (Anderson and Schuldenrien 1983:Table 1).

Rather than representing a *forager* technology, I believe the high frequencies of expedient tools in the assemblage reflect the more regular use and discard of local quartz while conserving tools made from nonlocal chert. Such an interpretation, in fact, is implied with regard to bifaces in the Rucker's Bottom assemblage.

> The formal biface assemblage, furthermore, was dominated by fine-grained extralocal materials, while the crude biface assemblage was dominated by quartz. The formal biface category appears to be part of a carefully maintained and curated assemblage, while the crude bifaces appear to reflect the expedient reduction and (probably) short-term use of local materials [Anderson and Schuldenrein 1983:188].

In essence, the assemblage at Rucker's Bottom is exactly the sort of lithic refuse one might expect from a group focused on the exploitation of Allendale chert supplemented by material procured while exploiting subsistence resources within a

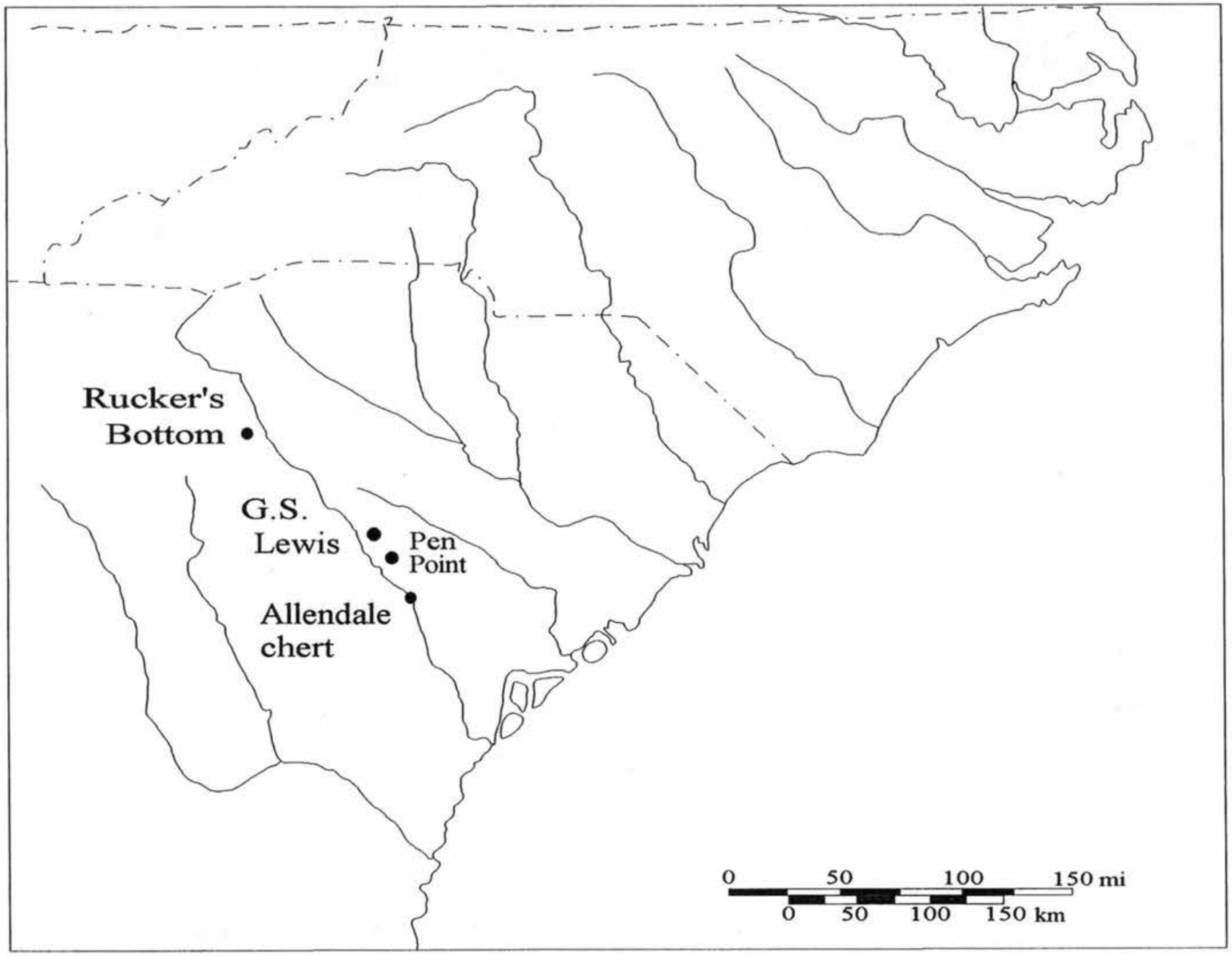


Figure 8.2. Early Archaic sites along the Savannah River.

region. What this strategy of raw material use has to say about settlement-subsistence organization, however, is unclear.

> The search for a "forager technology" or for any other technology defined only by a society's food-getting habits, is unlikely to be fruitful, because material for tool manufacture is a resource in the same sense as plants and animals: its nature and distribution fundamentally condition the ways in which it can be exploited [Bamforth 1986:40].

Thus, in the absence of any explicit reason why the "expedient" technology at Rucker's Bottom actually reflects a forager settlement adaptation, a far simpler explanation seems warranted. That is, the technology at Rucker's Bottom (and presumably the other sites in the region) tells us less about logistical or residential mobility than about how an Early Archaic technology was organized with respect to the availability of stone.

Band Range and Raw Material Distribution

A second aspect of the Band-Macroband model is the proposed watershed-based settlement range. Anderson and Hanson (1988) have presented two arguments in support of this assertion.

Their first argument was based on the relative frequencies of points made from chert and quartz, materials with mutually exclusive sources in the Coastal Plain and Piedmont, respectively. Frequencies of tools made from these stone types along the drainage exhibited "a gradual, rather than a dramatic or step-like fall off" as a function of the distance from their respective geologic sources (Anderson and Hanson 1988:280) . This pattern was presented as evidence of "minimal social boundaries" implying direct access to stone sources via group mobility (Anderson and Hanson 1988:280) .

Secondly, they suggested that "extralocal [chert] raw material use appears greatest along rather than across drainages, suggesting that most group activities (except for possibly seasonal or annual aggregation events) occurred within individual drainages" (Anderson and Hanson 1988:280). Although no similar graphs for adjacent drainages were presented to support this statement they did cite an earlier study (Anderson and Schuldenrein 1983:201) comparing projectile point raw materials from portions of the Santee River with those from the Savannah River. As implied in the above statement and noted elsewhere in their discussion (Anderson and Hanson 1988:280), the relatively smaller flow of raw materials between drainages was largely accounted for by indirect acquisition such as exchange during periods of macroband aggregation.

Anderson and Hanson's argument notwithstanding, there exists no reason why lesser chert frequencies across drainages must be the result of exchange. This would be the case, for example, if, after visiting the Allendale sources and moving along a portion of the Savannah River, a group incorporated some cross-drainage movement in its settlement round. In this case chert frequencies would reflect the temporal rather than the spatial distance of stone transport.

Indeed, recent data from South Carolina belie Anderson and Hanson's statements concerning the differences in frequencies of Allendale chert across drainages. Sassaman (1992:Figure 6.5) depicts two transects originating from the Allendale sources: one transect travels up the Savannah River while the other crosses the Middle Coastal Plain, traversing the state's major watersheds. Both transects depict a similar clinal decline in the frequencies of chert from its source which, given Anderson and Hanson's argument, should not be the case. Rather, the Savannah River curve should be gradual while the cross-drainage curve should be dramatic or step-like. If anything, the along-drainage decline in chert is more dramatic than the cross-drainage pattern. Moreover, a comparison of the two transects indicates that at a distances of 25-175 km from the Allendale sources, chert frequencies are as much as 30% greater across the Middle Coastal Plain than up the Savannah River.

In fact, chert frequencies along the Savannah River only exceed chert frequencies across drainages at distances between about 175 to 200 km from the Allendale sources; and even then the differences are insignificant (ca. 1-2%). In short, it appears that Allendale chert is moving the same distance and with the same (if not slightly greater) frequencies across the Coastal Plain as it is along the Savannah River.

These results, of course, mirror the rhyolite distributions discussed earlier. In fact, given Allendale chert's localized abundance and high flaking quality, combined with its predominant and widespread use in the Coastal Plain, the Allendale sources probably represent the Coastal Plain equivalent of Uwharrie rhyolite. As also in the Yadkin-Pee Dee case, it is unlikely that band range was confined to the Savannah River. Rather, Early Archaic settlement range probably encompassed at least portions of several drainages adjacent to the Savannah.

Also, like Uwharrie rhyolite, Allendale chert was supplemented by quartz, Ridge and Valley chert, and metavolcanic stone during the Early Archaic (Anderson and Hanson 1988:Figure 8; Sassaman et al. 1988:85; Sassaman 1992). Moreover, it appears that many, if not most, of the Early Archaic metavolcanic points in South Carolina were probably made from Uwharrie rhyolite. While some metavolcanic stone may have been quarried in South Carolina (see Goodyear et al. 1990:14), it is unlikely that any major metavolcanic sources were ever exploited to the same extent as those in the Uwharries. Although no systematic attempt has been made to locate metavolcanic stone quarries in the state, collections data indicate that metavolcanic stone was used in much lesser frequencies than Allendale chert (Anderson and Hanson 1988:280-281; Sassaman 1992; Sassaman et al. 1988). In fact, Charles's (1981:55) collections survey shows the major concentrations of metavolcanic points in South Carolina occur along the Pee Dee, suggesting that the Uwharrie Mountains were the primary source. In short, only two stone sources provided the vast majority of the raw materials used during the Early Archaic: Uwharrie rhyolite and Allendale chert.

THE UWHARRIE-ALLENDALE SETTLEMENT MODEL

By now it should be clear my analysis suggests a different view of Early Archaic settlement than that proposed by Anderson and Hanson. In brief, present evidence suggests that sources of knappable stone (i.e., Uwharrie rhyolite and Allendale chert) rather than watersheds formed the geographical focus of Early Archaic adaptation; in fact, band ranges cross-cut several drainages. At some point during the early Holocene, hunter-gatherer groups coalesced around the Uwharrie and Allendale sources forming at least two regions (Figure 8.3). While band mobility was restricted by and included scheduled visits to primary quarry sources, movement was otherwise quite variable across the Piedmont and Coastal Plain.

Population sizes of the bands that inhabited these regions can only be speculated about. But given that this period closely follows the initial human colonization of the New World, population densities must have been fairly low. Anderson and Hanson (1988:267), for example, propose individual bands of 50 to 150 people. This range seems reasonable.

For the sake of simplicity, I postulate that single bands occupied the Uwharrie and Allendale regions, although as noted in Chapter VII the Uwharrie area is large enough to have accommodated several contemporary bands. Presumably this was also true for the Allendale territory. If it can eventually be demonstrated that more than one band simultaneously occupied these ranges, then each could represent a "macroband" region in the sense used by Anderson and Hanson (1988:271).

In any event, these two regions are defined based on the distributions of rhyolite points (discussed in Chapter VII), and chert points (discussed earlier in this

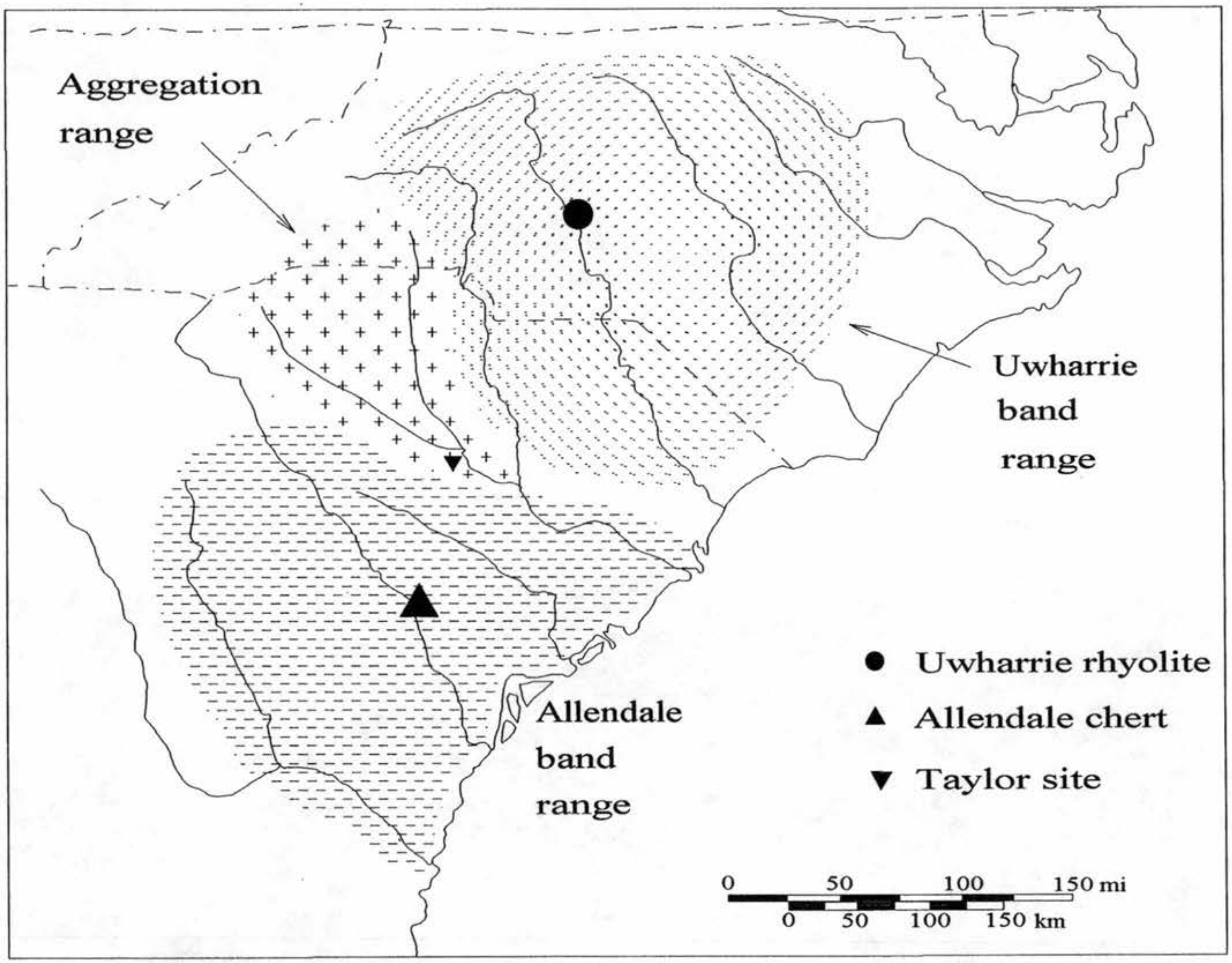


Figure 8.3. The Uwharrie-Allendale settlement model.

chapter). The proposed southern boundary of the Allendale region, it should be noted, is an exception. No studies of Early Archaic point frequencies by raw material exist for Georgia, but Coastal Plain chert points are known from the Oconee River valley (O'Steen 1992; Goad 1979). This drainage also provides a boundary roughly equivalent in distance from Allendale chert as the northern boundary is in Figure 8.3. Collections surveys are needed for Georgia in order to provide data for an accurate assessment of this boundary.

Not coincidentally, I believe, these two regions also mirror the geographic distributions of two local artifact types of the Early Archaic horizon: Taylor and Hardaway Side-Notched points. Taylor points--about 80% of which are made of Allendale chert--are concentrated in the southern part of South Carolina in an area south and west of the Santee River. Occurrence of Taylor points north of the Santee River are rare (Michie 1966; Sassaman 1992:51). This boundary also coincides with the northern limit of the Allendale band range proposed here.

Hardaway Side-Notched points, in contrast, occur with much less frequency than Taylor points in South Carolina (Sassaman 1992:49). Also in contrast to Taylor points, Hardaway Side-Notched points are found in South Carolina north of the Santee River in the area bordering North Carolina. In addition, over half of the Hardaway Side-Notched points found in South Carolina are made of metavolcanic stone while quartz constitutes most of the remaining specimens (Sassaman 1992:49). The proximity of the metavolcanic point distribution to the Uwharrie Mountains suggests that these artifacts originated from the Uwharrie region. Furthermore, this artifact distribution nicely reflects the southwestern edge of the proposed Uwharrie Band range. In short, the existence of two different but presumably coeval side-notched point types, with mutually exclusive geographic distributions predominantly associated with either Allendale chert or Uwharrie rhyolite, lends credence to the two settlement ranges proposed here.

The presence of relatively long-term base camps associated with the raw material sources in both regions provides additional support for these two ranges. Hardaway, of course, is an example in the Uwharrie region while G.S. Lewis and Pen Point (Figures 8.2) are examples from the Allendale region (Anderson and Hanson 1988:274-278). Both G.S. Lewis and Pen Point are located within 15 km of the Allendale quarries, while Hardaway is located only 8 km from Morrow Mountain. In the Band-Macroband model, the former two sites are proposed to have functioned as winter base camps occupied for a period of two to three months. Among other activities, the quarrying of nearby Allendale chert is proposed to have taken place during their occupation. While the seasonal occupation is conjectural, the functional interpretation is in accord with the model proposed here.

Although most lithic demands were satisfied at the Uwharrie and Allendale sources, stone supplies were also supplemented while moving within each region by exploiting secondary cobble sources and lesser quality outlying bedrock outcrops. Since these "expedient quarries" were dispersed across the region they served to extend the time spent or distance moved prior to scheduling a return visit to either the Uwharrie or Allendale sources. Procurement of these minor raw materials was probably "embedded" (Binford 1980:259) in basic subsistence schedules as groups moved across the landscape, and it is likely that no extra effort was expended in acquiring them. Moreover, since these minor sources were not systematically revisited, they probably will be less visible archaeologically than the Uwharrie and Allendale quarries.

The location of base camps relatively close to exploited outcrops also indicates that the mining of tool-stone was probably integrated with other resource procurement activities. That is, these sites were not just specialized lithic procurement stations, but rather habitations occupied by entire Early Archaic social units positioned within foraging distance of quarries. In other words, these Early Archaic groups most closely resembled *forager* hunter-gatherer adaptations, where social groups travel as a unit to the resources they intend to exploit (Binford 1980).

While not conclusive, a forager adaptation is also consistent with our limited understanding of both subsistence practices and environmental conditions during the Early Archaic. Although subsistence data are lacking from sites along the South Atlantic Slope, limited data from other Early Archaic sites suggests that a broadly similar "species-rich" foraging strategy probably existed elsewhere in the Southeast (Meltzer and Smith 1986). This subsistence strategy is characterized by

> a broad-based utilization of both closed canopy climax forest resources (e.g., gray squirrel and nuts), as well as early successional species more commonly associated with edge areas and relatively open and more disturbed situations (e.g., cottontail rabbits, pioneering seed bearing plants, and white-tailed deer) [Meltzer and Smith 1986:17].

Exactly how group mobility related to subsistence resources in the Uwharrie and Allendale regions, however, we can only guess; but palynological reconstructions of Early Holocene vegetational history in the Eastern Woodlands indicates similar resources (including the above plants and animals) should have been equally abundant in both the Piedmont and Coastal Plain.

Two major vegetational communities encompassed the South Atlantic region during the early Holocene (ca. 12,500-9,000 B.P.): a mixed hardwood forest and an oak-hickory-southern pine forest (Delcourt and Delcourt 1981:147-149). During this period biotic adjustments were in progress as a result of postglacial climatic warming.

By 10,000 years ago a mixed hardwood forest had replaced a late glacial boreal forest across the mid-latitudes of the Southeast (i.e., 33°-37°). Along the South Atlantic Slope this area included all of North Carolina, the northern half of Georgia, and all but the southern tip of South Carolina. This mixed hardwood forest included oak, maple, beech, basswood, elm, walnut, hemlock, and gum (Delcourt and Delcourt 1981:126) and was characterized by a "cool-temperate climate and abundant moisture during the growing season" (Delcourt and Delcourt 1984:276). The climate of this region at 10,000 B.P. was affected by two different weather systems, the Pacific Airmass influencing the winter and the Maritime Tropical Airmass influencing the summer (Delcourt 1985:Figure 1; Delcourt and Delcourt 1984:276-277), resulting in "increased seasonality of temperatures" (Delcourt and Delcourt 1984:280).

Just to the south (29°-33° latitude) a oak-hickory-southern pine forest remained stable from at least the last late glacial cycle and covered the southern tip of South Carolina and southern half of Georgia (Delcourt and Delcourt 1981:Figure 7). This region was dominated by oak, hickory, sweetgum, and southern pine; the climate was warm and temperate, as it is today (Delcourt and Delcourt 1981:147; 1983:269).

With an essentially deciduous forest covering most of the Piedmont and Coastal Plain during the Early Archaic there were probably more similarities than differences in resource availability along river valleys. In fact, those river valleys to the north of the Savannah--including the Yadkin-Pee Dee--would have been contained entirely within the mixed hardwood forest. Those river valleys south of and including the Savannah River would have encompassed portions of both the mixed hardwood and the oak-hickory-southern pine forests. It would have been this latter group of river valleys that would have exhibited the greatest environmental variation in terms of seasonality and biota.

But, in actuality, how different would the adaptational responses in the two vegetational regimes have been? Given the presumed "species rich" nature of both environmental zones, a generalized strategy of exploiting a variety of resources including nuts, seeds, small mammals, and deer would not have required a strict seasonal transhumance between the Piedmont and Coastal Plain (cf. Ward 1983; Steponaitis 1986). Rather, I envision a more reasonable hypothesis to be a forager settlement adaptation whereby these early hunter-gatherers "mapped on" to available resources in either the Piedmont or Coastal Plain through "residential moves and adjustments in group size" that was not restricted by watersheds (Binford 1980:10).

The seven Early Archaic components described by Anderson and Hanson (1988:272-280) from along the Savannah River can also be interpreted as *forager* sites. Two site types are predominantly produced by foragers: *residential bases* of varying sizes and locales, and *locations* where extractive tasks were carried out (Binford 1980:9). G.S. Lewis, for example, has already been mentioned as a residential base camp. Pen Point may also served in a similar manner. The remaining sites (e.g., Rucker's Bottom, Cal Smoak, and Theriault) probably represent somewhat smaller and shorter-term residential sites or extractive locations. *Locations*, on the other hand, may produce little in the way of archaeological residue, unless the activity involves repeated and/or high-bulk extraction (Binford 1980:9). Examples of the former are isolated point finds or small lithic scatters often noted across the landscape; the Allendale or Uwharrie quarries are examples of the latter.

Forager settlement also exhibits considerable variability in both residential size and the number of residential moves during an annual cycle (Binford 1980:5). The variability in residential size relates to another characteristic of hunter-gatherer adaptation: cycles of group dispersal (e.g., into family units) and aggregation. Dispersal and aggregation, of course, are usually associated with ecological variables, but the influence of cultural factors (such as social or ritual needs) on band aggregation is also well documented (Conkey 1980:609-611; Jochim 1976:19; Wilmsen 1970:80; Williams 1974:26-29). The stated purpose and apparent functions of these aggregations are varied: provision of mates, exchange, performance of ritual and curing, and information sharing.

Similarly, I believe aggregation sites were present during the Early Archaic and can be identified based upon the diversity of stone raw materials within assemblages. The emphasis on "diversity" as a criterion for identifying hunter-gatherer aggregation sites follows Conkey (1980) who argues that aggregation sites should exhibit products of greater diversity than dispersed sites as a result of group concentration. Conkey tested this expectation by analyzing the diversity of design elements on engraved bone artifacts from several Upper Paleolithic sites in Spain. Her results were provocative and have clear implications for identifying other hunter-gatherer aggregation sites as well.

Accordingly, I suggest that the diversity of raw materials from the Taylor site (Michie 1992), which exhibits frequencies of raw material types from both the Piedmont and Coastal Plain that are unique among known assemblages in the Carolinas, reflect aggregation events held between groups from the Uwharrie and Allendale regions. And while band aggregation (incorporating Taylor and other Upper Congaree River sites) is also raised in the Band-Macroband model, I suggest that the Uwharrie-Allendale model better explains the location of such sites along the Congaree than does the Band-Macroband model.

According to Anderson and Hanson, the Fall Line is a strategically favored ecological location for aggregations due to its position relative to the resources of the Piedmont and Coastal Plain. Several sites including Manning, Thom's Creek, and Taylor located in the Upper Congaree River Valley near the Fall Line are identified as possible aggregation sites (Anderson and Hanson 1988:271). These sites are often cited as having diverse assemblages with respect to both stone and tool types (Anderson et al. 1974:11; Wogaman et al. 1976:20-22). High raw material and tool type diversity are two assemblage criteria that are associated with aggregation by Anderson and Hanson (1988:280).

Unfortunately, with the recent exception of Taylor (Michie 1992), none of these sites have been reported in detail. The Taylor site, which covers some 14 ha, is one of the largest Paleoindian and Early Archaic sites known in South Carolina. The site lies near present day Columbia, about 400 m from the Congaree River. Surface collections from Taylor have yielded an impressive number of Clovis, Suwannee, Dalton, and Palmer points while excavations have revealed a remarkably pure Early Archaic assemblage represented primarily by Dalton and Palmer points.

Several tool categories were identified from Taylor including, points, bifaces, adzes, end scrapers, side scrapers, and *pièces esquillées*. Based upon the wide variety of tool types in the assemblage, Michie (1992:237-239) interprets Taylor as a macroband aggregation site consistent with the Band-Macroband model.

While a wide range of activities is apparently reflected in the Taylor assemblage, no explicit consideration is made as to why Taylor should necessarily represent an aggregation site as opposed to, say, a residential base camp--since the latter also produces assemblages with a wide variety of tool types. Rather, following Anderson and Hanson, it is the site's Fall Line *location* that Michie implicitly relies on to interpret Taylor as an aggregations site.

> The attractiveness of the Anderson and Hanson (1988) model is that it explains why there are large Early Archaic sites in Fall Line locations. Not only are these areas suitable for band aggregation, but provide environmental diversity with access to floral and faunal resources of the Piedmont and the Coastal Plain, while providing a natural ford for unrestricted river crossings. The latter consideration would have extended their kenetic [sic] range allowing for greater environmental exploitation on the opposite side of three major river systems, i.e., the Saluda, Broad, Congaree Rivers [Michie 1992:239].

Regardless of the functional interpretation of Taylor, Michie (1992:238-239) departs from the Anderson and Hanson (1988) model by questioning whether band movement was primarily within specific river systems. Moreover, in a view similar to mine he interprets the presence of Coastal Plain chert across drainages as evidence of regular band mobility.

> Therefore, when Coastal Plain chert or other non-local lithic raw materials are found along major drainages in central South Carolina it suggest that groups have crossed several river systems, and that procurement of raw materials must have been incidental to some broad scale annual range involving several hundred miles [Michie 1992:238].

This interpretation, however, leaves an interesting contradiction. While Michie's functional interpretation of Taylor is consistent with the Band-Macroband model, he rejects the model's watershed-based band territories. The question then becomes: If Taylor was a macroband aggregation site but doesn't represent occupations by bands based in adjacent drainages, what were the territories of the groups involved? Assuming my argument has been convincing thus far, the answer should be obvious: the Uwharrie and Allendale regions.

Taylor's Fall-Line location along the Congaree thus reflects its proximity to both the Uwharrie and Allendale sources, rather than any presumed logistical advantage this locale might have had with respect to subsistence resources in the Piedmont and Coastal Plain. In fact, I earlier questioned the notion that the environmental structure between the two physiographic zones was significant enough to have warranted such a seasonal transhumance during the early Holocene.

An examination of the two band ranges outlined in Figure 8.3, indicates that Taylor (as well as all of Anderson and Hanson's other proposed aggregation sites) are located exactly where expected--in places readily accessible to both regions, roughly equidistant from the Allendale and Uwharries sources (ca. 150-160 km). The equal frequencies of chert and metavolcanic points from Taylor support the notion of group movement from both the Coastal Plain and Piedmont. For example, in a total of 56 excavated Palmer Corner-Notched points, approximately equal percentages of Coastal Plain chert and metavolcanic stone are present (ca. 20%). Quartz occurs in the highest frequencies (44%), while orthoquartzite (14%), quartz crystal (2%), and black chert (2%) constitute the minority groups (Michie 1992:Tables 13.1-13.5).

Although Michie did not specifically identify any of the metavolcanic artifacts as Uwharrie rhyolite, stone from the Uwharrie Mountains is present in the Taylor assemblage. As a part of this study Michie graciously allowed me to examine a portion of the Taylor assemblage, in which I identified several aphyric rhyolite specimens from Morrow Mountain.

If aggregation events did take place midway between the Uwharrie and Allendale regions, this settlement characteristic has an important implication for Early Archaic site distributions: no other sites exhibiting the raw material diversity of Taylor should be found outside the Congaree. Such a pattern does, in fact, seem to hold true, and indicates another weakness of the Band-Macroband model. Anderson and Hanson (1988:271) posit that sites similar in size as well as assemblage and raw material diversity should exist at the Fall Line of each of the major watersheds along the South Atlantic Slope, yet no such sites have been identified outside the Congaree. In short, the Uwharrie-Allendale model better explains both the concentration of sites such as Taylor along the Congaree *and* their marked absence elsewhere in the Carolinas.

In light of the above argument, I have designated an "aggregation range" separate from the Uwharrie and Allendale band ranges (Figure 8.3). I propose that the Congaree, Broad, and Saluda River valleys were part of a territorial range exploited by groups aggregated along the Congaree. Collections data from these areas reveal relatively equal frequencies of chert and metavolcanic Early Archaic points (ca. 10-20%), albeit in lower proportions than quartz (ca. 50-80%) (Sassaman

1992:Figures 6.2-6.3). Some group movement also took place downriver as evidenced by the presence of points in the assemblage made from orthoquartzite (13%), which outcrops south of Taylor along the Santee (Michie 1992:223) (see Chapter III). Although the presence of orthoquartzite points suggests that the Santee was exploited by groups at Taylor, the relatively high frequencies (ca. 50%) of Coastal Plain chert points from the Santee suggests that this drainage was exploited more regularly by an Allendale band.

This aggregation range, however, does not exclude the possibility that portions of the Saluda and Broad could have been exploited by the Allendale or Uwharrie bands as well. But, if the Congaree was primarily utilized for aggregations events there is a practical reason why the Saluda and Broad Rivers may not have been a regular part of the Allendale or Uwharrie ranges. Presumably, these events resulted in a greater-than-usual drain on local resources relative to other regions. Assuming then, that these aggregations were regularly scheduled occurrences, it may have been beneficial to avoid this area between events to allow resources to regenerate.

The question of contact outside the Piedmont and Coastal Plain has already been addressed with respect to the collections survey. Based on the general absence of raw materials from outside the Piedmont or Coastal Plain (e.g., Ridge and Valley chert), it would appear that group interaction took place primarily between the Uwharrie and Allendale ranges rather than with other regions.

CONCLUSION

By now, many readers may have noticed similarities between the Uwharrie-Allendale model and the Flint Run settlement model advocated by William Gardner since the 1970s. Based upon his work in the Shenandoah Valley of northern Virginia, Gardner (1974, 1977, 1983, 1989) has proposed that Paleoindian and Early

Archaic settlement in this region was directly linked to the primary use of Flint Run jasper outcrops. Moreover, he has geographically expanded this model to account for other areas of the Southeast where cryptocrystalline quarry sources were located, including the Allendale sources as well as Williamson chert in Virginia and "Ocala" chert in Florida (Gardner 1983:57-58).

While both the Uwharrie-Allendale and Flint Run models feature the limited availability of high quality knappable stone as a significant factor influencing settlement, there are at least three significant differences between the two models. First, Gardner (1983:50-51; 1989:12-18) emphasizes the near exclusive preference of cryptocrystalline stone (such as jasper, chert, and chalcedony) during the Paleoindian and Early Archaic periods and only occasional use of "less desirable" materials as rhyolite. Thus, the Flint Run model fails to account for the extensive settlement of the Piedmont which lacks cryptocrystalline sources but does contain knappable microcrystalline stone such as rhyolite. Second, rather limited settlement ranges are proposed in the Flint Run model covering a maximum extent of 50-130 km that are primarily riverine focused (Gardner 1983:58). As outlined above, the maximum Early Archaic range in the Piedmont was probably twice as great. Finally, while the settlement complexes of both models are similar, the location of aggregation sites in the Uwharrie-Allendale model, unlike in the Flint Run model, is based less on proximity to quarry sources than proximity to neighboring social groups. Thus, while the "lithic determinist" underpinnings of the two models cannot be denied, the Uwharrie-Allendale settlement model is distinguished from Flint Run by an emphasis on rhyolite rather than chert, a band range that is not geographically bound by watersheds, and a settlement distribution including one site type whose location is influenced more by social than economic needs.

In contrast to the significance the above two models place on the distribution of knappable stone, little emphasis is given to stone resources as a factor shaping settlement in the Band-Macroband model. Tool-kit replenishment "is not thought to have been an overly critical factor influencing settlement. In the Piedmont, where lithic raw materials are widespread, this was not a factor" (Anderson and Hanson 1988:270). The notion of a widespread availability of chippable stone in the Piedmont, however, is simply untrue. While metavolcanic outcrops occur throughout the Piedmont, not all such outcrops contained usable stone. The extensive reliance by Early Archaic peoples on Uwharrie rhyolite and Allendale chert belies Anderson and Hanson's comments concerning the widespread availability of potential raw materials. The Band-Macroband model simply underestimates the importance of local conditions of raw material availability in shaping settlement.

The Band-Macroband model, however, is not the first to underestimate the significance of stone resources in Early Archaic settlement. Following Binford (1979:259-261), virtually all Southeastern settlement models have largely assumed that stone acquisition was "embedded" in (i.e., largely incidental to) subsistence practices (e.g., Goodyear et al. 1979:199; see Chapter I).

Although some lithic procurement probably took place under such conditions, I would argue that this behavior accounted for only the minor amounts of raw material that supplemented assemblages predominantly made of chert and rhyolite. Rather, as I have suggested above, scheduled trips were probably made to the Uwharrie and Allendale quarries specifically to acquire stone. This scheduling need not have involved any extra effort in settlement mobility since (turning the notion of embeddedness around) subsistence procurement then would have been incidental to stone procurement. Once groups had refurbished their toolkits and left the quarry settlements, the stone they did obtain was probably acquired incidentally in the region they were exploiting for food.

Finally, this brings me to the question of why the role of lithic procurement has been overlooked as a significant factor in Early Archaic settlement. Previous settlement models, either implicitly or explicitly, have relied heavily on ethnographic or ethnoarchaeological data in which to frame their interpretations. Since none of the groups in these accounts relies extensively upon stone resources, it is not surprising that subsistence practices rather than lithic procurement have been emphasized in these discussions. House and Wogaman (1978:12-26), for example, used the seasonal round of the historic Creek "as a useful baseline" to construct their model of Archaic settlement. Similarly, Anderson and Hanson have relied heavily upon the forager-collector continuum that is derived from the ethnoarchaeological studies of hunter-gatherers.

By uncritically borrowing ethnographic frameworks for Early Archaic settlement models, archaeologists in the Southeast have fallen into the trap of doing "ethnography with a shovel" whereby the ethnographic record is given too much weight in interpreting archaeological evidence (Wobst 1978). In essence, we have been blinded to the potential existence of a settlement pattern unlike any known ethnographically--a settlement pattern largely conditioned by the limited distribution of knappable stone.

There is, of course, no *a priori* reason why Early Archaic settlement should have been conditioned more greatly by the presence of plant or animal resources than stone resources. (This misplaced priority is all the more ironic given the absence of subsistence data.) There is also no reason why, given the vast cultural and environmental changes the Southeast has undergone since the Early Holocene, any ethnographic accounts of Southeastern Indians--or any other ethnographically known group--should provide an appropriate analog for Early Archaic settlement. In fact, given these circumstances, one might be suspicious of such attempts.

If archaeologists are successful in reevaluating the relationship between stone and subsistence resources as they affect hunter-gatherer settlement, we will be in a position to contribute uniquely to an anthropological understanding of hunter-gatherers: archaeologists can then provide insights into hunter-gatherer settlement strategies that are unknown ethnographically. Moreover, since hunter-gatherers are the "quintessential anthropological topic" (Bettinger 1991:v), such insights should insure that the Southeastern archaeology of prehistoric hunter-gatherers will remain a topic of wider anthropological interest for some time to come.

REFERENCES CITED

Anderson, D. G., and G. T. Hanson
1988 Early Archaic Settlement in the Southeastern United States: A Case Study From the Savannah River. *American Antiquity* 53:262-286.

Anderson, D.G., J. L. Michie, and M. B. Trinkley
1974 *An Archaeological Survey of the Proposed Southwestern Beltway Extension and Twelfth Street Extension Highway Route in the Vicinity of Congaree Creek.* South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia, Research Manuscript Series 60.

Anderson, D.G., and J. Schuldenrein
1983 Early Archaic Settlement on the Southeastern Atlantic Slope: A View from the Rucker's Bottom Site, Elbert County, Georgia. *North American Archaeologist* 4:117-210.

Ascher, R.
1968 Time's Arrow and the Archaeology of a Contemporary Community. In *Settlement Archaeology*, edited by K. C. Chang, pp. 43-52. Palo Alto: National Press Books.

Bamforth, D. B.
1986 Technological Efficiency and Tool Curation. *American Antiquity* 51:38-50.

1990 Settlement, Raw Material, and Lithic Procurement in the Central Mojave Desert. *Journal of Anthropological Archaeology* 9:70-104.

Baker, C. M.
1978 The Size Effect: An Explanation of Variability in Surface Artifact Assemblage Content. *American Antiquity* 43:228-293.

Bartram, L. E., E. M. Kroll, and H. T. Bunn
1991 Variability in Camp Structure and Bone Food Refuse Patterning at Kua San Hunter-Gatherer Camps, In *The Interpretation of Archaeological Spatial Patterning,* edited by E. M. Kroll and T. D. Price, pp.77-148. Plenum Press, New York.

Bettinger, R. L.
1991 *Hunter-Gatherers: Archaeological and Evolutionary Theory.* Plenum Press, New York.

Binford, L. R., and S. R. Binford
1966 A Preliminary Analysis of Functional Variability in the Mousterian of Levallois Facies. In Recent Studies in Paleoanthropology, edited by J. D. Clark and F. C. Howell, pp. 238-295. *American Anthropologist* 68: Part 2.

Binford, L. R.
1973 Interassemblage Variability: The Mousterian and the "Functional Argument. In *Explanation of Culture Change: Models in Prehistory*, edited by C. Renfrew, pp. 227-254, Duckworth, London.

1977 Forty-seven Trips: A Case Study in the Character of Archaeological Formation Processes. In *Stone Tools as Cultural Markers: Change, Evolution, and Complexity,* edited by R. V. S. Wright, pp. 24-36, Canberra: Australian Institute of Aboriginal Studies.

1978 Dimensional Analysis of Behavior and Site Structure: Learning from an Eskimo Hunting Stand. *American Antiquity* 43:330-361.

1979 Organization and Formation Processes: Looking at Curated Technologies. *Journal of Anthropological Research* 35:255-273.

1980 Willow Smoak and Dogs' Tails:Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45:4-20.

1983 *In Pursuit of the Past*. Thames and Hudson, New York.

1987 Researching Ambiguity: Frames of Reference and Site Structure. In *Method and Theory for Activity Area Research*, edited by S. Kent, pp.449-512, Columbia University Press.

Binford, L., and G. Quimby
1963 Indian Sites and Chipped Stone Materials in the Northern Lake Michigan Area. *Fieldiana-Anthropology* 36:277-307.

Broyles, B. J.
1971 *Second Preliminary Report: The St. Albans Site, Kanawha Valley.* Report of Archaeological Investigations 3. West Virginia Geological and Economic Survey, West Virginia.

Bullen, R. P.
1975 *A Guide to the Identification of Florida Projectile Points, Revised Edition.* Kendall Books, Gainesville.

Bullen, R. P., and L. E. Bielman
1973 The Nalcrest Site, Lake Weohyakapa, Florida. *Florida Anthropologist.* 26:1-22.

Burt, E. R., III
The Geology of the Northwest Eighth of the Troy Quadrangle. Unpublished Masters thesis, Department of Geology, University of North Carolina, Chapel Hill.

Butler, J. R.
1986 Carolina Slate Belt Near Albemarle, North Carolina. In *Southeastern Section of the Geological Society of America, Continental Field Guide,* vol. 6, edited by T.L. Neathery, pp. 235-237. Geological Society of America.

Butler, J. R., and D. T. Secor, Jr.
1991 The Central Piedmont. In *The Geology of the Carolinas: Carolina Geological Society Fiftieth Anniversary Volume*, edited by J. W. Horton, Jr. and V. A. Zullo, pp.59-78. University of Tennessee Press.

Cable, J. S.
1982 Description and Analysis of Lithic Assemblages. In *The Haw River Sites:Archaeological Investigations at Two Stratified Sites in the North Carolina Piedmont*. Commonwealth Associates, Inc., Report No. 23386, Prepared for Wilmington District Corp of Engineers.

Cahen, D., L. Keeley, and F. Van Noten
1979 Stone Tools, Tool Kits, and Human Behavior in Prehistory. *Current Anthropology* 20:661-683.

Caldwell, J. R.
1958 *Trend and Tradition in the Prehistory of the Eastern United States*. Memoirs of the American Anthropological Association No. 88.

Chapman, J.
1973 *The Icehouse Bottom Site (40MR23)*. Department of Anthropology, University of Tennessee, Department of Anthropology, Reports of Investigations 13.

1975 *The Rose Island Site and the Bifurcate Point Tradition*. University of Tennessee, Department of Anthropology, Report of Investigations 14.

1976 The Archaic Period in the Lower Little Tennessee River Valley: The Radiocarbon Dates. *Tennessee Anthropologist* 1:1-12.

1977 *Archaic Period Research in the Lower Little Tennessee River Valley - 1975, Icehouse Bottom, Thirty Acre Island, Calloway Island*. University of Tennessee, Department of Anthropology, Report of Investigations 18.

1978 *The Bacon Farm Site and A Burial Site Reconnaissance*. University of Tennessee, Department of Anthropology, Report of Investigations 23.

Charles, T.
1981 Dwindling Resources:An Overture to the Future of South Carolina's Archaeological Resources. University of South Carolina, Institute of Archaeology and Anthropology, *Notebook* 13.

1983 Thoughts and Records from the Survey of Private Collections of Prehistoric Artifacts Throughout South Carolina: A Second Report.University of South Carolina, Institute of Archaeology and Anthropology, *Notebook* 18.

1986 The Fifth Phase of the Collectors Survey. South Carolina Institute of Archaeology and Anthropology, *Notebook* 18.

Cleland, C. E.
1976 The Focal-Diffuse Model: An Evolutionary Perspective on the Prehistoric Cultural Adaptations of the Eastern United States. *Midcontinental Journal of Archaeology* 1:59-76.

Claggett, S. R., and J. S. Cable
1982 *The Haw River Sites:Archaeological Investigations at Two Stratified Sites in the North Carolina Piedmont*. Commonwealth Associates, Inc., Report No. 23386, Prepared for Wilmington District Corp of Engineers.

Coe, J. L.
1964 The Formative Cultures of the Carolina Piedmont. *Transactions of the American Philosophical Society*, 54. Philadelphia.

Conkey, M. W.
1980 The Identification of Prehistoric Hunter-Gatherer Aggregation Sites: The Case of Altamira. *Current Anthropology* 21:609-630.

Conley, J.F.
1962 Geology of the Albemarle quadrangle, North Carolina. *North Carolina Department of Conservation and Development, Division of Mineral Resources, Bulletin 75.*

Cooper, P.P, II, and C. Hanchette
1977 *An Historic and Prehistoric Archaeological Resources Survey of a Certain 5500 Acres of the Uwharrie National Forest*. Report Submitted to USDA Forest Service, Asheville. Copies available from USDA Forest Service, Asheville.

Cooper, P.P, II, and C. Norville
1978 *An Historic and Prehistoric Archaeological Resources Survey of a Certain 4875 Acres of the Uwharrie National Forest*. Report Submitted to USDA National Forests in North Carolina, Asheville. Copies available from USDA Forest Service, Asheville.

Crabtree, D.E.
1972 *An Introduction to Flintworking*. Occasional Papers of the Idaho State Museum No. 28, Pocatello.

Daniel, I. R., Jr.
1986 An Analysis of Unifacial Stone Tools From the Hardaway Site, North Carolina. *Southern Indian Studies* Volume XXXV.

Daniel, I. R., Jr., and M. Wisenbaker
1987 *Harney Flats: A Florida Paleo-Indian Site*. Baywood, New York.

Davis, R. P., Jr., and I. R. Daniel, Jr.
1990 *The Classification of Projectile Points in Collections from North Carolina*. Report prepared under a Survey and Planning Grant from the Unites States Department of the Interior and administered by the North Carolina Division of Archives and History. Copies available from the Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

Delcourt, H. R., and P. A. Delcourt
1985 Quaternary Palynology and Vegetational History of the Southeastern United States. In *Pollen Records of Late-Quaternary North American Sediments*, edited by V.M. Bryant and R. G. Holloway, pp. 123-166. Plenum, New York.

Delcourt, P. A., and H. R. Delcourt
1981 Vegetation Maps for Eastern North America: 40,000 years B.P. to Present. In *Geobotany*, edited by R. Romans, pp. 123-166. Plenum, New York.

1983 Late-Quaternary Vegetational Dynamics and Community Stability Reconsidered. *Quaternary Research* 19:265-271.

1984 Late Quaternary Paleoclimates and Biotic Responses in Eastern North America and the Western North Atlantic Ocean. In *Palaeogeography, Palaeoclimatology, Palaeoecology* 48:263-284.

Dibble, H. L.
1984 Interpreting Typological Variation of Middle Paleolithic Scrapers: Function, Style, or Sequence of Reduction? *Journal of Field Archaeology* 11:431-436.

1985 Technological Aspects of Flake Variation. *American Archaeology* 5:236-240.

1987 Reduction Sequences in the Manufacture of Mousterian Implements of France. In *The Pleistocene Old World: Regional Perspectives*, edited by O. Soffer, pp.33-45. Academic Press, New York.

1987 The Interpretation of Middle Paleolithic Scraper Morphology. *American Antiquity* 52:109-117.

Dibble, H. L., and J. Whittaker
1981 New Experimental Evidence on the Relation Between Percussion Flaking Flake Variation. *Journal of Archaeological Science* 6:283-296.

Dover, R.A., Jr.
1985 *Geology and Geochemistry of Silicified Rhyolites on Lick Mountain, Montgomery County, North Carolina*. Unpublished Masters thesis, Department of Geology, University of North Carolina, Chapel Hill.

Dragoo, D.
1976 Some Aspects of Eastern North America Prehistory: A Review 1975.*American Antiquity* 41:3-27.

Ensor, H. B.
1985 The Joe Powell Site (1Pi38): A Dalton Manifestation on the Alabama Gulf Coastal Plain. *Journal of Alabama Archaeology* 31(1):1-47.

1986 San Patrice and Dalton Affinities on the Central and Western Gulf Coastal Plain. *Bulletin of the Texas Archeological Society* 57:69-81.

Ellis, C. J., and D. B. Deller
1988 Some Distinctive Paleo-Indian Tool Types from the Lower Great Lakes Region. *Midcontinental Journal of Archaeology* 13:111-158.

Flenniken, J. J., and A. W. Raymond
1986 Morphological Projectile Point Typology: Replication Experimentation and Technological Analysis. *American Antiquity* 51:603-614.

Gardner, W. M.
1974 *The Flint Run Paleo-Indian Complex:A Preliminary Report 1971 through 1973 Seasons*. Occasional Paper No. 1 Archaeology, Catholic University of America, Washington, D.C.

1977 Flint Run Paleo-Indian Complex and its Implications for Eastern North America Prehistory. *Annals of the New York Academy of Sciences* 288:251-263.

1983 Stop Me If You've Heard This One Before: The Flint Run PaleoIndian Complex Revisited. *Archaeology of Eastern North America* 11:49-59.

1989 An Examination of Cultural Change in the Late Pleistocene. In *Paleoindian Research in Virginia: A Synthesis*, edited by J. M. Wittkofski and T. R. Reinhart, pp.5-51. Special Publication No. 19 of the Archaeological Society of Virginia.

Geiger, C. L., and T. Brown
1983 Waller Hafted Scraper Knives from Southeast Mississippi. *Mississippi Archaeology* 18:3-14.

Goad, S. I.
1979 *Chert Resources in Georgia: Archaeological and Geological Perspectives*. University of Georgia Laboratory of Archaeology Series, Report 21.

Goodyear, A. C.
1973 Archaic Hafted Spokeshaves with Graver Spurs from the Southeast. *Florida Anthropologist* 26:39-44.

1974 *The Brand Site:A Techno-Functional Study of a Dalton Site in Northeast Arkansas*. Arkansas Archaeological Survey Research Series No. 7.

1979 *A Hypothesis for the Use of Cryptocrystalline Raw Materials Among Paleo-Indian Groups of North America*. Research Manuscript Series No. 156, Institute of Archaeology and Anthropology, University of South Carolina.

1982 The Chronological Position of the Dalton Horizon in the Southeastern United States. *American Antiquity*47:382-395.

1991 The Early Holocene Occupation of the Southeastern United States: A Geoarchaeological Summary. In *Ice Age Peoples of North America,* edited by R. Bonnichsen, G. C. Frison, and K. Turnmire, Center for the Study of the First Americans, Orono, Maine, in press.

1993 Tool Kit Entropy and Bipolar Reduction: A Study of Interassemblage Lithic Variability Among Paleo-Indian Sites in the Northeastern United States. *North American Archaeologist* 14:1-23.

Goodyear, A. C., and T. Charles
1984 An Archeological Survey of Chert Quarries in Western Allendale County, South Carolina. *Research Manuscript Series No. 195, Institute of Archaeology and Anthropology, University of South Carolina.*

Goodyear, A. C., J. H. House and N. W. Ackerly
1979 Laurens-Anderson:An Archaeological Study of the Interriverine Piedmont. *University of South Carolina, Institute of Archaeology and Anthropology, Anthropological Papers 4.*

Goodyear, A. C., J. L. Michie and T. Charles
1989 The Earliest South Carolinians. In *Studies in South Carolina Archaeology: Essays in Honor of Robert L. Stephenson,* edited by A. C. Goodyear and G. T. Hanson, pp.19-52. South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Anthropological Studies 9.

Goodyear, A. C.; S. B. Upchurch, M. J. Brooks, and N. N. Goodyear
1983 Paleo-Indian Manifestations in the Tampa Bay Region, Florida. *The Florida Anthropologist* 36:40-66.

Gould, R. A.
1980 *Living Archaeology.* Cambridge University Press.

Griffin, J. F.
1974 *Investigations in Russell Cave*. Publications in Archaeology, National Park Service 13.

Gramly, R. M.
1982 *The Vail Site: A Palaeo-Indian Encammpment in Maine*. Bulletin of the Buffalo Society of Natural Sciences, Vol. 30, Buffalo, New York.

Gregg, S. A., K. W. Kintigh, and R. Whallon
1991 Linking Ethnoarchaeological Interpretation and Archaeological Data: The Sensitivity of Spatial Analytical Methods to Postdepositional Disturbance, In *The Interpretation of Archaeological Spatial Patterning,* edited by E. M. Kroll and T. D. Price, pp.149-196. Plenum Press, New York.

Grimes, J., W. Eldridge, B. Grimes, A. Vaccaro, F. Vaccaro, J. Vaccaro, N. Vaccaro and N. Orsini
1984 Bull Brook II. *Archaeology of Eastern North America* 12:159-183.

Hall, Linda G.
1983 *Variability Among Unifacial Tools From the Hardaway Site*. Unpublished Master's Thesis, Department of Anthropology, The University of North Carolina at Chapel Hill.

Hargrove, T.
1989 *An Archaeological Survey in Morrow Mountain State Park, Stanly County, North Carolina*. Archaeological Research Consultants, Inc., Raleigh, NC. Submitted to the North Carolina Division of Parks and Recreation. Copies available from North Carolina Division of Parks and Recreation, Raleigh.

Harmon, M. A., and R.J. Snedeker
1988 Cultural resources survey for the proposed Center Church Timber Sale, compartment 10. Submitted to USDA National Forests in North Carolina, Asheville.

Harris C. W. and L. Glover III
1988 The Regional Extent of the ca. 600 Ma Virgilina Deformation: Implications for Stratigraphic Correlation in the Carolina Terrane. *Geologic Society of America Bulletin* 100:200-217.

Hayden, B. G.
1980 Confusion in the Bipolar World: Bashed Pebbles and Splintered Pieces. *Lithic Technology* 9:2-7.

1979 Snap, Shatter and Superfractures: Use-Wear of Stone Skin Scrapers. In *Lithic Use-Wear Analysis*, edited by B. Hayden, pp. 207-229. Academic Press, New York.

Hietala, H. (editor)
1984 *Intrasite Spatial Analysis in Archaeology*. Cambridge University Press.

Hodder, I.
1982 Toward a Contextual Approach to Prehistoric Exchange, In *Contexts for Prehistoric Exchange,* edited by J. E. Ericson and T. K. Earle, pp. 199-211. Academic Press, New York.

Hodder, I., and C. Orton
1976 *Spatial Analysis in Archaeology.* Cambridge University Press.

House, J.H. and D.L. Ballenger
1976 *An Archaeological Survey of the Interstate 77 Route in the South Carolina Piedmont*. Institute of Archaeology and Anthropology, University of South Carolina, Research Manuscript Series 104.

House, J.H. and R.W. Wogaman
1978 *Windy Ridge, A Prehistoric Site in the Inter-riverine Piedmont in South Carolina*, Anthropological Studies, Series 3.

Johnson, J. K.
Yellow Creek Archaeological Project: Volume 2. Archaeological Papers of the Center for Archaeological Research Number 1, University of Mississippi. University, Mississippi.

Keeley, L. E.
1980 *Experimental Determination of Stone Tool Uses* University of Chicago Press, Chicago.

1982 Hafting and Retooling: Effects on the Archaeological Record. *American Antiquity* 47:798-809.

1991 Tool Use and Spatial Patterning: Complications and Solutions, In *The Interpretation of Archaeological Spatial Patterning,* edited by E. M. Kroll and T. D. Price, pp.257-268. Plenum Press, New York.

Kelly, R. L.
1983 Hunter-Gatherer Mobility Strategies. *Journal of Anthropological Research* 39:277-306.

1988 The Three Sides of a Biface. *American Antiquity* 53:717-734.

Kent, S. (editor)
1987 *Method and Theory for Activity Area Research: An Ethnoarchaeological Approach*. Columbia University Press, New York.

Kesel, R. H.
1974 Inselbergs on the Piedmont of Virginia, North Carolina, and South Carolina: Types and Characteristics. *Southeastern Geology* 16:1-30.

Kimball, L.
1981 *An Analysis of Residential Camp Site Structure for Two Early Archaic Assemblages from Rose Island (40MR44), Tennessee*. Unpublished Master's thesis, Department of Anthropology, University of Tennessee, Knoxville.

1982 Lithic Artifact Analysis. In *An Archaeological Survey of Aboriginal Settlement Within the Lower Little Tennessee River Valley*, edited by R.P.S. Davis, Jr., L.R. Kimball, and W.W. Baden, pp. 120-252. Submitted to the Tennessee Valley Authority. Copies available from the Department of Anthropology, University of Tennessee, Knoxville.

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

Kintigh, K.
1984 Measuring Archaeological Diversity by Comparison with Simulated Assemblages. *American Antiquity* 49:44-54.

1991 *Tools for Quantitative Archaeology.* Tempe, Arizona.

Kintigh, K. W., and A. Ammmerman
1982 Heuristic Approaches to Spatial Analysis in Archaeology. *American Antiquity* 47:31-63.

Kroll E. M., and T. D. Price (editors)
1991 *The Interpretation of Archaeological Spatial Patterning*. Plenum Press.

Kuhn, S. L.
1990 A Geometric Index of Reduction for Unifacial Stone Tools. *Journal of Archaeological Science* 17:583-593.

1991 "Unpacking" Reduction: Lithic Raw Material Economy in the Mousterian of West-Central Italy. *Journal of Anthropological Archaeology* 10:76-106.

Lothrop, J. C.
1988 *The Organization of Paleoindian Lithic Technology at the Potts Site*. Ph.D. Dissertation, Department of Anthropology. State University of New York, Binghamton, New York. University Microfilms Inc., Ann Arbor.

Lothrop, J. C., and R. M. Gramly
1982 *Pièces Esquillées* from the Vail Site. *Archaeology of Eastern North America* 10:1-22.

MacDonald, G. F.
1968 *Debert: A Palaeo-Indian Site in Central Nova Scotia*. National Museum of Man, Anthropology Papers, No. 16.

Meltzer, D. J.
1989 Was Stone Exchanged Among Eastern North American Paleoindians? In *Eastern Paleoindian Lithic Resource Use*, edited by C.J. Ellis and J.C. Lothrop, pp. 11-39. Westview Press, Boulder.

Meltzer, D. J., and B.D. Smith
1986 Paleo-Indian and Early archaic Subsistence Strategies in Eastern North America. In *Foraging, Collecting, and Harvesting: Archaic Period Subsistence and Settlement in the Eastern Woodlands*, edited by S. Neusius, pp. 1-30. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

McGill, R. Tukey, J. W. and W. A. Larsen
1978 Variation of Box Plots. *The American Statistician* 32:12-16.

Michie, J. L.
1966 The Taylor Point. *The Chesopiean* 6:30-31.

1992 The Taylor Site: An Early Occupation in Central South Carolina. In *Paleoindian and Early Archaic Research in the Lower Southeast: A South Carolina Perspective,* edited by D. G. Anderson, K. E. Sassaman, and C. Judge, pp.208-241. Council of South Carolina Professional Archaeologists, Columbia.

Milton, D. J.
1984 Revision of the Albemarle Group, North Carolina. *U. S. Geological Survey Bulletin* 1537:A69-A72.

Moore, D.
1977 Original unpublished field notes from the Hardaway site excavations. Ms. on file, Research Laboratories of Anthropology, The University of North Carolina at Chapel Hill.

Morse, D. F., Jr.
1971 Recent Indications of Dalton Settlement Pattern in Northeast Arkansas. *Southeastern Archaeological Conference Bulletin* 13:5-10.

1973 Dalton Culture in Northeast Arkansas. *The Florida Anthropologist*26:23-28.

1975a Reply to Schiffer. In *The Cache River Archaeological Project: An Experiment in Contract Archaeology*, assembled by M.B. Schiffer and J.M. House, Arkansas Archaeological Survey Research Series 8:113-119.

1975b Paleo Indian in the Land of Opportunity: Preliminary Report on the Excavations at the Sloan Site (3GE94). In *The Cache River Archaeological Project: An Experiment in Contract Archaeology*, assembled by M.B. Schiffer and J.M. House, Arkansas Archaeological Survey Research Series 8:135-141.

1977 Dalton Settlement Systems:Reply to Schiffer (2). *Plains Anthropologist* 22:149-158.

Morse, D. F., Jr., and A. C. Goodyear
1973 The Significance of the Dalton Adze in Northeast Arkansas. *Plains Anthropologist* 18:316-322.

Morse, D. F., Jr., and P. A. Morse
1983 *Archaeology of the Central Mississippi Valley.* Academic Press, New York.

Movius, H. L., D. C. Nicholas, H. M. Bricker, and R. B. Clay
1968 *The Analysis of Certain Major Classes of Upper Paleolithic Tools.* American School of Prehistoric Research, Bulletin No. 26. Peabody Museum, Harvard University, Cambridge.

Muto, G.
1971 A Stage Analysis of the Manufacture of Stone Tools. In *Great Basin Anthropology Conference 1970: Selected Papers*, pp. 109-118, University of Oregon Anthropology.

North Carolina Geological Survey
1985 Geologic map of North Carolina, North Carolina Geologic Survey.

Novick, L. A.
1978 Prehistoric Lithic Material Sources and Types in South Carolina: A Preliminary Statement. *South Carolina Antiquities* 10:23-38.

O'Connell, J. F.
1987 Alyawara Site Structure and its Archaeological Implications. *American Antiquity* 52:74-108.

O'Connell, J. F., K. Hawkes, and N. B. Jones
1991 Distribution of Refuse-Producing Activities at Hadza Residential Base Camps: Implications for Analyses of Archaeological Site Structure. In *The Interpretation of Archaeological Spatial Patterning,* edited by E. M. Kroll and T. D. Price, pp.61-76. Plenum Press, New York.

O'Dell, G. H.
1981 The Morphological Express at Function Junction: Searching for Meaning in Lithic Tool Types. *Journal of Anthropological Research* 37:319-343.

Oliver, B. L.
1985 Tradition and Typology: Basic Elements of the Carolina Projectile Point Sequence. In *Structure and Process in Southeastern Archaeology*, edited by R. S. Dickens and H. T. Ward, pp.195-211. University of Alabama Press.

Overstreet, W.C., and H. Bell III
1965 The Crystalline Rocks of South Carolina. *U.S. Geological Survey Bulletin* 1183.

O'Steen, L. D.
1983 *Early Archaic Settlement Patterns in the Wallace Reservoir: An Inner Piedmont Perspective*. Unpublished Master's Thesis, Department of Anthropology, The University of Georgia, Athens.

1992 Paleoindian and Early Archaic Settlement Along the Oconee Drainage. In *Paleoindian and Early Archaic Research in the Lower Southeast: A South Carolina Perspective,* edited by D. G. Anderson, K. E. Sassaman, and C. Judge, pp.78-95. Council of South Carolina Professional Archaeologists, Columbia.

Parry, W. J., and R. L. Kelly
1987 Expedient Core Technology and Sedentism. In *The Organization of Core Technology*, edited by J. K. Johnson and C. A. Morrow, pp.285-304. Westview Press, Boulder.

Perkinson, P. H.
1971 North Carolina Fluted Projectile Points--Survey Report Number One. *Southern Indian Studies* 23:3-40.

1973 North Carolina Fluted Projectile Points--Survey Report Number Two. *Southern Indian Studies* 25:3-60.

Phelps, D.
1958 Original unpublished field notes from the Hardaway site excavations. Ms. on file, Research Laboratories of Anthropology, The University of North Carolina at Chapel Hill.

1959 Original unpublished field notes from the Hardaway site excavations. Ms. on file, Research Laboratories of Anthropology, The University of North Carolina at Chapel Hill.

Price, J. E., and J. J. Krakker
1975 Dalton Occupations of the Ozark Border. *Museum Briefs No.20.* University of Missouri, Columbia.

Purdy, B. A.
1981 *Florida's Prehistoric Stone Technology*. University of Florida Press, Gainesville.

Renfrew, C.
1972 *The Emergence of Civilization*. London, Methuen.

1975 Trade as Action at a Distance: Questions of Interaction and Communication. In *Ancient Civilization and Trade*, edited by C. C. Lamberg-Karlousky, pp.3-60. University of New Mexico Press, Albuquerque.

1977 Alternate Models for Exchange and Spatial Distribution, In *Exchange Systems in Prehistory*, edited by T. Earle and J. Ericson, pp.71-90 Academic Press, New York.

Sassaman, K. E.
1992 Early Archaic Settlement in the South Carolina Coastal Plain. In *Paleoindian and Early Archaic Research in the Lower Southeast: A South Carolina Perspective,* edited by D. G. Anderson, K. E. Sassaman, and C. Judge, pp.48-67. Council of South Carolina Professional Archaeologists, Columbia.

Sassaman, K. E., G. T. Hanson, and T. Charles
1988 Raw Material Procurement and the Reduction of Hunter-Gatherer Range in the Savannah River Valley. *Southeastern Archaeological Bulletin* 7:79-94.

Schiffer, M. B.
1975a An Alternative of Morse's Dalton Settlement Hypothesis. *Plains Anthropologist* 20. 253-266.

1975b Some Further Comments on the Dalton Settlement Pattern Hypothesis. In *The Cache River Archaeological Project: An Experiment in Contract Archaeology*, assembled by M.B. Schiffer and J.M. House, Arkansas Archaeological Survey Research Series 8:103-111.

Semenov, S. A.
1964 *Prehistoric Technology*. Translated by M. W. Thompson. Barnes and Noble, New York.

Seiders, V. M.
1981 *Geologic Map of the Asheboro, North Carolina and Adjacent Areas.* U. S. Geological Survey, Map I-1314.

Shafer, H. J.
1970 Notes on Uniface Retouch Technology. *American Antiquity*. 35:480-487.

Shott, M. J.
1989a On Tool-Class Use Lives and the Formation of Archaeological Assemblages. *American Antiquity* 54:9-30.

1989b Technological Organization in Great Lakes Paleoindian Assemblages. In *Eastern Paleoindian Lithic Resource Use*, edited by C. J. Ellis and J. C. Lothrop, pp.221-237. Westview Press, Boulder.

1989c Bipolar Industries: Ethnographic Evidence and Archaeological Implications. *North American Archaeologist* 10:1-24.

Smith, B. D.
1986 The Archaeology of the Southeastern United States, from Dalton to Desoto (10.500 B.P. - 500 B.P.). In *Advances In World Archaeology Volume 5*, edited by Fred Wendorf and Angela E. Close. Orlando: Academic Press.

Speth, J.
1972 The Mechanical Basis of Percussion Flaking. *American Antiquity* 37:34-60.

1975 Miscellaneous Studies in Hard-Hammer Percussion Flaking: The Effects of Oblique Impact. *American Antiquity* 40:203-207.

1981 The role of Platform Angle and Core Size in Hard-Hammer Percussion Flaking. *Lithic Technology* 10:16-21.

Steponaitis, V. P.
1986 Prehistoric Archaeology in the Southeastern United States, 1970-1985. *Annual Review of Anthropology* 15:363-404.

Stoltman, J. B.
1978 Temporal Models in Prehistory: An Example from Eastern North America. *Current Anthropology* 19:703-746.

Stromquist, A. A., Choquette, P. W., and W. W. Sundelius
1971 *Geologic Map of the Denton Quadrangle, Central North Carolina.* U. S. Geological Survey, Map GQ-872.

Stuckey, J. L.
1965 *North Carolina:Its Geology and Mineral Resources*. Dept. of Conservation and Development, Raleigh.

Thomas, D. H.
1982 *The Archaeology of Monitor Valley: 2. Gatecliff Shelter*. Anthropological Papers Vol. 59, Pt. 1. American Museum of Natural History, New York.

Tippitt, V. A., and I. R. Daniel, Jr.
1987 Lithic Artifacts from the Fredricks, Wall, and Mitchum Sites. *In The Siouan Project: Seasons I and II*, edited by R. S. Dickens, Jr., H. T. Ward, and R. P. S. Davis, Jr., pp.217-236. Research Laboratories, University of North Carolina, Monograph Series No. 1, Chapel Hill.

Tippitt, V. A., and W.H. Marquardt
1984 *The Gregg Shoals and Clyde Gulley Sites: Archaeological and Geological Investigations at Two Piedmont Sites on the Savannah River*. Archaeological Services Branch, National Park Service, Russell Papers. Atlanta.

Tukey, J.
1977 *Exploratory Data Analysis*. Addison-Wesley, Reading, Massachusetts.

Upchurch, C. N.
1968 *The Geology of the Southwest quarter of the Troy Quadrangle, North Carolina*. Unpublished Masters thesis, Department of Geology, University of North Carolina, Chapel Hill.

Upchurch, S.
1984 Petrology of Selected Lithic Materials from the South Carolina Coastal Plain. In *An Archeological Survey of Chert Quarries in Western Allendale County, South Carolina*. Research Manuscript Series No. 195, Institute of Archaeology and Anthropology, University of South Carolina.

Upchurch, S. B,, R. N. Strom, and M. G. Nuckels
1981 *Methods of Provenance Determination of Florida Cherts*. Report on file with the Florida Bureau of Historic Sites and Properties, Florida.

Velleman, P. F., and D. C. Hoaglin
1981 *Applications, Basics, and Computing of Exploratory Data Analysis*. Doxbury Press, Boston.

Waller, B. I.
1971 Hafted Flake Knives. *Florida Anthropologist* 24:173-174.

Walling, R., I. R. Daniel, Jr., and N. J. Metzger
1992 *An Intensive Cultural Resource Survey Within Compartments 8, 12, 38, and 39, Uwharrie Ranger District, Uwharrie National Forest, Montgomery and Randolph Counties, North Carolina*. Panamerican Consultants, Inc.. Submitted to USDA Forest Service, Asheville. Copies available from Panamerican Inc., Tuscaloosa, Alabama.

Ward, H. T.
1975 Original unpublished field notes from the Hardaway site excavations. Ms. on file, Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

1976 Original unpublished field notes from the Hardaway site excavations. Ms. on file, Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

1977 Original unpublished field notes from the Hardaway site excavations. Ms. on file, Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

1979 Original unpublished field notes from the Hardaway site excavations. Ms. on file, Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

1980 Original unpublished field notes from the Hardaway site excavations. Ms. on file, Research Laboratories of Anthropology, University of North Carolina, Chapel Hill.

1983 A review of Archaeology in the North Carolina Piedmont: A Study of Change. In *Prehistory of North Carolina: An Archaeological Symposium,* edited by M. A. Mathis and J. A.Crow, pp.53-81. North Carolina Division of Archives and History, Department of Cultural Resources.

Watson, J. B., and M. A. Mathis
1983 National Register of Historic Places Inventory-Nomination Form. Nomination form for the Hardaway site. Manuscript on file, Archaeology Branch, North Carolina Division of Archives and History, Raleigh.

Webb, C. H.
1946 Two Unusual Types of Chipped Stone Artifacts From Northwest Louisiana. *Bulletin of the Texas Archeological and Paleontological Society* 17:9-17.

Webb, C. H., J. L. Shiner, and E. W. Roberts
1971 The John Pearce Site (16CD56): A San Patrice Site in Caddo Parish, Louisiana. *Bulletin of the Texas Archaeological Society*. 42:1-49.

Whallon, R.
1984 Unconstrained Clustering for the Analysis of Spatial Distributions in Archaeology. In *Intrasite Spatial Analysis in Archaeology,* edited by H. Hietala, pp.242-277. Cambridge University Press, Cambridge.

Williams, B. J.
1874 A Model of Band Society. *Memoirs of the Society for American Archaeology* No. 29.

Wilmsen, E.
1970 *Lithic Analysis and Cultural Inference: A Paleo-Indian Case*. Anthropological Papers #16, University of Arizona, Tuscon.

Wise, S., Jr., M. Ausburn, D. Textoris, W. Wheller, R. Daniels, E. Gamble
1981 Lithologic Characterisitics and Diagensis of Some Siliceous Coastal Plain Rocks. *Scanning Electron Microscopy* 1:577-584.

Wogaman, R. W., J. H. House, and A. C. Goodyear
1976 *An Archaeological Reconnaissance of the Four Proposed Twelfth Street Extension Routes, Lexington County, South Carolina.* Research Manuscript Series 106, Institute of Archaeology and Anthropology, University of South Carolina, Columbia.

Yellen, J. E.
1977 *Archaeological Approaches to the Present.* Academic Press, New York.

Appendix A

RHYOLITE SOURCES IN THE UWHARRIE MOUNTAINS, CENTRAL NORTH CAROLINA

by

I. Randolph Daniel, Jr. and J. Robert Butler

An initial examination of the Hardaway assemblage indicated that metavolcanic stone, primarily a rhyolitic flow, dominated raw material types. Moreover, given the density of stone debris in the assemblage, and our review of the previous geological and archaeological work (see below) done in the area, it seemed likely that the source or sources of this rhyolite would be relatively close to Hardaway. Thus, the objectives of this survey were to investigate the rhyolite outcrops and quarries known to exist in the area, locate any potentially unrecorded quarries, and gather data sufficient to determine whether any of these locations were the sources of stone seen in the Hardaway assemblage.

Rhyolite is a very fine-grained igneous rock that is composed mainly of quartz and feldspar, with minor amounts of accessory minerals such as biotite, hornblende, and iron oxides. Rhyolites are formed in a volcanic environment, either at or near the surface of the earth. Rhyolite is commonly porphyritic; that is, it has larger crystals (phenocrysts) in an aphanitic groundmass. Aphanitic refers to a grain size in which the crystals are too small to be seen with an unaided eye. We use the term *sugary* to refer to a rhyolite groundmass that is a fine-grained granular aggregate, slightly coarser than the usual aphanitic groundmass. In the Uwharrie Mountains, the phenocrysts in rhyolite are typically quartz and/or feldspar, 1 to 3 mm long, in a dark groundmass that is microcrystalline or cryptocrystalline. Aphyric rhyolite, which lacks phenocrysts and is entirely aphanitic, is rare in the Uwharrie Mountains.

SURVEY OBJECTIVES AND METHODS

The survey strategy was fairly straightforward: rhyolite outcrops in the vicinity of Hardaway were identified using current geologic maps and then field checked for quarrying activity. The Hardaway site is located on the Albemarle 15-minute quadrangle, which was geologically mapped by Conley (1962). Our fieldwork was concentrated here where many large areas of rhyolite were mapped around Hardaway in the Uwharrie Mountains. Most of the rest of the Uwharries were mapped by Stromquist et al. (1971) and Seiders (1981). Burt (1967), Upchurch (1968), and Dover (1985) mapped smaller areas in the Uwharries.

All known rhyolite quarries in the area were also visited. Archaeological surveys in the vicinity of Hardaway included work in Morrow Mountain State Park (Hargrove 1989) and just across the river in the Uwharrie National Forest (Cooper and Hanchette 1977; Cooper and Norville 1978; Harmon and Snedeker 1988). This work recorded several quarries which we revisited in order to gather the data needed for this project.

Similarly, both professional and amateur archaeologists who were familiar with archaeological sites in the Uwharrie region were also interviewed. These informants included several members of the Uwharrie Archaeological Society who were particularly helpful in identifying a second area for survey near Asheboro.

The survey was conducted by the two authors in a truck and on foot, over a total of 20 days primarily during the winter and spring months of 1990 and 1991. Specific areas surveyed are described below. All information from the survey including fieldnotes, site location maps, and photographs are on file in the Research Laboratories of Anthropology and the Department of Geology at The University of

North Carolina at Chapel Hill. These data also include an extensive raw materials type collection housed in both locations.

Given the geological maps and dormant undergrowth, outcrops were fairly easy to locate. When an outcrop was encountered, rhyolite samples were collected for further analysis and a brief field description of its lithic characteristics were made. The objective here was to assess the variability exhibited by the stone archaeologists call "rhyolite" to see if the creation of different types was warranted.

If an outcrop was also utilized as a quarry, information on site size and degree of utilization as well as stone type was obtained. Usually vegetation was sparse enough that site size could be roughly estimated based on the stone remains present on the surface, although these estimates remain to be verified by more systematic survey. In some instances, however, surface remains of quarry debris was virtually continuous on mountain tops (e.g., Morrow Mountain) and no attempt was made to bound the site except by its geologic unit.

Although no subsurface testing was performed, an idea of site depth could be obtained at some locations from tree falls which uprooted lithic material. These were fairly common in the surveyed areas around Hardaway due to the recent (1988) winds of Hurricane Hugo. Specific instances of these occurrences are discussed below. A few flakes, and in some instances crude bifaces, were collected from each quarry but no attempt was made to collect systematically. No temporally diagnostic artifacts were observed at any of the sites.

In addition, we also surveyed (and collected rock samples from) outcrops that were not used prehistorically but are important to understanding the area's geology. Moreover, these samples helped differentiate the rhyolite that was used prehistorically from other similar stone in the area as well as indicating where quarries were not located.

The results of our survey are discussed below. The southern Uwharrie area, containing most of the sources used by the inhabitants of Hardawày is described first. This discussion is followed by a description of the sources located in the northern Uwharries.

THE SOUTHERN UWHARRIES: RHYOLITE TYPES AND SITE DESCRIPTIONS

We began our survey by examining outcrops in the immediate vicinity of the Hardaway site. This was done to familiarize ourselves with the local geology and to evaluate if Conley's (1962) geologic map of the Albemarle region (including the southern Uwharrie's) adequately showed the locations of rhyolite exposures in the area. We checked contacts of geologic units where they were best exposed along the Yadkin River south of the Hardaway site and at spot locations throughout the area. We found only minor discrepancies in locations of the contacts, and no significant problems with the designations of lithologic units on the maps. Massive rhyolite suitable for flaking was found almost exclusively in the map unit with the symbol *ur* and described as "rhyolite and porphyritic rhyolite containing prominent flow-banding" (Conley 1962). This unit also correlated with the location of previously recorded quarries. None of the rhyolite mapped by Burt (1967) and Dover (1985) in parts of the Albemarle quadrangle is similar to the raw materials in the Hardaway assemblage and we found no likely quarries in those areas.

Specifically, we examined all major outcrops in the above mapped lithologic unit for evidence of quarrying. The vast majority of this rhyolite occurred in Morrow Mountain State Park in Stanly county, and portions of the Uwharrie National Forest bordering the Yadkin River in Montgomery county; a minor amount of this unit also occurred on The Aluminum Company of America, Badin Works, property just south of the Hardaway site. This resulted in a total of approximately 90 sq km around the Hardaway site being thoroughly driven or walked over. This proved to be a fruitful strategy as approximately 20 quarry sites were located and/or revisited and sampled for petrologic analysis (Figure A.1).

The main Morrow Mountain Rhyolite unit mapped by Conley (1962) can be subdivided into distinct types based on color, grain size, and the presence or abundance of special features such as phenocrysts, flow-banding, and spherulites. In general, this rhyolite exhibits a fine-grained texture that exhibits a gray to grayish black color in fresh specimens. Upon weathering it develops a white chalky outer coating that in some cases reveals a distinct flow-banding.

The most consistent features for characterizing rhyolite types are those that relate to the original magma, such as the nature and abundance of phenocrysts, rather than to features formed during or after magma emplacement. For example, brecciation of lava or development of flow-banding take place during emplacement of a volume of magma, but rhyolite breccia or flow-banded rhyolite still contain the same phenocrysts present in the bulk of the magma. There may be sporadic development of spherulites by devitrification of volcanic glass, or local hydrothermal alteration of rhyolite and formation of disseminated fine-grained pyrite. These are post-magmatic effects that may vary within one rhyolite body. Therefore, we have found that the most useful bases for subdividing this rhyolite are the nature and relative abundance of phenocrysts (or absence of phenocrysts in the aphyric variety). Color is fairly consistent in fresh samples from one rhyolite body, but can vary with incipient weathering.

The presence or absence of phenocrysts correspond to restricted areas of occurrence within the rhyolite unit around Hardaway, usually including one or two mountain tops. Four basic rhyolitic types were identified: 1)aphyric, 2)plagioclase porphyritic, 3)quartz porphyritic, and 4)plagioclase-quartz porphyritic. An additional "miscellaneous" category of stone included sources of rhyolitic breccia, lapilli-

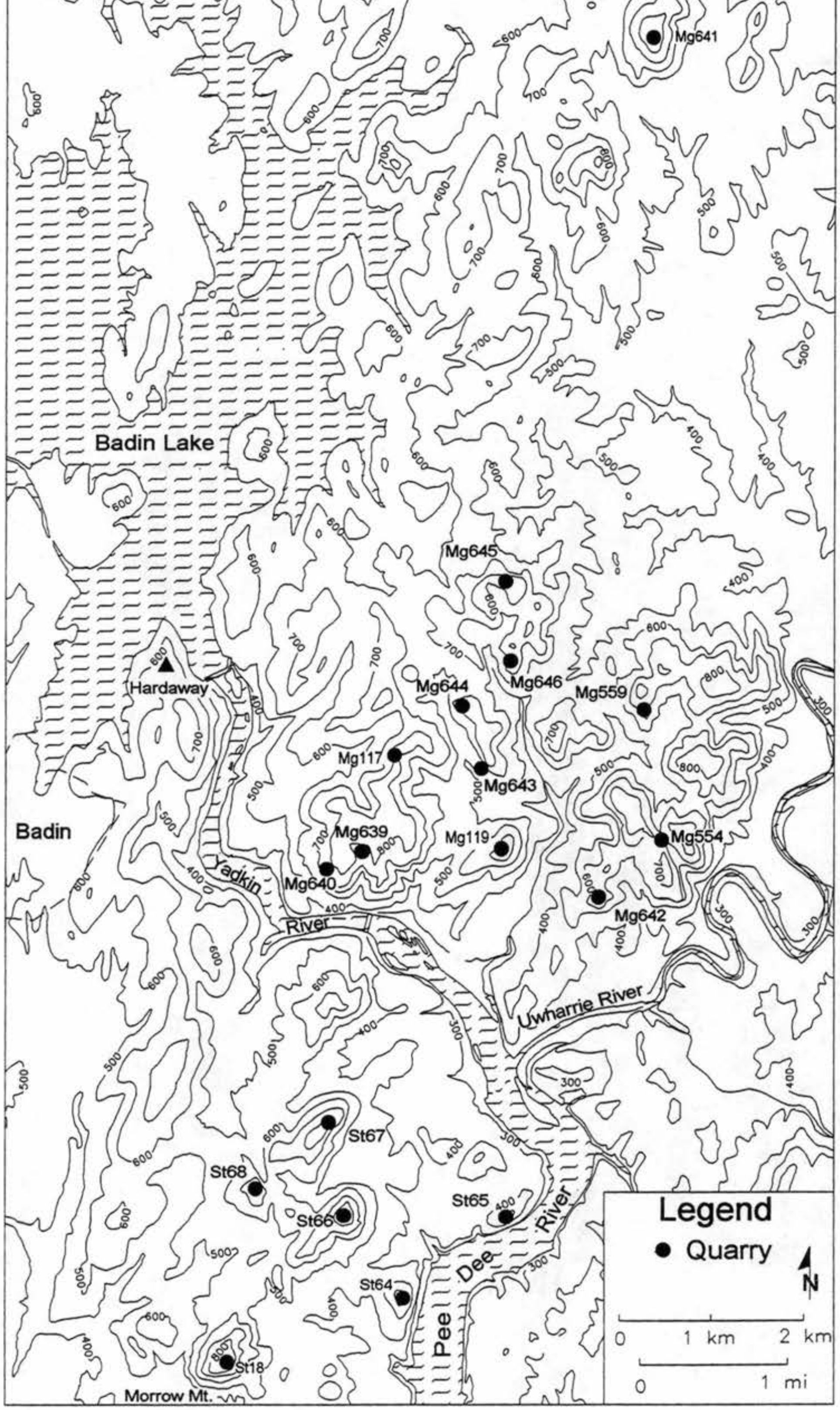


Figure A.1. Quarry locations in the southern Uwharrie Mountains.

stone, and tuff. Virtually all of the prehistoric quarries were located in areas of each of the four rhyolite; only two quarries--both of rhyolitic tuffs--were identified within the area of miscellaneous stone.

Each of the four rhyolite types has been named after the most prominent mountain with which it is associated. A general description of each type and its associated quarries follows.

Morrow Mountain Rhyolite (aphyric rhyolite)

The results of our survey and petrologic analysis indicates that the dark-gray homogeneous rhyolite that is so abundant in the Hardaway assemblage (see Chapter 4) as well as the collections survey (see Chapter 7) was obtained almost exclusively from Morrow Mountain. As discussed below, rhyolite artifacts in the Hardaway assemblage are indistinguishable in both macroscopic and microscopic characteristics from geological samples obtained from Morrow Mountain (Figures A.2-A.4).

Hand Sample Description. This type is a dark gray, aphanitic, aphyric rhyolite, that commonly exhibits flow-banding, especially on slightly weathered surfaces (Figure A.2:c-d). In some fresh rhyolite, however, flow lines are relatively inconspicuous (Figure A.2:a-b). When present, flow lines are generally very thin (i.e., only a few mm) and alternate in a pattern of light and dark gray. Some extremely weathered quarry debris from Morrow Mountain lack discernible flow-banding; these specimens exhibit an extremely chalky grayish-white exterior (Figure A.2:e). Although this rhyolite has a very homogeneous appearance, some specimens exhibit small spherulites (circa 1 mm in diameter) which appear as tiny patches of radiating fibers. These spherulites may occur in the absence of flow-banding (Figure A.3d; Figure A.4:e).

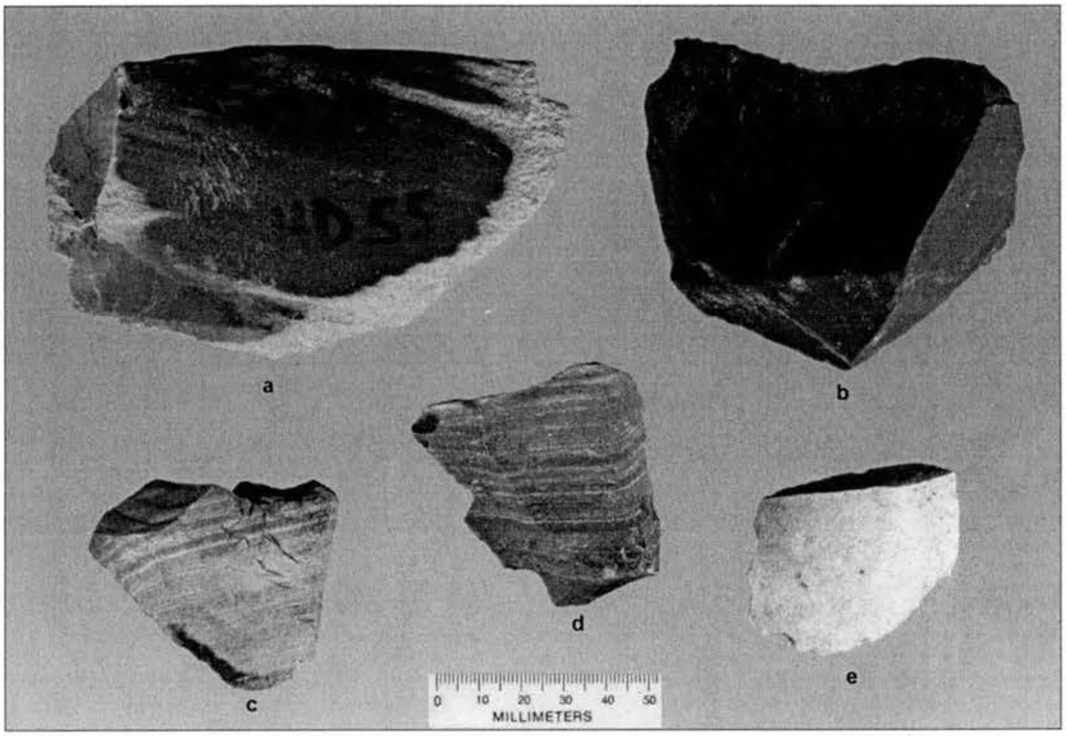


Figure A.2. Aphyric rhyolite from Morrow Mountain: *(a-b)* geological specimens from Morrow Mountain; *(c-e)* artifacts from Morrow Mountain.

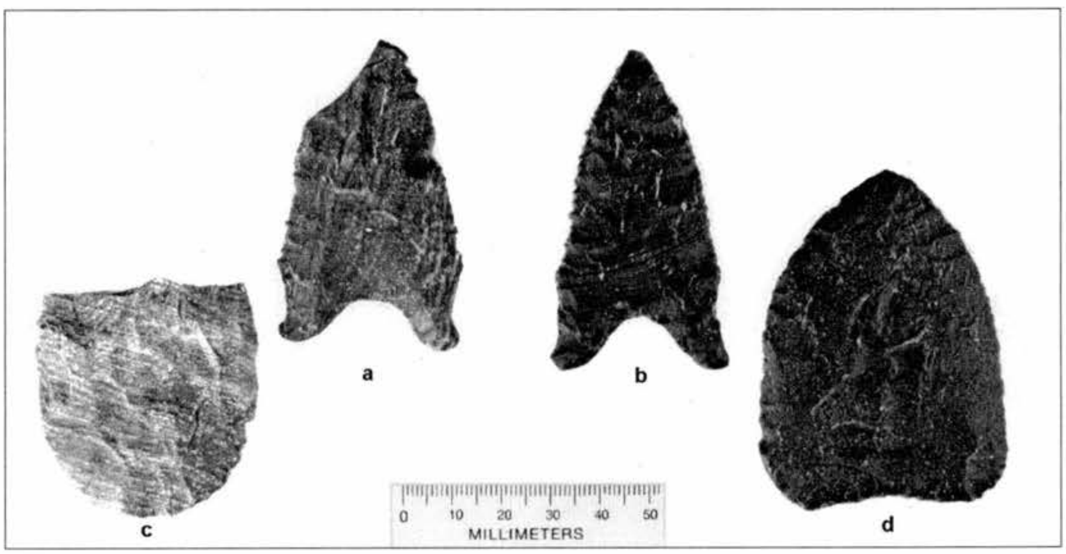


Figure A.3 Aphyric rhyolite artifacts in the Hardaway assemblage: *(a-b)* Hardaway-Dalton points; *(c-d)* Bifaces.

Thin Section Description. The texture is a microcrystalline intergrowth of feldspar and quartz, with minor biotite and chlorite (Figure A.4). The individual minerals are difficult to distinguish. Flow banded samples have distinct layers less than 0.2mm thick (Figure A.4:c). There are strings of dark minerals along some fractures.

Morrow Mountain, St18. Morrow Mountain is clearly the most spectacular quarry identified in the Piedmont (Figure A.5). It was first recorded in the Research Laboratories of Anthropology site files in 1958, although it was apparently known as an archaeological site for many years prior to that. Today, Morrow Mountain is the main feature of the State Park bearing its name. Quarry debris is present virtually everywhere on the mountain. In fact, rhyolite flakes and chunks are so dense that they literally form a pavement covering most of the summit and slopes.

Although Morrow Mountain has been known for decades, it has received little systematic archaeological investigation. Recent investigations included a reconnaissance survey of about 162 ha of Park ground along with some surface collecting and limited excavations on Morrow Mountain (Hargrove 1989). This work indicated that the quarry encompassed the summit and slopes of the mountain as well as about 600 meters of the narrow ridge extending north of the mountain (Hargrove 1989:18).

Despite the limited testing, over 30,000 artifacts were recovered. The assemblage contained mostly quarry debris quarry debris, as well as a few points spanning the Early Archaic through Woodland periods. The subsurface testing on the summit revealed an unstratified, 10 to 20 cm gray loam that was densely packed with artifacts. Below this layer was a culturally sterile red-clay subsoil. This shallow deposit on the mountain top stands in contrast to the deep deposits we observed on the mountain slope described below.

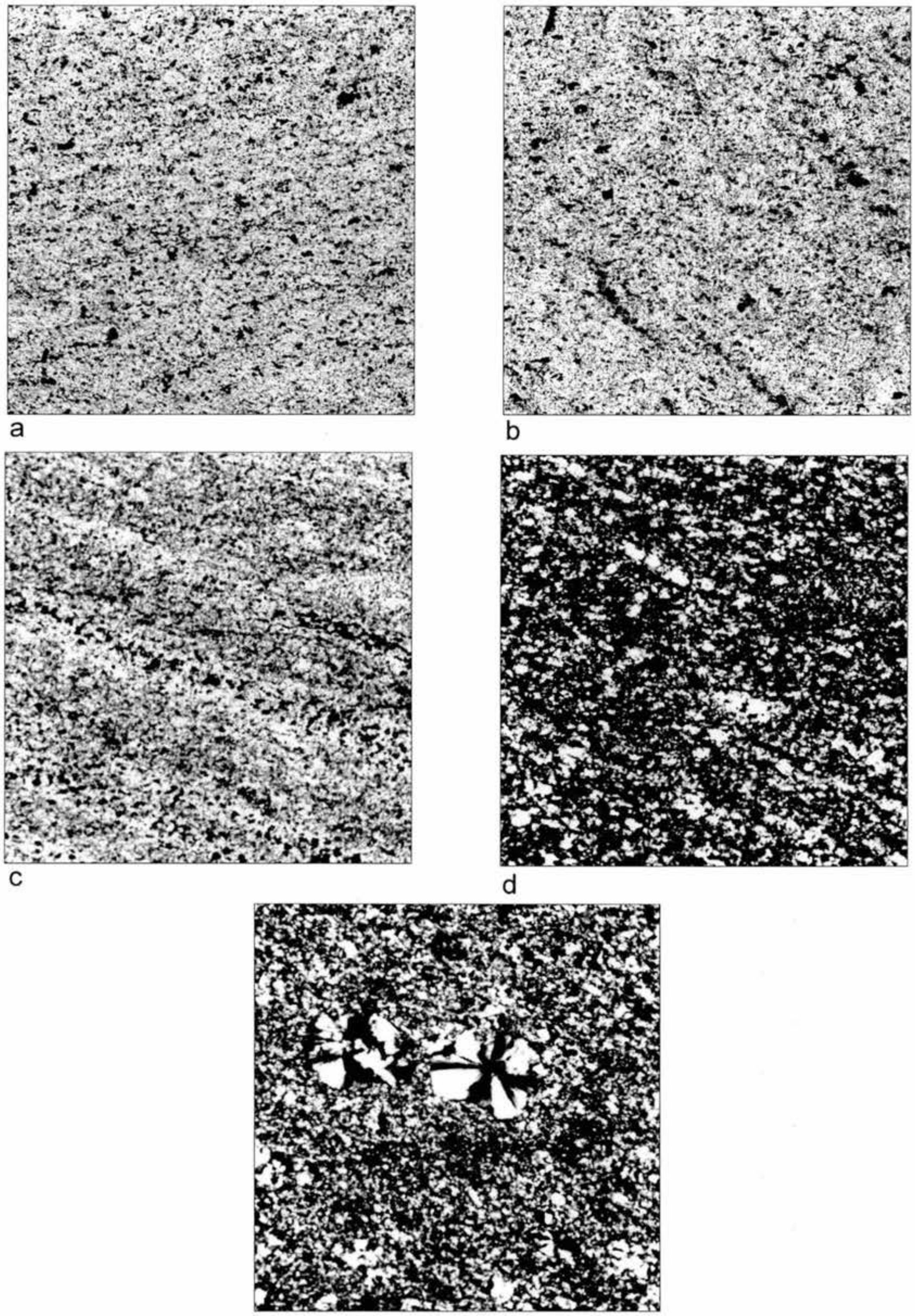


Figure A.4. Photomicrographs of aphyric rhyolite thin sections: *(a)* flake, Hardaway site; *(b)* geological specimen, Morrow Mountain; *(c-d)* flow-banded artifact, Hardaway assemblage; *(e)* spherulite in geological specimen from Morrow Mountain. (Note: *a-c* are plain polarized light, 40x; *d-e* are cross-polarized light, 40x).

Figure A.5. Morrow Mountain (looking southwest).

a b

Figure A.6. Erosional ditch on Morrow Mountain containing quarry debris: *(a)* ditch wall showing quarry debris; *(b)* close-up of ditch wall.

An analysis of the recovered material suggests some broad spatial differences in the use of the mountain (Hargrove 1989:38). Some tools and late-stage manufacturing debris were present on the flat peak as well as lower, flatter elevations of the mountain; steeper areas were dominated by early-stage reduction flakes.

Like Hargrove (1989:17), we were puzzled by the absence of visible rhyolite outcrops on the mountain's slope. This absence stands in contrast to every other mountain top we visited that exhibited at least small rhyolite boulders exposed on the ground surface. However, in situ beds are exposed in the bottom of a recent erosional gully present on the southeast side of the mountain. This gully is over three meters deep in some places and exhibits virtually a continuous profile of flaking debris (Figure A.6). Given slope steepness, colluvium is probably a contributing factor to the deep deposits; however, these deposits also probably are the remains of filled prehistoric pits dug (and redug) to expose rhyolite beds. Therefore, given the density of quarry debris on Morrow Mountain and the unlikely event that no surface exposure of rhyolite existed, it suggests that those surface exposures that were present on the mountain were completely exploited, leaving it necessary to quarry underground bedrock.

Tater Top Mountain, St64. Tater Top is one of the smaller mountains in the state park with a very steep eastern slope immediately adjacent to the Yadkin River. The rhyolite unit occurs along the eastern slope and mountain crest. The evidence of quarry activity is less apparent here than with most other rhyolite-capped mountains visited during this survey. Evidence of rhyolite working is thinly distributed over the hilltop; the most obvious signs of quarry activity are present in the form of flaking debris on the north end of the mountain crest around several tree trunks.

The rhyolite from Tater Top and Morrow Mountain have been grouped because of their similar color, fine-grained texture, and lack of phenocrysts. Tater

Top rhyolite, however, tends to lack flow-banding. In any event, it has a blocky rather than a conchoidal fracture, as revealed in our attempt to procure sample rock. This might at least partially explain the minor use of this rhyolite outcrop.

Discussion. Given the minor evidence for quarrying on Tater Top Mountain, it appears that Morrow Mountain was the primary source of the aphyric rhyolite in the Hardaway assemblage. Moreover, we reject the possibility that aphyric rhyolite was obtained from quarries along the Yadkin-Pee Dee River that are now covered by man-made reservoirs. Our field work confirmed Conley's (1962) map that shows the rhyolite occurring mainly at higher elevations in the area, on the middle to upper slopes and crests of the more rugged hills. We located numerous places where rhyolite on the upper parts of hills was in contact with argillite or basaltic tuff at lower elevations consistent with Conley's map. The only type of rhyolite that extended below waterline in the survey area was the plagioclase-porphyritic rhyolite on both sides of the river in the vicinity of Falls Dam (see below). Therefore, it is possible that plagioclase-porphyritic rhyolite quarries were covered when water was impounded by the dam. All known outcrops of aphyric rhyolite, however, are well above the river and lake levels. Therefore, we conclude that it is unlikely that any aphyric rhyolite quarries were submerged when the dams were built.

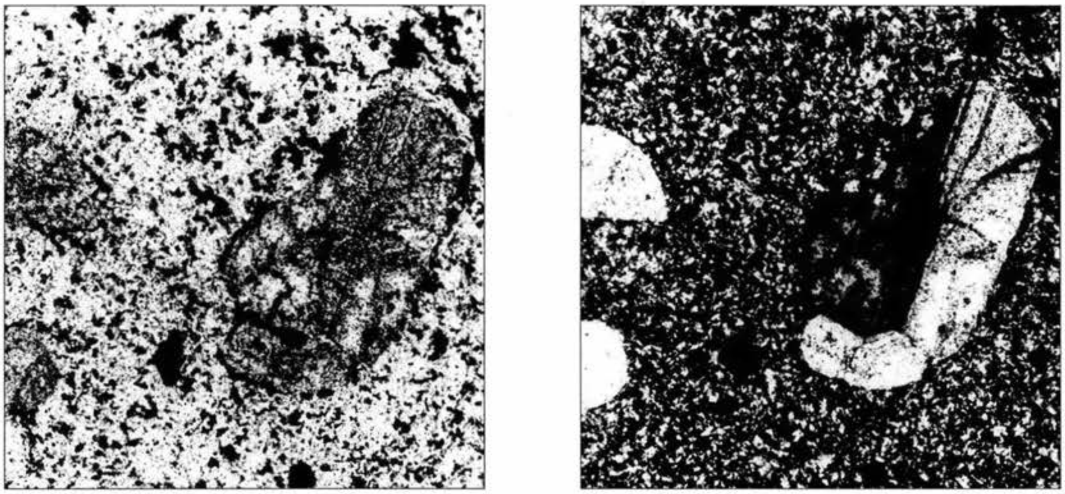
Wolf Den Rhyolite (plagioclase-porphyritic rhyolite)

Two large mountains in the Uwharrie National Forest, near the eastern banks of the Yadkin River, contain the primary sources of this rhyolite: Wolf Den Mountain and Falls Mountain. Wolf Den Mountain encompasses most of the plagioclase porphyritic rhyolite adjacent to the Yadkin River. It is a large mountain with a relatively flat and, in places, narrow ridge top that runs for almost 2 km. Three quarries were located on the mountain, given the size of the rhyolite unit additional utilized areas may also be present. Falls Mountain, which lies to the east of Wolf Den Mountain is much smaller and contained only one quarry. One other unnamed mountain, approximately 9 km to the north (near El Dorado), was also quarried for plagioclase-porphyritic rhyolite. Finally, some large outcrops of this rhyolite are also present on the west side of the river near Falls Dam.

Hand Sample Description. This is a dark gray to medium dark gray porphyritic rhyolite, with scattered white phenocrysts of plagioclase feldspar mostly less than 3 mm long in an aphanitic matrix. The phenocrysts rarely constitute more than 5% of the rock. At several localities, the rhyolite has scattered small crystals of fresh pyrite as much as 5 mm across; the crystals are surrounded by rims of whitish bleached-looking rhyolite.

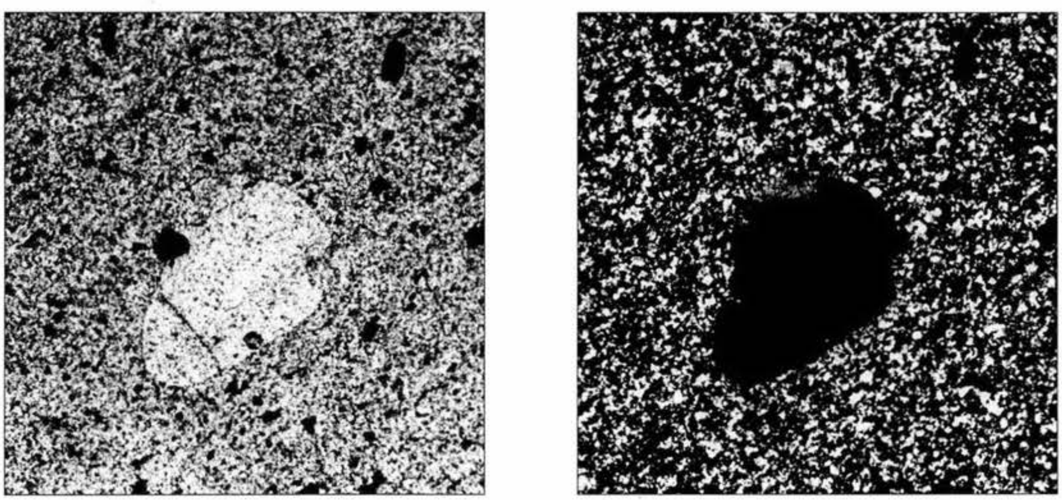
Thin Section Description. Individual plagioclase crystals and clots of crystals occur in a microcrystalline matrix, mainly composed of feldspar and quartz, with some biotite (Figure A.7).

Wolf Den Mountain, Mg117. This site was shown to us by US Forest Service Archaeologists Rodney Snedeker and Michael Harmon. The main portion of the site lies on the small cleared ridge crest on the north end of the mountain. Abundant porphyritic rhyolite flakes and some crude bifaces are scattered on the surface amid a few small rhyolite boulders, covering an area perhaps 200 meters in diameter. Additional quarry debris extends just south of this area intermittently for about another 400 meters along a gravel road. Again, cores and flakes are present among a few small porphyritic rhyolite boulders. A few tree-falls also exhibit flakes in the soil clumped around their exposed roots. How far this material extends east of the road was not determined, but the edge of the crest lies less than 200 m away. Additional outcrops likely exist on the slope, although it was not surveyed.



a b

Figure A.7. Photomicrographs of plagioclase porphyritic rhyolite thin section: *(a)* geological specimen from Falls Dam (plain polarized light, 40x); *(b)* geological specimen from Falls Dam (cross polarized light, 40x).



a b

Figure A.8. Photomicrographs of quartz porphyritic rhyolite thin section: *(a)* geological specimen from Mill Mountain (plain polarized light, 40x); *(b)* geological specimen from Mill Mountain (cross polarized light, 40x).

Mg639. This site occurs on the south slope of Wolf Den Mountain above Falls Dam, between approximately 230 and 240 m in elevation. Small outcrops and chunks of sparsely plagioclase-porphyritic rhyolite were scattered on the slope over an area of at least 100 by 50 meters. Cores, chunks, and flakes were present among the outcrops and under leaflitter, although no attempt was made to determine if there was any depth to the cultural material. Many of the small boulders appear to have been split naturally, presumably as a result of freeze-cracking. Assuming that this process occurred prehistorically, it likely facilitated quarrying by providing smaller blocks of raw material suitable for cores.

Mg640. This probable quarry is topographically similar to Mg639. It is located on the south-facing slope of the mountain adjacent to its crest at about 240 m in elevation. Quarry debris is thinly scattered among small outcrops of porphyritic rhyolite present on the slope; however, numerous trees and dense leaf litter prevented an accurate estimation of both site size and intensity of use.

Falls Mountain, Mg119. Falls Mountain lies immediately east of Wolf Den Mountain and is capped by an extension of the same porphyritic rhyolite unit. The most obvious signs of quarrying we noted are present on the mountain peak which is small and flat. Here the mountain top has been cleared and is part of a hiking trail. Here also, flakes and rejected bifaces were fairly abundant in an area about 150 m in diameter. Again several treefalls reveal flakes clustered in clumps of soil around exposed roots.

The possibility exists that only secondary reduction of material took place on the mountain top. This inference is based on the fact that very little large debris and only small rhyolite boulders were observed there. Presumably, the initial quarrying took place on the slopes, although we saw no clear evidence of this on our traverse across the mountain. Such evidence could have been missed, however, since we did not circle the entire mountain.

Mg641. This was another site was shown to us by Forest archaeologists who recorded it as part of cultural resource assessment (Harmon and Snedeker 1988). Harmon and Snedeker (1988) described this as larger but less intensively used quarry than Wolf Den. The quarry lies on an unnamed mountain about 1.5 km mile north of El Dorado at the northern end of the rhyolite range mapped by Conley (1962). A portion of the site has been disturbed by a recent logging road. Although rhyolite outcrops are spread are spread at least 700 meters along the western mountain slope, it is not altogether clear how much prehistoric quarrying actually took place here. That is, large angular chunks of fractured rhyolite are abundant among the outcrops but actual flakes and cores, which are typically present in the other rhyolite quarries, are rare; although one biface was recovered. If this fracturing of outcrops was the result of natural causes, we are at a loss to explain why it occurred so extensively here as compared to other mountain tops.

Mill Mountain Rhyolite (quartz-porphyritic rhyolite)

Only a single, relatively small occurrence of this porphyritic rhyolite was located during the survey.

Hand Sample Description. This rhyolite is characterized by a medium gray color, with sparse, glassy phenocrysts of quartz generally less than 1 mm across in an aphanitic sugary matrix. Very fine-grained, disseminated grains of pyrite are also present.

Thin Section Description. Scattered phenocrysts of quartz, generally less than 1 mm across, occur in a microcrystalline matrix, mainly composed of feldspar and quartz, with some biotite, chlorite, and disseminated pyrite (Figure A.8).

Mill Mountain, St65. Mill Mountain is one of the smaller rhyolite-capped mountains in the state park. It lies on the west bank of the Yadkin River just north of Tater Top Mountain. The entire rhyolite unit that covers the middle to upper slopes and crest of Mill Mountain exhibits extensive evidence of quarrying activity. Flaking debris litters the mountain slopes amid massive rhyolite boulders several meters in diameter. Uprooted trees also indicate deposits 20-30 cm deep in some places. The extensive flaking debris notwithstanding, only one small biface was also recovered.

Although this rhyolite unit is much smaller in extent than most other rhyolite units in the park, it appears to have been as intensively utilized (if not more so) than any source excluding Morrow Mountain. This interpretation, however, may be biased by the greater surface exposure due to erosion. The mountain slope is very steep particularly on the eastern side adjacent to the river, and this steepness is clearly promoting site erosion.

Sugarloaf Mountain Rhyolite (plagioclase-quartz porphyritic rhyolite)

Several quarries of this plagioclase-quartz porphyritic rhyolite are found on mountains on both sides of the Yadkin River. The primary outcrops of this rhyolite lie on Sugarloaf and Hattaway Mountains in Morrow Mountain State Park and Shingletrap Mountain in the Uwharrie National Forest.

Hand Sample Description. This is a dark gray to light gray porphyritic rhyolite, with scattered phenocrysts of white plagioclase feldspar and glassy quartz, mainly less than 3 mm long, in an aphanitic matrix. Plagioclase phenocrysts are generally more abundant than quartz. Some specimens are flow-banded, and rarely disseminated pyrite is present.

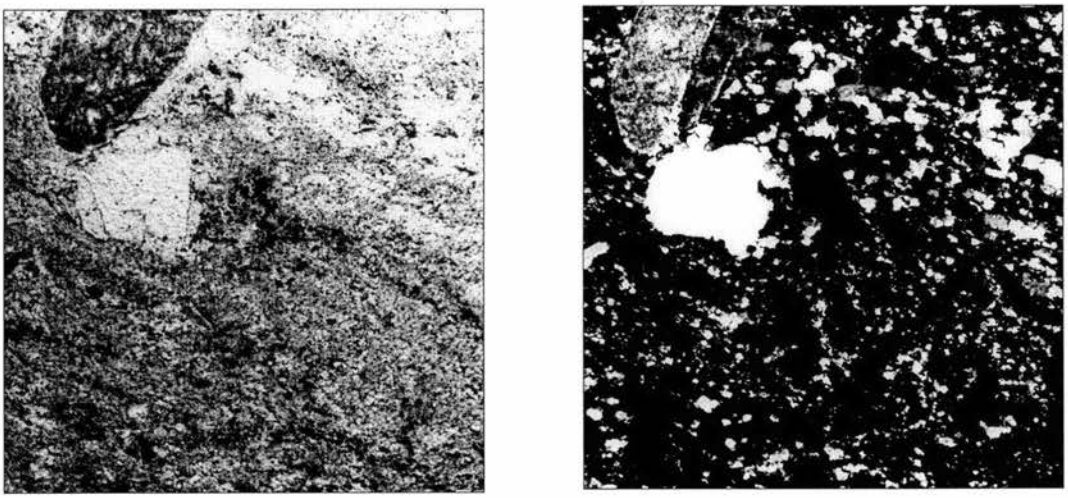
Thin Section Description. Plagioclase and less common quartz crystals occur in a microcrystalline matrix, mainly composed of feldspar and quartz, with lesser biotite and chlorite. Some rocks have faint to distinct flow-banding. Disseminated, fine-grained pyrite is locally present (Figure A.9).

Sugarloaf Mountain, St66. Sugarloaf Mountain (31St107) is another extensive mountaintop quarry. Hargrove's (1989:22) survey indicates that quarry debris is spread intermittently over the rhyolite unit that covers the mountain crest and upper slopes. We noted that quarry debris was most concentrated among rhyolite boulders on the mountain summit. We also observed the soil depressions mentioned by Hargrove, which he interpreted to represent filled quarry pits (1989:22). If these depressions are indeed pit remnants, Sugarloaf Mountain appears to be the only other quarry besides Morrow Mountain where subsurface bedrock was procured.

Hattaway Mountain, St67. The Hattaway Mountain rhyolite unit is part of an S-shaped rhyolite ridge that meanders through the Park for over 4 km. It begins on the summit of a small mountain just northeast of Hattaway and includes Sugarloaf and Morrow Mountain. The former two mountains are the primary source of plagioclase-quartz porphyritic rhyolite we encountered on the west side of the Yadkin River.

Although the rhyolite ridge runs through the spine of Hattaway Mountain, quarry activity is not prevalent until the northeastern edge of the mountain crest is reached. Here abundant rhyolite flakes are scattered amid clusters of numerous small rhyolite boulders. One treefall on the summit revealed a flaking debris deposit 10-20 cm thick.

St68. This site is located on an unnamed peak just south of Hattaway Mountain. Rhyolite flakes are thinly spread amid scattered small boulders along the



a b

Figure A.9. Photomicrographs of plagioclase-quartz porphyritic rhyolite thin section: *(a)* geological specimen from Mg559 (plain polarized light, 40x); *(b)* geological specimen from Mg559 (cross polarized light, 40x).

porphyritic rhyolite unit that caps the mountain. The exact size of this site is unknown but it appears to be one of the lesser utilized quarry areas in the park.

Shingletrap Mountain, Mg554. Shingletrap Mountain borders the western bank of the Uwharrie River and is a major source of plagioclase-quartz porphyritic rhyolite in the Uwharrie National Forest. The mountain slopes are steep with small- to medium-sized rhyolite boulders and three relatively flat, narrow ridgetops. Although the entire mountain appears to have some evidence of quarry activity we have delineated the two most intensively utilized areas. These include the southeastern and northwestern ridgetops and slopes. Again, although site distinctions have been made on physiographic differences, artifact distribution is almost continuous on the mountain top. For instance, a third ridgetop to the south also displayed some evidence of quarry use

The extensive nature of the quarry debris on Shingletrap Mountain presents a good example of the problem presented in trying to define site boundaries on many of these rhyolite-capped mountains. The Research Laboratories of Anthropology site files has at least five sites recorded on Shingletrap mountain (Mg554, Mg555, Mg557, Mg558, Mg568, and Mg570), which range in size from $4{,}500^2$ m to 9 ha. Arguably, however, one could define the whole mountain as a quarry. In such cases it may be more practical to initially define a "site" based on its geologic unit with "subareas" within the unit being defined as more concentrated areas of use.

Each of these ridgetops is relatively large and level, particularly the northwestern one where large treefalls revealed the presence of a "flake midden" at least 10-20 cm thick. Quarried material extends intermittently across the ridgetops for several hundred meters. Several rejected bifaces were also present among the quarry debris. Moreover, it was our impression that these ridgetops contained smaller flakes and fewer outcrops that contrasted with the relatively larger and more numerous boulders, chunks, and flaking debris present on the slopes. Thus, as with several other quarried mountains, the more level ridgetops may have been stone processing areas while initial quarrying took place on the mountain slopes.

Mg642. This site is also related to the extensive outcrops on Shingletrap Mountain. It lies on a southwest trending ridgetop that is about 150 m lower in elevation than the rest of the mountain. A motorbike trail follows the ridgetop among small to medium size outcrops of porphyritic rhyolite. Sporadic and small scale quarrying can be observed along portions of the ridge, and appears somewhat more concentrated at the southern peak and portions of its slope for perhaps 100 m.

This same rhyolite unit continues for almost 1.5 km onto the next hill to the southwest near the confluence of the Yadkin and Uwharrie Rivers. In a saddle, however, about 250 m southwest of the above peak there is an abrupt contact. Here the rhyolite changes markedly from a dark gray porphyritic stone to a sugary, non-porphyritic variety that is light gray to pinkish gray in color. There is no evidence of quarrying among this rhyolite which outcrops much less frequently than the porphyritic variety.

Mg559. This site was discovered by observing quarry debris on a mountain slope while driving one of the roads in the National Forest. It is located on an unnamed mountain just north of Shingletrap Mountain. The rhyolite unit containing the site begins at about 180 m in elevation and continues to the crest at 240 m. The western slope and crest of the mountain exhibit numerous rhyolite boulders with scattered concentrations of flakes and chunks. Particularly extensive concentrations of quarry debris are present along the southwestern slope and crest. This debris extends along the slope for about 500 m at the base of the rhyolite unit.

This site encompasses Mg559 listed in the Research Laboratories of Anthropology site file which appears to be smaller than our survey indicates. Of interest, however, is that a Savannah River point base was listed among the recovered artifacts from this site.

Virtually no quarrying activity was seen beyond the western crest of the mountain. This is despite the fact that numerous rhyolite outcrops extend beyond the mountain top virtually all the way to the Uwharrie River approximately 1.5 km to the east. The absence of quarrying there is likely due to its inferior flaking quality. This judgment is based on the irregular, hackly fracture the stone exhibited as we sampled outcrops along the mountain top to the river. Moreover, the hackly fracture is likely attributable to a marked increase in quartz phenocrysts in this portion of the rhyolite unit. This frequency change is most noticeable in a saddle to the northeast of Mg559. Presumably a geologic contact exists there.

This same quartz rich porphyritic rhyolite unit extends to the next mountain across Gold Mine Branch immediately to the south. Likewise, abundant unused porphyritic rhyolite outcrops were seen there as well.

Mg643. This quarry was shown to us by US Forest Service archaeologists. It is located on the mountain just east of a tributary into Dutch John Creek. Numerous large porphyritic rhyolite boulders and quarry debris occupy the steep southwest flank of the mountain slope. This is one of the few places where rhyolite can be found at the base of the mountain and boulders are present in the adjacent tributary. Worked material extends along this drainage for approximately 200 m and up to the top of the hill. Based on our determination this would encompass two previously recorded sites: Mg260 and Mg261.

Although this rhyolite was generally similar in color and texture to the other porphyritic rhyolites, one unusual color difference distinguishes it form our other samples. That is, some rocks displayed irregular zones or streaks of a pale olive color that graded into the more usual dark gray groundmass. It is possible that these green streaks may serve as a color attribute unique to this location.

Mg644. This site is located on the northern most peak of the same mountain containing Mg643. While rhyolite outcrops are fairly continuous across the mountain top, quarry activity is basically confined to an approximately 100 m diameter area on the south facing slope of its north peak. This site was unusual in the presence of numerous large rough bifaces, although the significance of this observation is uncertain.

Rhyolitic Tuffs

The following two sites are the only rhyolitic tuff quarries we located among the rhyolite units in the southern Uwharries. In fact, they are the only quarries present on a large (circa 3 km long) rhyolite unit located on an unnamed mountain just north of Wolf Den Mountain. The relative absence of quarries on this as well as another similar sized rhyolite unit to the north is probably due to the more heterogeneous composition of their rhyolite bodies. Our survey indicates that rhyolitic breccia and porphyritic rhyolite comprise most of these units, with a lesser amount of tuff present only on the southernmost mountain. Only the tuff outcrops showed any evidence of quarrying.

Similarly, rhyolitic breccia, tuffs, and porphyritic rhyolite make up the majority of about one dozen small island-like rhyolite bodies scattered across several nearby mountain-tops bordering the east side of Badin Lake. These are generally small outcrops of poor quality stone and we saw no evidence of quarrying among them.

Mg645. This quarry lies on the north slope of a u-shaped ridge that forms the mountain crest. It is a small but intensively worked area of small-to medium-size tuff outcrops that are cut by a trailbike path. Small chunks and flakes extend along this path and further upslope almost to the mountain summit, covering an area perhaps 100 m in diameter. Some sporadic evidence of quarrying also extends along the mountain path along the east side of the ridge.

Hand Sample Description. This stone is dark gray sugary tuff that weathers to a chalky grayish white. It is generally homogeneous but exhibits scattered patchy olive-green "splotches" (somewhat similar to HD28) of varying sizes and shapes. Although subtle, they are even apparent on weathered surfaces.

Mg646. This site is a series of small quarried tuff outcrops located about 1 km south of Mg643. A moderate amount of flaking debris is scattered for about 100 m along a path between two knolls near the southern tip of the mountain ridge. This material has a somewhat hackly fracture which likely accounts for its only moderate exploitation.

Of particular interest also is another concentration of flaking debris, apparently of the same material, less than 50 m to the east of this site. Topographically, this area is a small spur located just below the ridgetop where Mg646 is situated. Much of this spur is fairly level ground that offers a good panorama of Moccasin Branch and the landscape to the east. Rather than a quarry, the presence of small flaking debris particularly numerous bifacial retouch flakes coupled with the absence of any stone outcrops all suggest a workshop associated with Mg646.

Hand Sample Description. This stone is a black to dark gray homogeneous tuff that is otherwise nondescript. Given its color and the absence of phenocrysts this stone is somewhat similar in appearance to Morrow Mountain rhyolite, some 8 km to the south. It also displays some flow-banding noticeable on weathered specimens. The band widths appear thicker and somewhat more irregular than on Morrow Mountain rhyolite, although this distinction may be very subtle. Despite the macroscopic similarities, this tuff is clearly discernible from Morrow Mountain rhyolite in thin-section.

THE NORTHERN UWHARRIES: LITHIC TYPES AND SITE DESCRIPTIONS

Our attention was drawn to this area by members of the Uwharrie Archaeological Society who were aware of several stone sources in the vicinity of Asheboro, about 38 km north of Badin (Figure A.10). Here, our goal was to compare the sources around Asheboro with those around Hardaway. Initially, an opportunistic survey strategy was adopted, relying mostly on local informants to point out quarries. We had hoped to find a pattern in the location of quarries and mapped geologic units that could provide a basis for more systematic survey such as was done around Hardaway. As it turned out, such a pattern could not be found.

Unfortunately, the Asheboro area has only been mapped in general (mostly felsic or mafic) units (Seiders 1981). Most of these units are tuffs that for our purposes appear to be variable. Moreover, none of these units could be correlated with the rhyolite units that exhibited quarries to the south; nor was it readily apparent which felsic or mafic locations might contain potentially knappable stone. For example, an area including Shepherd and Caraway Mountains northwest of Asheboro is mapped in the same unit: a light to dark gray felsite parts of which contain phenocrysts. As will be discussed below, we found a plagioclase-porphyritic rhyolite on Shepherd Mountain and a fine-grained granite on Caraway Mountain. Neither stone appeared to have been quarried. The hill immediately adjacent to Shepherd Mountain, however, featured a porphyritic rhyolite that was intensively exploit-

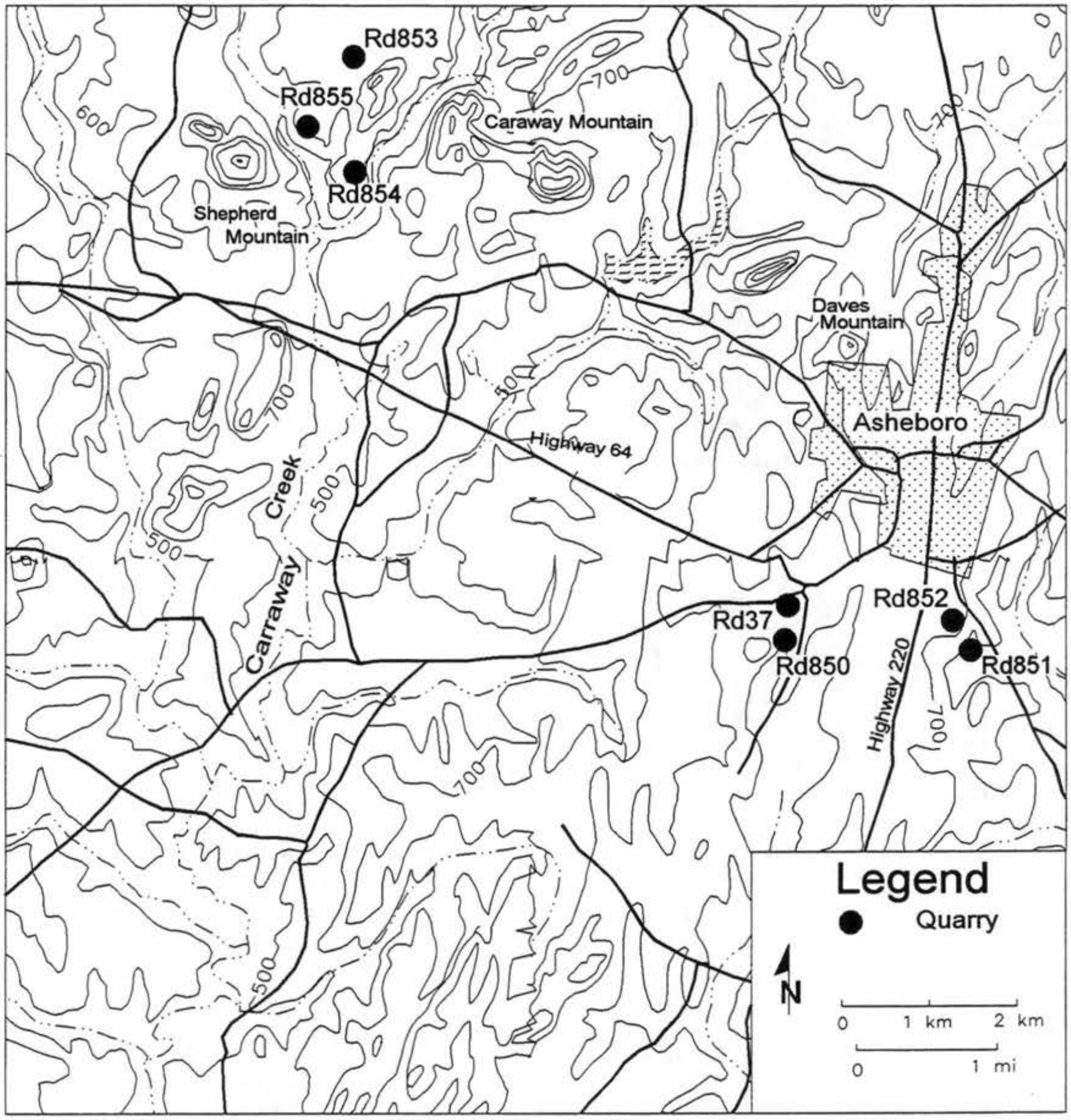


Figure A.10. Uwharrie Formation quarries and other outcrops near Asheboro.

ed. In short, unlike the Albemarle region to the south, the Asheboro geologic map provided little structure on which to base a quarry survey.

Therefore, our survey strategy simply consisted of visiting a specific quarry identified by an informant and then surveying the adjacent area for additional exposures and/or quarries. In this manner we recorded seven quarries around Asheboro. All but one were rhyolitic metatuffs, more commonly referred to as tuffs. Some of these might have been the source of the tuffs in the Hardaway assemblage; our uncertainty is due to the more variable nature of the tuffs and their widespread distribution around the northern Uwharries. Here only general descriptions of these lithic sources are presented, no formal type names are offered yet. First, I describe four quarries located within the Uwharrie Formation; followed by three sources identified within the Tillery Formation.

Uwharrie Formation Quarries Near Asheboro

Rd37. At least one area of quarrying was noted here and others might have been present prior to extensive earth moving activities which have taken place over the past several years. Specifically, this area is located in southwest Asheboro along the south side of State Road 49, just about one kilometer west of the intersection of US 64 and SR 49. As such, it is situated on the eastern edge of the Uwharries. Although recorded in 1969, no information was noted beyond the fact that much flaking debris was present and no points were recovered.

Since this time the area has undergone extensive modification as a result of borrow activities and most recently building construction. Currently, some archaeological mitigation is being undertaken to mitigate the impact of further construction (John Davis, personal communication 1993).

It is unknown how much of this earth moving has resulted in site destruction, however, the only remaining evidence of any quarry activity we noted was present on a cleared hilltop just east and northeast of the borrow pit. Here much debitage was concentrated along the hill slope and portion of the southern crest of the hill. Additional flaking debris was also scattered along the hilltop to the north. Although we noted some exposures of this material--a dark gray metarhyolite--along the slope, these outcrops appeared to be recently exposed. Presumably the exposures exploited prehistorically have been removed as a result of borrow activities. What natural outcrops we did observe on the hilltop, however, were mostly highly variable exposures of rhyolitic lapillistone and breccia that would not have been suitable for flaking.

Rhyolitic lappillistone and breccia were also observed in large roadcut exposures along the southeast side of NC-49. The most homogeneous rock was an aphyric, bluish-gray metarhyolite flow or dike. Flow-banding is variable in hand specimen along with the presence of small oval white calcite patches. We saw no evidence that this stone was quarried prehistorically and our sampling of outcrops suggests it has more of a blocky than a conchoidal fracture. Nevertheless, this stone cannot be entirely eliminated as a potential raw material source.

The dark gray metarhyolite and to a lesser extent the bluish-gray metarhyolite flow or dike could potentially be confused with the rhyolite from Morrow Mountain. The former sample, like Morrow Mountain, is a dark-gray, fine grained, non-porphyritic stone that is classified as an aphyric garnite-biotite metarhyolite flow or dike. Most of the material we observed, however, did not exhibit flow-banding in hand-specimen, although it was present to some degree. Nevertheless, this stone is distinctive from Morrow Mountain rhyolite in thin-section.

Similarly, the latter sample is also classified as an aphyric garnite-biotite metarhyolite flow or dike, and also can be distinguished from Morrow Mountain rhyolite in thin-section. Moreover, it can also be distinguished in hand-specimen somewhat in color (a lighter gray) and texture (some portions of the outcrop were even more fine-grained than Morrow Mountain rhyolite). Perhaps the most distinctive characteristic, though, is the presence of white calcite patches, although their presence can be quite variable.

Rd850. This site was found while surveying the hill-tops near the borrow-pit described above. It is located on the southern toe of a ridgetop just southeast of the borrow area. At the time of the survey quarry debris was scattered along a slight slope and apparently confined to two or three recently cleared adjacent lots where new houses were undergoing construction. A particular dense concentration of quarry debris--including numerous bifaces scattered among some small outcrops--was noted in one lot. It was apparent that grading and construction had done considerable damage to the site.

This stone is a lithic crystal tuff that is a bluish-gray in color with a very sugary texture that weathers to a chalky greenish-yellow.

Hillcrest Stables, Rd851. This site was located through the help of Mike Murrow of Asheboro; it occurs on private property in the southeast portion of the city off of State Road 159. Although this site is in the Uwharrie Formation, it is about 3 km east of the edge of the Uwharries and does not appear to have been a major stone source.

The site consists of flaking debris exposed for about 30 m in a road-cut along the southeastern face of the hill slope. In particular, flaking debris was several tens of centimeters thick, exposed in a ditch along the road. Although some apparent outcrops were present along the road, the exact nature of the site was difficult to determine since it has been disturbed by grading as well as the periodic visits by local knappers who mine this material.

This stone is a rhyolitic metatuff that is mostly light green in color but can vary from dark gray to brown; it also has a variable texture from fine-grained to very fine-grained.

Northampton Road, Rd852. These worked outcrops were found as we surveyed the slope of the hill above Hillcrest Stables. The site occupies a portion of a hillcrest which is actually a south projecting finger-like ridge, approximately 200 meters upslope from the quarrying at Hillcrest Stables. The site lies in an undeveloped slightly wooded area adjacent to some residences on Northhampton Road. A minor amount of quarry debris is spread over a few tens of meters amid low scattered tuff outcrops on the west side of the road which runs along the eastern edge of the ridge top. A powerline right-of-way also runs through a portion of the outcrops. It does not appear that the houses or powerline have had much impact on the site, however.

This stone is light gray in color with a very sugary texture and is classified as a crystal-lithic metatuff.

Tillery Formation Quarries Near Asheboro

This following three quarries were shown to us by John Arsenault of Asheboro. All three are within 2 km of each other, situated on the eastern edge of the Tillery Formation about 7 km west of the Uwharries.

Pierce Mountain, Rd853. This particular site is located on the southwest slope of a low hill about 2 km west of Caraway Creek, just south of State Road 1539. This area is in pasture and some minor amount of flaking debris is associated with very low outcrops of rhyolite. Also of interest are some associated shallow depressions, 1 to 3 meters in diameter. While these may be filled-in pits resulting from prehistoric quarrying, they more likely are related to former gold prospecting since an abandoned gold mine lies in a gully to the south.

Although this material resembles the plagioclase-porphyritic rhyolite from the southern Uwharries, it actually is classified as a crystal-lithic metatuff. This stone is gray in color and contains plagioclase crystals that can be seen in hand-specimen; although their presence is sparse. These may be clasts rather than phenocrysts, however, which distinguishes this material in thin-section from the porphyritic rhyolites to the south. The presence of a more sugary groundmass as well as numerous disseminated small pyrite--which leaves leached square to rectangular voids in weathered specimens--serve to distinguish this stone in hand-specimen as well.

Rd854. This is another relatively minor quarry located on a low north trending ridge about 2.5 km south of Rd41, on the west side of Caraway Creek. Here low outcrops and flakes are spread intermittently across the ridge top for about 200 meters. As with the outcrops from Rd41, this material has been identified as a crystal-lithic metatuff and is also similar in hand-specimen to the sample from Rd41.

Tator Head Mountain, Rd855. Tater Head is a local name for a small mountain located on the east side of Little Caraway Creek across from Shephard Mountain, about 23 km northwest of Asheboro. This is the most intensively quarried source we encountered in the Asheboro area. Massive porphyritic rhyolite outcrops are present on the southwest slope of the mountain just above the creek. A dense layer of quarry debris can be seen in the cut of an old logging road, just above the outcrops. The exact size of the quarrying was hard to estimate due to dense leaf litter cover at the time of our visit; however, it is likely that it is present on most of the southwest flank of the hill, if not a larger area.

The stone at this quarry is classified as a slightly altered and pyritized plagioclase-porphyritic rhyolite. It is similar in hand-specimen to the plagioclase-porphyritic rhyolite found to the south: it is medium dark gray in color and has a very fine sugary textured groundmass with plagioclase phenocrysts and small pyrite inclusions. Weathered specimens tend to be a mottled grayish white with small voids marking the presence of leached pyrite. The greater abundance of pyrite relative to the plagioclase, however, might tend to distinguish this stone in hand-specimen from the porphyritic rhyolite to the south. Regardless, the pyritized nature of this stone also distinguishes it in thin-section.

OTHER OUTCROPS NEAR ASHEBORO

Finally, three other mountains near Asheboro were surveyed whose outcrops did not exhibit any evidence of prehistoric quarrying: Shepherd Mountain, Carraway Mountain, and Daves Mountain. The first two mountains lie northwest of the city on the eastern edge of the Tillery Formation while the last is located in northwest Asheboro on the western edge of the Uwharrie Formation.

Shepherd Mountain is the most prominent mountain along Little Carraway Creek. Numerous porphyritic rhyolite outcrops can be seen along a dirt road up the southern flank, although no definite evidence of quarrying is present here or on the mountain summit. It is a plagioclase-porphyritic rhyolite with disseminated pyrite similar to that found at Rd42. Our attempts to obtain rock samples indicates that it does not have a conchoidal fracture which would explain its apparent lack of use.

Carraway Mountain is another large mountain located about 3 km east of Shepherd Mountain. A survey of its three peaks and portions of its slope revealed massive stone outcrops but no evidence of quarrying. This stone is classified as a plagioclase-porphyritic felsic granophyre (i.e., fine grained granite). Again, the absence of a conchoidal fracture probably precluded this material's use.

Daves Mountain occurs at the northern tip of the Uwharries and is in a heavily developed section of the city. The numerous residences made locating exposures more difficult, but from the outcrops we did see it is unlikely that this stone was used prehistorically. The stone here is a densely plagioclase porphyritic rhyolite with a blocky fracture. Its abundant phenocrysts probably contributes to this characteristic.

SUMMARY AND DISCUSSION

The Uwharrie Mountains are of particular significance to the archaeology of the North Carolina and the Southeast. The results of this survey tend to confirm archaeologist's impression that this region once served as an important source of the high quality microcrystalline metavolcanic stone so often observed in lithic assemblages across the Piedmont. In fact, as the Hardaway assemblage the collection's survey data indicate the Uwharrie Mountains were *the* major stone source during the Early Archaic.

Through fortuitous geologic events a series of these outcrops suitable for knapping are clustered at the southern end of the Uwharries in a rhyolite unit tentatively assigned to the Tillery Formation (Milton 1984). It is, thus, no coincidence that Hardaway is located in the midst of these bedrock outcrops. In fact, we recorded approximately 20 quarries associated with this formation and, with a single exception, all lie within an 8 km radius of the Hardaway site. Moreover, 18 of these quarries could be divided into four macroscopically distinct metarhyolite types, including the distinctive aphyric flow-banded rhyolite from Morrow Mountain; the remaining two quarries are classified as rhyolitic tuffs.

Most of the stone in the Hardaway assemblage, however, appears to be from a single quarry located just 8 km to the south: Morrow Mountain. Morrow Mountain also happens to be the largest and most extensively quarried source currently known in North Carolina. The focus on Morrow Mountain as a rhyolite source is all the more interesting in that more abundant and somewhat closer outcrops of porphyritic rhyolites, some of which show fairly extensive signs of use, were largely ignored by the inhabitants of the Hardaway site. Presumably, this preference for Morrow Mountain rhyolite was due its superior conchoidal fracture.

A significant implication of this preference is the likelihood that a temporal difference exists in the use of rhyolite quarries. That is, during the Early Archaic Period (and presumably the Paleoindian period as well), Morrow Mountain was the primary Piedmont stone source while the use of the more abundant porphyritic rhyolites did not become widespread until after the Early Archaic. Preliminary support for this can be found in Coe's (1964:35-44) comments that porphyritic rhyolite was the primary raw material used for the manufacture of the Middle and Late Archaic stemmed points from the Doerschuk site. Although I have no quantified data to support such a view, my distinct impression from examining numerous collections is that this pattern of raw material use holds for Middle and Late Archaic points across the Piedmont.

Presuming that porphyritic rhyolites are inferior in quality to Morrow Mountain rhyolite and that a temporal difference did exist in quarry use, it raises the question of why such a shift occurred. Perhaps the use of porphyritic rhyolite was precipitated by the over-exploitation of the outcrops on Morrow Mountain. In this context, the absence of significant outcrops on Morrow Mountain (and the suspected underground quarrying of stone there) may be significant: over time, the preferred quality of Morrow Mountain rhyolite may have been offset by the difficulty in acquiring it as opposed to the readily available porphyritic rhyolite outcrops. In any event, the prospects are tantalizing and worth further consideration.

By comparison, the metavolcanic sources we found in the Uwharrie and Tillery Formations around Asheboro were much smaller and generally less intensively exploited than the sources around Hardaway. These sources were primarily rhyolitic tuffs which are distinguishable in thin-section, if not in hand-specimen, from the rhyolites to the south. Although they can be distinguished as a group from the sources to the south, further work needs to be done before these tuffs can be divided into types such has been done for the rhyolites around Hardaway. And while these Asheboro sources may be the point of origin of some of the tuffs in the Hardaway assemblage, further work needs to be done to verify this possibility.

Part of the difficulty in distinguishing among tuffs may be related to their widespread distribution. Given the results of our survey around Asheboro and what we know about the geology of the Uwharrie Formation, it is likely that additional tuff beds were mined around Asheboro. However, how many of these were exploited during the Early Archaic remains to be seen.

Nevertheless, the possibility of other metavolcanic stone quarries, both in the Uwharries and beyond needs to be addressed. For example, a number of "lithic scatters" have been recorded in the central Uwharries, on Cooler Knob and Cedar Rock Mountains. These mountains were surveyed some 15 years ago. Descriptions of this work are sketchy, but at least two sites (Rd346 and Rd349) are listed as porphyritic stone quarries on Cedar Rock Mountain. Unfortunately, no details concerning the type of porphyritic stone is given, but both mountains are geologically mapped as felsite lithologic units that contain varying sizes and amounts of plagioclase phenocrysts commonly accompanied by quartz (Seiders 1981).

Even though this area needs to be reevaluated in light of our current work, it is doubtful if it was exploited during the Early Archaic. As documented earlier, Early Archaic points made of porphyritic rhyolite are very rare. Moreover, the area around these sites produced only later points: one Savannah River point was found at Rd349, and numerous Kirk Stemmed, Guilford, and Savannah River points were recovered elsewhere on the two mountains. No mention of any Early Archaic points was made on the site forms.

Admittedly, much of the central portion of the Uwharrie Mountains lies within the Uwharrie Formation and remains to be surveyed. Because this region is mapped in the same Felsite unit as Cedar Rock Mountain, quarry sites might exist. If they do exist, however, they were probably not were used during the Early Archaic. Recall that Daves Mountain, near Asheboro, is similarly mapped and contains a densely porphyritic rhyolite that was unsuitable for tool manufacture.

Elsewhere in Montgomery and Randolph counties, east of the Uwharries, a cultural resource survey of 8 tracts of National Forest land totaling over about 690 ha was recently done (Walling et al. 1992). Among these tracts only one quarry (31MG906) was found in the Uwharrie Formation just south of Troy. This site, located on a ridge just west of the Little River about 24 km southeast of Hardaway, was revisited during the present survey and rock samples taken for analysis. Here scattered float boulders and rare small tuff outcrops and artifacts are intermittently scattered for a few hundred meters along a ridge crest. Walling also recovered several bifaces in various stages of reduction, including one Savannah River point. This stone can be classified as a rhyolitic metatuff which appears to be similar in nature to the other tuff sources around Asheboro.

Finally, we have also done reconnaissance elsewhere in the Slate Belt, assessing the potential for metavolcanic quarries outside the Albemarle-Asheboro region. This fieldwork included inspection of some additional areas identified as rhyolite by Conley (1962) that are located on a range of mountains just to the east of the Uwharrie and Pee Dee Rivers (e.g., Shelter Mountain, Lick Mountain, Buck Mountain, and Dark Mountain) associated with the Uwharrie Formation. Our reconnaissance revealed little, if any, evidence of quarrying. Moreover, our examination of these outcrops indicated units of variable porphyritic and spherulitic rhyolite that exhibited little in the way of a conchoidal fracture. Although this area remains to be more closely surveyed, these results suggest little potential exists for significant quarries to be found here.

The details of this work and additional survey will be presented in a later report. Suffice it to say here that we have found only three quarries outside the Albemarle-Asheboro area, all located northeast of Hardaway within the Carolina Slate Belt. Two of these were located in northern Chatham County about 74 km from Hardaway: one contains a welded tuff while the other contains a rhyolitic breccia. Both are macroscopically distinctive, unlike any other raw material we have seen. No similar materials were seen in the Hardaway assemblage, but 5 Kirk Corner-Notched points recorded in the collections survey were made of material resembling the breccia. The third quarry is located in southeastern Person County about 144 km from Hardaway. It is a very fine-grained, bluish-green rhyolitic metatuff that is otherwise fairly nondescript. It is uncertain if any Hardaway artifacts or points from the collections survey were made from this source.

In sum, our survey work has located and petrologically characterized approximately 27 quarries in or adjacent to the Uwharrie Mountains. Among these sites we have pin-pointed the location of the dark gray, aphyric and often flow-banded rhyolite so abundant in the Hardaway assemblage. In addition we have also located the sources of three porphyritic rhyolite types that also are present in the assemblage. These rhyolite sources near Hardaway appear to be microscopically if not macroscopically distinct from a series of additional lithic sources at the northern end of the Uwharries, which for the most part can be classified as rhyolitic tuffs. A significant percentage of the tools from Hardaway appear to have been made from tuffs, but whether they came from these sources is unclear. In any event, it appears that Morrow Mountain was the most intensively exploited source during the Early Archaic.

Appendix B

VARIABLES RECORDED IN ANALYSIS

The variables used in the analysis of the chipped-stone tools in the Hardaway assemblage are listed below. Initially, all bifacial and unifacial tools were classified according to tool class (see Chapter IV) and raw material type (see Chapter III). Additional variables were recoded for specific tool classes as indicated below. A summary of metric variables is presented in Tables B.1-B.13. All metric variables were recorded to the nearest mm. Summaries of the nonmetric variables are presented in Chapters IV and V.

POINTS

The following variables were recorded on all Early Archaic points in the Hardaway assemblage.

Condition. Condition includes whether the artifact was intact or broken. If the specimen was broken but still identifiable as a point type, the tool portion was recorded: base, body, ear, or barb. If the point was essentially complete but missing some tool portion (i.e., tip, ear, barb, or some combination), it was recorded as such.

Total length. This measurement was taken from base to tip on Palmer and Kirk points. On Hardaway points this dimension was measured from a line drawn perpendicular to both ears and the point tip. Only values for intact specimens were used in calculating this dimension.

Axial length. This measurement was taken on Hardaway points along the tool midline from the top of the basal concavity to the point tip. In corner-notched points this measurement is the same as total length.

Tang length. This dimension records the maximum tang length taken from the point base to the top of the tang; in the case of notched points the latter was defined as a line drawn perpendicular to tang length tangent to the top of both notches.

Basal width. This dimension records the maximum width of the base or the maximum distance between ears in the case of Hardaway.

Tang width. On all notched points this dimension was taken as the minimum distance between notches; on Hardaway-Dalton points, tang width was measured as the minimum width of the base.

Shoulder width. This measurement was taken parallel to tang width. On notched points, this dimension records the maximum distance between blade barbs which usually corresponds to maximum blade width. On Hardaway-Dalton points, however, shoulder width was often greater than blade width. In this case, shoulder width was recorded as the maximum distance along the top of the base.

Mid-blade width. This measurement was taken parallel to shoulder width midway up the blade.

Maximum thickness. This dimension was recorded as the maximum distance perpendicular to total length and basal width.

Basal grinding. The presence/absence of basal grinding was monitored by a series of the following categories: complete, partial, absent, indeterminate. Complete refers to the presence of continuous grinding along the point base. Partial refers to incomplete or discontinuous basal grinding. Absent and indeterminate refer to the absence or indeterminacy of basal grinding, respectively.

Degree of basal grinding. The amount of basal grinding was monitored by three categories: distinct, light, and indeterminate.

Blade beveling. The presence/absence of blade beveling was recorded.

Blade serrations. The presence/absence of blade serrations was recorded by four values: distinct, light, absent, indeterminate.

BIFACES

The following variables were recorded on bifaces.

Biface condition. Condition includes whether the specimen was intact or broken. If broken, the tool portion was recorded: tip, body, base/end, unidentified fragment. If the specimen was essentially whole but missing a small portion of the tip, body, or base, it was classified as complete.

Maximum length. The total length of the specimen from base to tip.

Maximum width. The maximum width was recorded perpendicular to maximum length.

Maximum thickness. Maximum thickness was measured perpendicular to both maximum length and maximum width.

Fractures. If the specimen was broken the type of fracture was recorded: hinge/step, reverse, perverse, lateral snap, and material flow. These determinations largely follow Crabtree (1971) and Johnson (1981:43-52).

UNIFACIAL TOOL BLANKS

The following variables were recorded on unifacial tools. Variables relating to tool blanks are defined first.

Blank type. All tools were classified according to either a block, bifacial, or indeterminate core derivation (see Chapter V).

Transverse cross section shape. A cross-section shape was attributed to each tool: triangular, offset triangular, flat trapezoidal, convex trapezoidal, concave trapezoidal, plano-convex, other, indeterminate. Cross-section determination was viewed from the proximal end of the specimen with the dorsal surface up.

Maximum length. This measurement, as well as all other dimensions, were recorded to the nearest .1 mm. Length was recorded on the longest dimension of the artifact which usually corresponded with the flaking or bulbar axis (cf. Movius et al. 1968:33). In a few cases, however, maximum length was taken at perpendicular or oblique angles to the flaking axis (see platform orientation). Types I and IV Side Scrapers, for example, usually had their maximum dimension oriented perpendicular to the flaking angle.

Maximum width. This dimension was measured at right angles to maximum length.

Maximum thickness. This dimension was measured at the maximum point of tool thickness, other than the bulb of percussion.

Platform orientation. Four types of platform orientations were identified: parallel, perpendicular, oblique, and indeterminate. A parallel striking platform is oriented so that the axis of percussion and the long axis of the tool are parallel. A perpendicular striking platform is oriented so that the axis of percussion of the flake intersects the tool long axis at 90°. An oblique striking platform is oriented so that the axis of percussion of the tool intersects the tool long axis at an oblique angle (cf. Claggett and Cable 1982:Appendix 2).

Exterior platform angle. This angle was measured to the nearest 5° with a contact goniometer at the intersection of the striking platform and dorsal surface of the artifact (cf. Dibble and Whittaker 1981:286).

Striking platform thickness. This dimension is the distance from the dorsal surface of the striking platform drawn perpendicular to the point of percussion (i.e., the thickness of the platform at the point of percussion) (cf. Dibble and Whittaker 1981:286).

Striking platform width. This dimension is recorded perpendicular to the striking platform thickness.

END SCRAPERS

The following variables were recorded only on end scrapers. Side determination was made by placing end scrapers with dorsal surface up and striking platform to the bottom.

Lateral retouch location. The following observations were made on the location of lateral retouch: right lateral, left lateral, bilateral, absent, indeterminate.

Lateral notch location. The following observations were made on the location of lateral retouch: right lateral, left lateral, bilateral, absent, indeterminate.

Proximal thinning location. Proximal thinning was defined as flaking occurring at the proximal end of the tool in order to thin that tool segment to facilitate hafting (see Chapter V). The following occurrences of this retouch were observed: ventral surface, dorsal surface, ventral and dorsal surface, absent, and indeterminate.

Spur location. The presence/absence of spurs was made for each tool. If present, its location (i.e., lateral edge) was recorded (see lateral notch location).

Bit width. Bit width was measured as the maximum distance between the lateral margins of the tool bit.

Bit thickness. Bit thickness was measured as the maximum dimension between the distal termination of retouch scars on the bit dorsal surface and the opposing ventral surface of the tool.

Bit depth. Bit depth was measured as the maximum distance between the convex end of the bit, usually near its center, and an imaginary line drawn between the opposite corners of the bit.

Bit Edge Angle. Bit edge angles were measured with a contact goniometer to the nearest 5° at the juncture of the ventral surface and the retouched bit edge on the dorsal surface. Both maximum and minimum values were recorded.

Bit edge retouch scar length. This distance was measured from the origin of the retouch flake scar at the bit edge (i.e., the intersection of the dorsal and ventral surface) to a point where the distal termination of the flake scar invades the dorsal surface of the tool blank. Both maximum and minimum values were recorded.

OTHER UNIFACIAL SCRAPERS

The following values were recorded on all side scrapers, pointed scrapers, oval scrapers, and miscellaneous scrapers. Tool orientation for side determination was as follows. Tools that had parallel platform orientations were placed with the dorsal surface up and striking platform to the bottom. Side scrapers with perpendicular or oblique platform orientations were placed with the dorsal surface up and striking platform to the right in order to preserve the consistency of measurement within the type (i.e., all Type I and Type IV Side Scrapers were classified as having left retouched edges). All side scrapers that were classified as indeterminate with regard to platform orientation or number of retouched edges (see below) were arbitrarily classified as having left edges.

Number of bits. The number of bits on each tool were recorded. Only Pointed Scrapers and Miscellaneous Scrapers had any tools exhibiting more than two bit edges.

Bit shape combination. A series of bit shape categories were used: single convex, single concave, single straight, single irregular, double convex, double concave, double straight, convex straight, concave straight, other.

Bit shape. Individual shape categories were recorded for each bit location (i.e., left, right, or other): straight, concave, convex, irregular, indeterminate.

Bit retouch surface location. Bit retouch was recorded as occurring on the dorsal surface, ventral surface, or a combination of the two.

Bit thickness. Measurements were taken as the thickness of the bit edge between the distal termination of flake scars on the dorsal surface of the tool and a point on the opposing ventral surface. Both maximum and minimum values were recorded.

Bit edge angle. Bit edge angles were measured in the same manner as for end scrapers.

Bit flake scar length. Bit flake scar length was measured in the same manner as for end scrapers.

Bit thickness. Bit thickness was measured in the same manner as for end scrapers.

Table B.1. Hardaway-Dalton and Related Side-Notched Projectile Point Dimensions

	Hardaway-Dalton			Hardaway Side-Notched			"Taylor" Side-Notched			Small Dalton		
Type	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n
Axial length	45.1	12.5	8	32.8	2.4	2	-	-	-	35.0	5.0	5
Total length	57.2	15.1	8	37.3	4.2	2	-	-	-	38.2	5.4	5
Tang length	19.7	5.2	13	9.5	1.4	7	9.9	-	1	9.5	1.3	6
Tang width	30.1	3.0	13	22.3	3.4	7	16.9	-	1	15.1	3.0	6
Mid-blade width	24.7	4.2	10	17.2	2.6	5	19.2	-	1	14.8	3.4	6
Shoulder width	30.9	3.0	13	28.4	6.8	7	23.6	-	1	19.4	3.5	7
Basal width	34.7	3.5	10	28.8	4.1	7	22.3	-	1	19.3	3.6	5
Maximun thickness	5.9	.9	13	4.9	1.0	8	6.6	-	1	5.0	.5	7

Note: All dimensions in mm.

Table B.2. Corner-Notched Projectile Point Dimensions.

				Kirk Corner-Notched											
	Palmer Corner-Notched			Ground Straight Base			Ground Excurvate Base			Unground Straight Base			Unground Excurvate Base		
Type	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n
Axial length	38.7	8.7	15	44.7	7.2	18	46.1	7.9	9	44.5	8.9	28	45.1	4.9	5
Total length	38.8	8.9	15	44.9	7.4	18	46.1	7.9	9	45.1	8.9	29	45.1	4.9	5
Tang length	6.9	.9	22	10.7	2.2	25	11.3	2.5	10	10.4	2.0	33	12.9	1.8	5
Tang width	14.1	1.9	20	15.9	1.8	25	15.9	2.2	10	16.4	2.2	32	16.7	2.1	5
Mid-blade width	14.7	2.9	20	17.8	3.9	23	18.5	2.9	9	17.7	3.6	32	16.0	1.0	5
Shoulder width	21.7	2.8	19	25.1	4.5	23	23.5	3.1	8	24.3	3.5	31	22.8	1.2	5
Basal width	18.6	2.3	20	21.5	3.3	22	21.6	4.4	9	20.9	3.5	28	20.8	1.9	5
Maximun thickness	5.8	.8	22	6.4	.6	25	6.5	1.2	10	6.8	1.1	33	7.3	1.6	5

Table B.3. Biface Dimensions

Type	Maximum Length			Maximim Width			Maximum Thickness		
	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n
Biface I	73.5	14.9	87	52.9	12.4	132	24.5	7.3	153
Biface II	64.7	12.6	120	42.7	9.5	252	13.7	3.9	383
Biface III	55.3	11.0	41	38.9	8.9	113	9.3	2.0	160
Preforms									
Hardaway-Dalton	72.4	12.0	6	48.5	7.2	19	9.7	2.9	20
Hardaway Side-Notched	51.5	-	1	30.3	3.2	5	7.2	.4	5

Table B.4. End Scraper Dimensions

Type	Length			Width			Thick		
	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n
Ia	40.4	9.8	103	31.9	6.2	116	8.0	2.8	119
Ib	39.3	10.6	38	26.9	3.5	40	9.0	2.0	41
IIa	68.2	14.0	57	44.2	7.8	72	18.3	6.5	73
IIb	55.1	6.9	38	31.1	6.7	43	6.9	1.7	43
III	71.9	13.0	6	45.4	5.5	9	14.2	3.8	9
IV	57.8	13.9	23	49.1	7.0	24	11.4	4.0	25
V	64.5	14.6	60	43.8	9.4	74	11.2	5.7	77

Table B.5. End Scraper Bit Dimensions

Type	Thickness			Width			Depth		
	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n
Ia	6.0	2.2	106	29.6	6.9	101	7.6	3.4	102
Ib	7.9	1.9	38	25.2	4.3	38	6.5	2.2	37
IIa	12.9	6.5	57	38.8	8.3	53	12.0	4.5	54
IIb	4.5	1.8	38	25.8	7.9	39	6.3	2.4	38
III	11.5	4.2	7	41.3	12.1	7	14.6	2.4	6
IV	7.5	3.6	25	34.3	10.7	25	9.4	3.5	25
V	5.2	2.1	71	20.9	6.8	67	6.2	3.1	69

Table B.6. Side Scraper Dimensions.

	Length			Width			Thickness		
Type	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n
I	75.2	11.9	19	46.7	8.5	20	15.4	5.3	20
IIa	61.5	14.2	184	43.4	10.9	215	11.0	5.4	221
IIb	32.9	5.4	20	23.7	4.2	21	4.4	1.8	24
III	58.9	10.4	111	29.8	5.8	123	6.1	2.1	123
IV	73.5	7.0	19	45.8	6.6	23	14.2	2.9	23

Table B.7. Type IIa, IIb, and III Side Scraper (Single and Double Bits) Dimensions.

	Length			Width			Thickness		
Type	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n
IIa Single	62.3	14.7	154	43.2	10.9	178	11.3	5.5	183
IIa Double	57.5	10.5	30	43.4	9.8	36	9.5	4.7	36
IIb Single	33.1	4.7	16	24.4	4.5	16	4.4	1.8	19
IIb Double	34.5	9.2	3	21.4	2.4	4	4.6	2.1	4
III Single	58.3	10.2	82	30.4	5.9	90	6.2	2.1	90
III Double	60.8	11.1	29	28.4	5.5	33	6.1	1.9	33

Table B.8. Side Scraper Bit Dimensions.

	Minimum Bit Thickness			Maximum Bit Thickness		
Type	Mean	s.d	n	Mean	s.d.	n
SSI	5.9	3.0	19	11.7	4.7	19
SSIV	6.7	1.8	23	10.4	1.8	23

Table B.9. Type IIa Side Scraper Bit Thickness.

	Minimum Bit Thickness			Maximum Bit Thickness		
Type	Mean	s.d	n	Mean	s.d.	n
Left Single	3.2	1.8	126	5.5	3.2	126
Right Single	3.2	1.7	56	5.2	3.0	56
Left Double	2.7	1.3	36	4.2	2.2	36
Right Double	2.9	1.8	36	4.9	3.1	36

Table B.10. Type IIb Side Scraper Bit Thickness.

	Minimum Bit Thickness			Maximum Bit Thickness		
Type	Mean	s.d	n	Mean	s.d.	n
Left Single	1.4	.5	9	1.6	.4	9
Right Single	1.2	.3	10	1.8	.8	10
Left Double	1.5	.8	4	2.2	1.2	4
Right Double	1.8	.5	4	2.6	1.4	4

Table B.11. Type III Side Scraper Bit Thickness.

	Minimum Bit Thickness			Maximum Bit Thickness		
Type	Mean	s.d	n	Mean	s.d.	n
Left Single	1.9	.7	42	2.9	1.4	42
Right Single	2.0	1.0	47	3.2	1.5	47
Left Double	1.9	.7	42	2.9	1.4	42
Right Double	2.0	.9	47	3.2	1.5	47

Table B.12. Dimensions of Miscellaneous Scraper Types.

	Length			Width			Thickness		
Type	Mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n
Pointed Scraper (Ia)	78.7	7.3	3	42.3	2.8	3	14.4	.8	3
Pointed Scraper (Ib)	59.8	10.0	6	26.9	2.6	6	5.4	1.2	6
Oval Scraper	43.2	1.9	5	39.8	1.2	5	8.4	2.6	5
Other Scraper	51.8	9.4	10	47.1	12.2	12	9.1	3.5	13
Hafted Spokeshave	56.4	-	1	30.6	7.2	2	6.2	.4	2
Denticulate	59.5	10.6	2	35.0	11.3	2	10.0	2.8	2
Graver	48.7	16.3	15	28.6	9.9	18	7.4	4.8	19
Drill/Perforator	76.4	17.8	5	40.0	15.5	5	10.2	3.8	5

Table B.13. Bit Dimensions for Miscellaneous Scraper Types.

		Minimum Bit Thickness			Maximum Bit Thickness		
Type	Edge	Mean	s.d.	n	Mean	s.d.	n
Pointed Scraper (Ia)	Left	2.6	.4	2	5.7	3.8	2
	Right	1.9	1.0	3	3.8	1.5	3
	Distal	2.3	-	1	3.5	-	1
Pointed Scraper (Ib)	Left	2.1	.6	6	3.7	1.1	6
	Right	2.2	.9	6	3.2	.9	6
	Distal	2.4	.4	2	2.4	.4	2
Oval Scraper	Left	5.5	2.5	4	7.9	3.0	4
	Right	4.5	3.1	5	5.5	3.7	5
Other Scraper	Left	2.7	1.0	7	4.4	1.9	7
	Right	2.6	1.5	9	3.6	1.4	9
	Distal	2.7	1.0	13	4.0	1.3	12

Appendix C

ARTIFACT COUNTS

Table C.1 shows total artifact counts by square from the undisturbed portions of CBM, Zone 3, and Zone 4. Table C.2 lists the proportion of each square that was undisturbed. Dividing the artifact count in Table C.1 by the proportion in Table C.2 yielded the "corrected" artifact count used for the spatial analysis in Chapter VI.

Table C.1. Artifact Counts by Provenience Unit.

	Provenience					
Type	-45L10	-45L15	-50L05	-50R05	-55L00	-55L05
Hardaway-Dalton	-	-	-	-	-	-
Hardaway Side-Notched	-	-	-	-	1	-
Small Dalton	1	-	-	1	-	-
Palmer Corner-Notched	-	-	-	-	-	-
Kirk Corner-Notched	-	-	-	-	-	-
Indeterminate Corner-Notched	-	-	-	-	-	-
Indeterminate Side-Notched	-	-	-	-	-	-
Indeterminate Points	-	-	4	-	1	-
Biface I	-	1	4	-	-	-
Biface II	2	-	9	-	-	-
Biface III	-	-	3	-	-	-
Indeterminate Bifaces	1	-	-	-	1	1
End Scraper Ia	-	-	3	-	-	-
End Scraper Ib	-	1	2	-	1	1
End Scraper IIa	-	-	1	1	-	-
End Scraper IIb	-	-	-	-	-	-
End Scraper III	-	-	-	-	-	-
End Scraper IV	-	-	-	-	-	-
End Scraper V	-	-	1	-	-	-
Side Scraper I	1	-	1	-	-	-
Side Scraper IIa	3	-	7	-	1	1
Side Scraper IIb	-	-	-	-	-	-
Side Scraper III	-	-	4	-	1	-
Side Scraper IV	-	-	1	-	-	-
Pointed Scrapers	-	-	-	-	-	-
Oval Scrapers	-	-	-	-	-	-
Miscellaneous Scrapers	-	-	-	-	-	-
Indeterminate Scrapers	3	-	8	3	1	-
Perforator/Drill/Graver	-	-	-	-	-	-
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	-	-	-	-	-	-
Adzes	-	-	-	-	-	-
Hammerstones	-	-	-	-	-	-
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	-	-	-	-	-
Grindingstones/anvils	1	-	1	-	-	-
Anvils	-	-	-	-	-	-
Cores	-	-	-	-	1	-
Pièces Esquillées	-	-	-	-	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	-	-	-	-
Unmodified cobbles\stone	-	-1	-	-	-	-

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

Type	-55L10	-55L15	-55L20	-55L25	-55R05	-60L00
	Provenience					
Hardaway-Dalton	-	-	-	-	-	-
Hardaway Side-Notched	-	-	1	-	-	-
Small Dalton	-	1	-	-	-	-
Palmer Corner-Notched	1	1	1	-	-	-
Kirk Corner-Notched	1	1	-	-	-	-
Indeterminate Corner-Notched	-	1	-	-	-	-
Indeterminate Side-Notched	1	1	-	-	-	-
Indeterminate Points	3	7	-	-	1	-
Biface I	3	12	3	-	-	1
Biface II	11	13	1	2	-	1
Biface III	3	13	1	2	-	-
Indeterminate Bifaces	9	12	1	1	1	-
End Scraper Ia	1	7	2	-	-	1
End Scraper Ib	2	1	-	-	-	-
End Scraper IIa	-	2	-	-	-	-
End Scraper IIb	2	-	-	-	-	-
End Scraper III	-	1	-	-	-	-
End Scraper IV	1	1	1	-	-	-
End Scraper V	3	3	1	-	-	-
Side Scraper I	1	1	-	-	-	-
Side Scraper IIa	7	16	3	1	-	2
Side Scraper IIb	5	1	-	-	-	-
Side Scraper III	5	12	2	-	-	-
Side Scraper IV	-	-	1	-	-	-
Pointed Scrapers	-	1	1	-	-	-
Oval Scrapers	-	-	-	-	-	-
Miscellaneous Scrapers	1	1	1	-	-	-
Indeterminate Scrapers	10	16	1	1	-	2
Perforator/Drill/Graver	-	1	-	-	-	-
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	1	1	-	-	-	-
Adzes	-	-	-	-	-	-
Hammerstones	2	3	1	-	-	-
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	1	2	1	-	-	-
Grindingstones/anvils	-	1	-	-	-	-
Anvils	1	-	-	-	-	-
Cores	3	5	1	-	1	1
Pièces Esquillées	-	-	-	-	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	-	-	-	-
Unmodified cobbles\stone	1	7	1	-	1	-

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

	Provenience					
Type	-60R10	-60R15	-60R20	-60R25	-60R30	-60R35
Hardaway-Dalton	-	-	-	1	-	-
Hardaway Side-Notched	-	1[a]-	-	-	-	
Small Dalton	-	-	-	-	-	-
Palmer Corner-Notched	-	1	1	-	-	-
Kirk Corner-Notched	-	1	-	-	-	-
Indeterminate Corner-Notched	1	-	-	-	-	1
Indeterminate Side-Notched	-	-	-	-	-	-
Indeterminate Points	-	1	1	-	-	3
Biface I	-	-	1	-	-	-
Biface II	-	3	5	2	1	-
Biface III	1	-	1	1	-	-
Indeterminate Bifaces	1	3	1	1	2	1
End Scraper Ia	1	1	2	-	1	-
End Scraper Ib	-	-	-	1	-	-
End Scraper IIa	-	4	-	-	-	-
End Scraper IIb	-	-	-	-	-	-
End Scraper III	-	-	-	-	-	-
End Scraper IV	-	-	-	-	-	-
End Scraper V	-	2	1	-	-	-
Side Scraper I	-	-	-	-	-	-
Side Scraper IIa	-	-	-	2	-	2
Side Scraper IIb	-	-	1	-	-	-
Side Scraper III	-	3	-	1	-	-
Side Scraper IV	-	-	-	-	-	-
Pointed Scrapers	-	-	-	-	-	-
Oval Scrapers	-	-	-	-	-	-
Miscellaneous Scrapers	-	-	-	-	-	-
Indeterminate Scrapers	1	-	-	3	1	-
Perforator/Drill/Graver	-	-	1	1	-	1
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	1	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	-	-	-	-	1	-
Adzes	-	-	-	-	-	-
Hammerstones	-	-	1	-	-	1
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	-	-	-	-	-
Grindingstones/anvils	-	-	-	-	-	-
Anvils	-	-	-	-	-	-
Cores	-	2	1	-	-	-
Pièces Esquillées	-	-	-	-	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	-	-	-	-
Unmodified cobbles\stone	-	-	-	-	-	-

[a] Preform.

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

Type	Provenience					
	-60L05	-60L10	-60L15	-60L20	-60L25	-60R05
Hardaway-Dalton	1	-	-	-	-	1
Hardaway Side-Notched	-	1	-	-	-	-
Small Dalton	-	-	-	-	-	-
Palmer Corner-Notched	-	-	-	-	-	-
Kirk Corner-Notched	-	1	-	-	-	1
Indeterminate Corner-Notched	-	2	-	-	2	-
Indeterminate Side-Notched	-	-	-	-	-	-
Indeterminate Points	-	2	-	-	2	-
Biface I	1	1	1	2	-	-
Biface II	2	11	2	3	-	1
Biface III	3	2	3	1	1	1
Indeterminate Bifaces	-	10	-	3	2	-
End Scraper Ia	-	3	1	-	-	-
End Scraper Ib	1	1	2	-	-	-
End Scraper IIa	1	1	-	-	-	-
End Scraper IIb	-	-	-	1	-	-
End Scraper III	-	-	-	-	-	1
End Scraper IV	-	-	-	2	-	-
End Scraper V	-	2	-	-	-	-
Side Scraper I	-	-	1	-	-	-
Side Scraper IIa	2	10	3	1	1	-
Side Scraper IIb	-	2	-	-	-	-
Side Scraper III	1	3	1	-	1	-
Side Scraper IV	1	3	-	-	-	-
Pointed Scrapers	-	-	-	-	-	-
Oval Scrapers	-	-	-	1	-	-
Miscellaneous Scrapers	-	-	-	-	-	-
Indeterminate Scrapers	1	9	-	-	1	1
Perforator/Drill/Graver	-	2	-	-	-	-
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	-	-	-	1	-	-
Adzes	-	-	-	-	-	-
Hammerstones	-	-	-	2	-	-
Hammerstones/abraders	-	-	1	-	-	-
Hammerstones/anvils	1	1	1	-	-	-
Grindingstones/anvils	1	-	-	-	-	-
Anvils	-	-	-	-	-	-
Cores	1	5	3	-	-	-
Pièces Esquillées	-	-	-	-	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	-	-	-	-
Unmodified cobbles\stone	1	3	-	1	-	-

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

	Provenience					
Type	-60R40	-60R45	-65L00	-65L05	-65L10	-65L25
Hardaway-Dalton	-	-	-	2*	1*	-
Hardaway Side-Notched	-	-	-	1	1	-
Small Dalton	-	-	-	1	-	-
Palmer Corner-Notched	-	-	-	1	-	-
Kirk Corner-Notched	-	-	-	-	-	-
Indeterminate Corner-Notched	-	-	-	-	-	-
Indeterminate Side-Notched	-	-	-	-	-	-
Indeterminate Points	2	4	1	3	1	-
Biface I	2	1	-	-	-	-
Biface II	7	6	-	8	1	1
Biface III	2	1	-	7	1	-
Indeterminate Bifaces	-	-	-	10	3	-
End Scraper Ia	-	-	-	3	-	-
End Scraper Ib	-	-	-	-	1	-
End Scraper IIa	2	1	-	2	-	-
End Scraper IIb	-	-	-	-	-	-
End Scraper III	-	-	-	-	-	-
End Scraper IV	-	-	-	-	-	-
End Scraper V	-	-	-	1	-	2
Side Scraper I	-	-	-	-	-	-
Side Scraper IIa	1	2	-	4	5	-
Side Scraper IIb	-	-	-	2	2	-
Side Scraper III	-	1	1	-	2	-
Side Scraper IV	-	-	-	1	1	-
Pointed Scrapers	-	-	-	-	-	-
Oval Scrapers	-	-	-	-	-	-
Miscellaneous Scrapers	-	-	-	1	-	-
Indeterminate Scrapers	-	1	-	7	4	2
Perforator/Drill/Graver	-	-	-	5	-	-
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	1	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	-	-	-	-	-	-
Adzes	-	-	-	-	-	-
Hammerstones	1	-	-	1	-	1
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	-	-	-	-	-
Grindingstones/anvils	-	-	-	-	1	-
Anvils	-	-	-	-	-	-
Cores	1	1	-	-	2	-
Pièces Esquillées	-	-	-	-	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	1	-	-	-
Other worked stone	-	-	1	-	-	-
Unmodified cobbles\stone	1	-	1	-	2	-

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

Type	Provenience					
	-65R05	-65R10	-70L00	-75L00	-70L05	-70L10
Hardaway-Dalton	-	1	4[b]	2	-	-
Hardaway Side-Notched	-	1[a]	1	-	-	-
Small Dalton	-	-	1	-	-	-
Palmer Corner-Notched	-	1	3	1	-	1
Kirk Corner-Notched	-	-	2	2	1	-
Indeterminate Corner-Notched	-	-	-	-	-	-
Indeterminate Side-Notched	-	-	-	1	-	-
Indeterminate Points	-	2	4	2	3	-
Biface I	3	-	4	2	3	1
Biface II	2	1	18	6	4	2
Biface III	1	-	1	5	4	1
Indeterminate Bifaces	1	4	2	-	4	-
End Scraper Ia	-	-	6	5	4	3
End Scraper Ib	-	-	1	1	1	1
End Scraper IIa	-	-	-	-	-	-
End Scraper IIb	-	-	1	-	-	-
End Scraper III	-	-	-	-	-	-
End Scraper IV	-	1	1	-	-	2
End Scraper V	-	1	5	4	1	-
Side Scraper I	-	-	-	1	1	-
Side Scraper IIa	-	-	10	3	3	3
Side Scraper IIb	-	1	-	-	3	-
Side Scraper III	2	-	-	-	4	1
Side Scraper IV	-	-	1	2	-	-
Pointed Scrapers	-	-	-	-	5	-
Oval Scrapers	-	-	-	-	-	-
Miscellaneous Scrapers	-	-	2	-	-	-
Indeterminate Scrapers	1	1	5	6	5	1
Perforator/Drill/Graver	-	-	1	-	-	-
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	1	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	-	-	-	-	-	-
Adzes	-	1	-	-	-	-
Hammerstones	-	-	-	1	1	1
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	-	1	-	1	-
Grindingstones/anvils	-	-	-	-	-	-
Anvils	-	-	-	-	-	-
Cores	-	1	1	-	-	-
Pièces Esquillées	-	-	-	-	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	1	-	-	-
Unmodified cobbles\stone	-	-	1	-	-	-

[a]Preform.
[b] Includes one preform.

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

Type	Provenience					
	-70L15	-70L20	-70R05	-70R10	-75L05	-75L10
Hardaway-Dalton	-	-	1[a]	1[a]	-	-
Hardaway Side-Notched	-	-	-	-	-	-
Small Dalton	-	-	-	-	-	-
Palmer Corner-Notched	-	-	2	-	-	-
Kirk Corner-Notched	-	-	2	-	-	-
Indeterminate Corner-Notched	-	-	-	-	-	-
Indeterminate Side-Notched	-	-	1	-	-	-
Indeterminate Points	-	-	3	1	1	-
Biface I	1	-	3	-	3	2
Biface II	1	-	7	1	5	1
Biface III	-	-	1	-	6	-
Indeterminate Bifaces	3	-	5	4	5	1
End Scraper Ia	-	-	-	1	4	4
End Scraper Ib	-	-	1	-	2	2
End Scraper IIa	-	-	1	-	-	-
End Scraper IIb	-	-	2	1	1	-
End Scraper III	-	-	-	-	-	-
End Scraper IV	-	-	-	-	1	-
End Scraper V	-	-	5	-	2	-
Side Scraper I	-	-	2	-	-	-
Side Scraper IIa	2	-	8	1	5	-
Side Scraper IIb	1	-	-	-	5	-
Side Scraper III	2	-	2	1	5	2
Side Scraper IV	-	-	1	1	-	-
Pointed Scrapers	-	-	-	-	-	-
Oval Scrapers	-	-	1	-	-	-
Miscellaneous Scrapers	-	-	-	-	2	1
Indeterminate Scrapers	1	2	7	2	4	6
Perforator/Drill/Graver	-	-	-	-	2	-
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	-	-	-	-	-	-
Adzes	-	-	-	-	-	-
Hammerstones	-	-	-	-	-	-
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	-	-	1	-	-
Grindingstones/anvils	-	-	-	-	1	-
Anvils	-	-	-	-	-	-
Cores	-	-	-	-	1	1
Pièces Esquillées	-	-	-	-	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	-	1	-	-
Unmodified cobbles\stone	2	3	1	1	3	1

[a]Preform.

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

	Provenience					
Type	-75L20	-75R05	-75R10	-80L00	-80L20	-80R05
Hardaway-Dalton	-	-	-	-	-	1
Hardaway Side-Notched	-	-	-	-	-	-
Small Dalton	-	1	1	-	-	-
Palmer Corner-Notched	-	2	1	-	-	-
Kirk Corner-Notched	-	-	-	-	-	1
Indeterminate Corner-Notched	-	-	-	-	-	-
Indeterminate Side-Notched	-	-	-	-	-	-
Indeterminate Points	-	1	-	-	2	1
Biface I	-	1	-	-	-	1
Biface II	-	2	-	-	1	1
Biface III	1	-	-	-	-	-
Indeterminate Bifaces	-	1	4	-	1	-
End Scraper Ia	-	1	2	-	-	-
End Scraper Ib	-	-	1	-	-	1
End Scraper IIa	1	-	1	-	-	-
End Scraper IIb	1	1	-	-	-	-
End Scraper III	-	3	-	-	-	-
End Scraper IV	-	-	-	-	-	-
End Scraper V	1	2	1	-	-	-
Side Scraper I	-	-	-	-	-	-
Side Scraper IIa	1	3	1	-	1	1
Side Scraper IIb	-	-	-	-	-	-
Side Scraper III	-	3	-	-	-	1
Side Scraper IV	-	-	-	-	-	-
Pointed Scrapers	-	-	-	-	-	-
Oval Scrapers	-	-	-	-	-	-
Miscellaneous Scrapers	-	-	-	-	-	-
Indeterminate Scrapers	-	3	-	-	-	-
Perforator/Drill/Graver	-	-	-	-	-	-
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	-	-	1	-	-	-
Adzes	-	-	-	-	-	-
Hammerstones	-	-	1	1	-	-
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	-	-	-	-	-
Grindingstones/anvils	-	1	-	-	-	-
Anvils	-	-	-	-	-	-
Cores	1	1	-	1	-	-
Pièces Esquillées	-	-	-	1	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	-	-	-	-
Unmodified cobbles\stone	3	1	2	-	-	-

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

	Provenience					
Type	-80R10	-85L00	-85R05	-85R10	-05L05	-05L40
Hardaway-Dalton	-	-	-	-	-	2[a]
Hardaway Side-Notched	-	-	-	-	-	-
Small Dalton	-	-	-	-	-	-
Palmer Corner-Notched	-	-	-	-	-	-
Kirk Corner-Notched	-	-	-	-	-	1
Indeterminate Corner-Notched	-	-	-	-	-	-
Indeterminate Side-Notched	-	-	-	-	-	-
Indeterminate Points	1	1	1	-	-	3
Biface I	-	-	-	-	6	8
Biface II	1	-	2	3	19	8
Biface III	-	-	-	-	4	6
Indeterminate Bifaces	-	2	-	-	2	3
End Scraper Ia	-	-	2	2	1	6
End Scraper Ib	-	-	-	-	1	2
End Scraper IIa	-	-	-	-	1	3
End Scraper IIb	-	-	-	-	1	3
End Scraper III	-	-	-	-	-	-
End Scraper IV	-	-	-	-	-	1
End Scraper V	-	-	-	-	2	5
Side Scraper I	-	-	-	-	-	1
Side Scraper IIa	1	-	2	-	5	9
Side Scraper IIb	-	-	-	-	-	-
Side Scraper III	-	-	-	1	1	4
Side Scraper IV	-	-	-	-	-	2
Pointed Scrapers	-	-	-	-	-	-
Oval Scrapers	-	-	-	-	-	-
Miscellaneous Scrapers	-	-	-	1	-	-
Indeterminate Scrapers	1	-	1	1	5	4
Perforator/Drill/Graver	-	-	-	-	-	1
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	-	-	-	-	-	2
Adzes	-	-	-	-	-	-
Hammerstones	-	-	-	-	2	1
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	-	-	-	-	-
Grindingstones/anvils	-	-	-	-	-	-
Anvils	-	-	-	-	-	-
Cores	-	-	1	-	2	-
Pièces Esquillées	-	-	-	-	-	
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	-	-	-	-
Unmodified cobbles\stone	-	-	-	-	-	-

[a]Preforms.

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

Type	Provenience					
	-80R10	-85L00	-85R05	-85R10	-05L05	-05L40
Hardaway-Dalton						
Hardaway Side-Notched	-	-	-	-	-	-
Small Dalton	-	-	-	-	-	-
Palmer Corner-Notched	-	-	-	-	-	-
Kirk Corner-Notched	-	-	-	-	-	1
Indeterminate Corner-Notched	-	-	-	-	-	-
Indeterminate Side-Notched	-	-	-	-	-	-
Indeterminate Points	1	1	1	-	-	3
Biface I	-	-	-	-	6	8
Biface II	1	-	2	3	19	8
Biface III	-	-	-	-	4	6
Indeterminate Bifaces	-	2	-	-	2	3
End Scraper Ia	-	-	2	2	1	6
End Scraper Ib	-	-	-	-	1	2
End Scraper IIa	-	-	-	-	1	3
End Scraper IIb	-	-	-	-	1	3
End Scraper III	-	-	-	-	-	-
End Scraper IV	-	-	-	-	-	1
End Scraper V	-	-	-	-	2	5
Side Scraper I	-	-	-	-	-	1
Side Scraper IIa	1	-	2	-	5	9
Side Scraper IIb	-	-	-	-	-	-
Side Scraper III	-	-	-	1	1	4
Side Scraper IV	-	-	-	-	-	2
Pointed Scrapers	-	-	-	-	-	-
Oval Scrapers	-	-	-	-	-	-
Miscellaneous Scrapers	-	-	-	1	-	-
Indeterminate Scrapers	1	-	1	1	5	4
Perforator/Drill/Graver	-	-	-	-	-	1
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	-	-	-	-	-	2
Adzes	-	-	-	-	-	-
Hammerstones	-	-	-	-	2	1
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	-	-	-	-	-
Grindingstones/anvils	-	-	-	-	-	-
Anvils	-	-	-	-	-	-
Cores	-	-	1	-	2	-
Pièces Esquillées	-	-	-	-	-	
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	-	-	-	-
Unmodified cobbles\stone	-	-	-	-	-	-

[a]Preforms.

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

Type	Provenience					
	-10L05	-15L05	-20L00	-20L05	-25L05	-25L30
Hardaway-Dalton	2[a]	1[b]	1[b]	1	-	2
Hardaway Side-Notched	-	-	-	-	-	-
Small Dalton	-	-	-	-	-	-
Palmer Corner-Notched	-	-	-	-	1	1
Kirk Corner-Notched	4	1	1	-	-	1
Indeterminate Corner-Notched	-	-	1	-	-	-
Indeterminate Side-Notched	-	-	-	-	-	-
Indeterminate Points	-	3	-	2	3	4
Biface I	4	6	-	9	2	4
Biface II	3	15	6	19	12	10
Biface III	4	7	-	8	3	5
Indeterminate Bifaces	5	1	1	7	1	2
End Scraper Ia	4	7	2	2	2	-
End Scraper Ib	3	-	-	-	-	2
End Scraper IIa	3	-	1	5	1	3
End Scraper IIb	-	-	2	2	1	1
End Scraper III	-	-	-	-	-	1
End Scraper IV	1	-	-	1	-	1
End Scraper V	2	3	-	1	-	2
Side Scraper I	1	-	2	-	1	1
Side Scraper IIa	3	7	2	11	2	5
Side Scraper IIb	-	-	-	-	-	-
Side Scraper III	2	1	3	3	4	4
Side Scraper IV	-	-	2	-	-	1
Pointed Scrapers	-	-	-	-	-	-
Oval Scrapers	-	-	-	-	-	-
Miscellaneous Scrapers	-	1	-	1	-	-
Indeterminate Scrapers	8	4	6	6	7	2
Perforator/Drill/Graver	1	-	-	-	1	1
Denticulate	-	-	-	1	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	1	1	-	-	-	1
Choppers	1	-	-	-	-	-
Adzes	-	-	-	-	-	-
Hammerstones	2	2	-	-	-	-
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	1	-	2	-	-
Grindingstones/anvils	-	1	-	-	-	2
Anvils	-	1	-	-	-	-
Cores	-	2	2	3	5	1
Pièces Esquillées	-	-	-	-	1	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	1	-	2	-	-
Unmodified cobbles\stone	-	-	-	-	-	-

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

	Provenience					
Type	-30L05	-30L30	-35L00	-35L05	-35L30	-40L00
Hardaway-Dalton	1	1	-	-	-	2
Hardaway Side-Notched	-	-	-	-	-	1
Small Dalton	-	-	-	-	-	-
Palmer Corner-Notched	-	-	-	-	-	2
Kirk Corner-Notched	-	1	1	2	-	-
Indeterminate Corner-Notched	-	-	1	-	-	-
Indeterminate Side-Notched	-	-	-	-	-	-
Indeterminate Points	6	2	1	1	1	2
Biface I	9	5	7	2	4	5
Biface II	19	11	16	5	13	17
Biface III	3	8	6	1	4	8
Indeterminate Bifaces	2	1	2	7	4	3
End Scraper Ia	3	2	1	3	3	5
End Scraper Ib	-	4	1	1	-	1
End Scraper IIa	6	4	9	-	-	9
End Scraper IIb	3	-	1	-	1	-
End Scraper III	-	1	-	-	-	1
End Scraper IV	1	1	-	-	1	1
End Scraper V	1	3	2	2	-	2
Side Scraper I	-	1	-	-	-	-
Side Scraper IIa	6	6	4	2	4	3
Side Scraper IIb	-	-	-	-	-	-
Side Scraper III	2	-	-	5	2	5
Side Scraper IV	-	-	1	-	1	2
Pointed Scrapers	1	-	-	-	-	-
Oval Scrapers	-	-	-	1	-	-
Miscellaneous Scrapers	-	-	-	-	1	-
Indeterminate Scrapers	1	-	1	-	2	11
Perforator/Drill/Graver	1	-	1	-	3	-
Denticulate	-	-	-	-	-	1
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	-	-	-
Choppers	1	1	-	-	-	1
Adzes	-	-	-	-	-	-
Hammerstones	1	-	1	2	-	-5
Hammerstones/abraders	-	-	-	2	-	-
Hammerstones/anvils	-	-	-	-	-	1
Grindingstones/anvils	1	-	-	-	-	-
Anvils	-	-	-	-	-	-
Cores	5	1	2	1	3	3
Pièces Esquillées	1	-	-	-	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	-	-	1	2
Unmodified cobbles\stone	-	-	-	-	-	-

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

Type	Provenience					
	-40L05	-40L25	-45L00	-45L05	-45L25	-50L00
Hardaway-Dalton	2	-	1[a]	3[a]	-	-
Hardaway Side-Notched	-	-	-	-	-	-
Small Dalton	-	-	-	-	-	-
Palmer Corner-Notched	-	-	-	-	-	-
Kirk Corner-Notched	-	-	-	2	1	-
Indeterminate Corner-Notched	-	-	-	-	-	-
Indeterminate Side-Notched	-	-	-	-	-	-
Indeterminate Points	2	1	-	-	1	-
Biface I	4	2	-	3	1	-
Biface II	8	7	4	6	5	1
Biface III	2	2	-	5	6	-
Indeterminate Bifaces	6	4	2	3	4	-
End Scraper Ia	1	2	1	8	2	3
End Scraper Ib	1	-	-	1	-	-
End Scraper IIa	1	1	2	5	-	-
End Scraper IIb	1	2	-	2	3	-
End Scraper III	-	-	-	-	1	-
End Scraper IV	2	-	1	-	-	-
End Scraper V	-	1	-	1	-	1
Side Scraper I	-	-	-	1	-	1
Side Scraper IIa	2	-	4	3	3	-
Side Scraper IIb	-	1	-	-	-	-
Side Scraper III	8	1	-	1	1	-
Side Scraper IV	-	-	1	-	-	-
Pointed Scrapers	-	-	-	-	-	-
Oval Scrapers	-	-	-	-	-	-
Miscellaneous Scrapers	-	-	-	-	1	-
Indeterminate Scrapers	2	1	4	6	3	7
Perforator/Drill/Graver	-	-	-	-	-	1
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	-	-	1	-	-
Choppers	-	-	1	-	-	-
Adzes	-	-	-	1	-	-
Hammerstones	1	3	1	1	2	1
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	-	-	-	1	-
Grindingstones/anvils	-	-	-	-	1	-
Anvils	-	-	-	-	-	-
Cores	3	3	-	1	2	31
Pièces Esquillées	-	1	-	-	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	1	2	-	-	-	-
Unmodified cobbles\stone	-	-	1	-	1	-

[a]Preforms.

(continued)

Table C.1 (continued). Artifact Counts by Provenience Unit.

Type	Provenience					
	-50L10	-50L15	-50L20	-50L25	-25L00	-30L00
Hardaway-Dalton	-	3[a]	-	-	1	-
Hardaway Side-Notched	-	-	-	-	-	-
Small Dalton	-	-	-	-	-	-
Palmer Corner-Notched	2	2	2	-	-	-
Kirk Corner-Notched	3	1	5	-	-	-
Indeterminate Corner-Notched	1	-	-	-	-	-
Indeterminate Side-Notched	-	1	-	-	-	-
Indeterminate Points	3	1	5	-	-	-
Biface I	1	7	5	-	4	1
Biface II	3	19	13	-	13	2
Biface III	2	11	5	1	2	
Indeterminate Bifaces	2	4	4	-	1	-
End Scraper Ia	3	10	2	-	2	-
End Scraper Ib	2	2	-	-	-	-
End Scraper IIa	1	2	1	-	3	3
End Scraper IIb	-	2	2	-	-	1
End Scraper III	-	-	-	-	-	-
End Scraper IV	1	1	2	-	1	-
End Scraper V	2	1	8	-	2	-
Side Scraper I	-	1	-	-	1	-
Side Scraper IIa	-	6	5	-	1	1
Side Scraper IIb	-	-	-	-	-	-
Side Scraper III	1	7	5	1	1	-
Side Scraper IV	-	-	-	-	-	-
Pointed Scrapers	1	-	-	-	-	-
Oval Scrapers	-	1	1	-	-	-
Miscellaneous Scrapers	1	-	-	-	-	-
Indeterminate Scrapers	1	3	3	-	1	1
Perforator/Drill/Graver	2	1	-	-	1	-
Denticulate	-	-	-	-	-	-
Hafted Spokeshave	-	-	-	-	-	-
"Waller knife"	-	-	-	-	-	-
Core/scrapers	-	1	-	-	-	-
Choppers	-	-	-	-	-	-
Adzes	-	-	-	-	-	-
Hammerstones	2	1	3	-	2	1
Hammerstones/abraders	-	-	-	-	-	-
Hammerstones/anvils	-	1	1	-	-	-
Grindingstones/anvils	-	-	-	-	-	-
Anvils	-	-	-	-	-	-
Cores	3	1	1	-	5	-
Pièces Esquillées	-	-	-	-	-	-
Engraved Stone	-	-	-	-	-	-
Indeterminate Ground Stone	-	-	-	-	-	-
Other worked stone	-	-	1	-	1	-
Unmodified cobbles\stone	-	-	-	-	-	-

[a]Includes 2 preforms.

(continued)

Table C.2. Estimated Proportion of Undisturbed Deposits by Square.

Unit	%
-05L05	100.0
-05L40	100.0
-10L05	100.0
-15L05	100.0
-20L00	100.0
-20L05	100.0
-25L00	100.0
-25L05	100.0
-25L30	100.0
-30L00	100.0
-30L05	100.0
-30L30	100.0
-35L00	100.0
-35L05	100.0
-35L30	100.0
-40L00	100.0
-40L05	100.0
-40L25	100.0
-45L00	100.0
-45L05	100.0
-45L10	72.0
-45L15	58.0
-45L25	100.0
-50L00	100.0
-50L05	100.0
-50L10	100.0
-50L15	100.0
-50L20	100.0
-50L25	100.0
-50R05	76.0
-55L00	38.0
-55L05	30.0
-55L10	93.0
-55L15	100.0
-55L20	67.0
-55L25	69.0
-55R05	77.0
-60L00	39.0
-60L05	96.0
-60L10	64.0
-60L15	100.0
-60L20	40.0
-60L25	86.0
-60R05	82.0
-60R10	72.0
-60R15	100.0
-60R20	100.0
-60R25	100.0
-60R30	100.0
-60R35	100.0
-60R40	100.0
-60R45	100.0
-65L00	100.0
-65L05	88.0

(continued)

Table C.2 (continued). Estimated Proportion of Undisturbed Deposits by Square.

Unit	%
-65L10	82.0
-65L25	100.0
-65R05	71.0
-65R10	100.0
-70L00	100.0
-70L05	100.0
-70L10	61.0
-70L15	44.0
-70L20	77.0
-70R05	97.0
-70R10	85.0
-75L00	100.0
-75L05	79.0
-75L10	74.0
-75L20	100.0
-75R05	86.0
-75R10	50.0
-80L00	52.0
-80L20	100.0
-80R05	57.0
-80R10	12.0
-85L00	23.0
-85R05	46.0
-85R10	44.0

Appendix D

COLLECTIONS SURVEY DATA

Table D.1 lists the Hardaway-Dalton and Hardaway Side-Notched points by county and raw material recorded in the collections survey. Table D.2 lists the Palmer and Kirk Corner-Notched points similarly recorded in the collections survey. These data were used in the point distribution analysis in Chapter VII.

Appendix D.1. Hardaway-Dalton and Hardaway Side-Notched Point Frequencies from Collections Survey Cross Tabulated By Raw Material and County.

			Porphyritic Rhyolite			
State: County	Aphyric Rhyolite	Weathered Rhyolite	Plagioclase	Quartz	Plagioclase-Quartz	Rhyolitic Tuff
North Carolina:						
Alamance	7	1	3	-	1	-
Anson	4	3	-	-	-	3
Chatham	7	5	1	1	-	1
Durham	10	19	3	-	-	-
Davie	2	1	-	-	-	-
Davidson	4	2	2	-	-	3
Forsyth	4	4	-	-	-	2
Granville	1	3	-	-	-	-
Montgomery	7	4	-	-	1	1
Mecklenburg	-	-	-	-	-	-
Moore	2	8	-	-	-	-
Randolph	34	14	1	-	-	4
Orange	1	2	-	-	-	-
Richmond	28	13	2	-	2	2
Stanly	21	10	-	-	-	4
Union	1	3	-	-	-	-
Vance	-	-	-	-	-	-
Warren	-	-	-	-	-	-
Granville	1	3	-	-	-	-
South Carolina:						
Chesterfield	40	27	2	-	2	-
Marion	-	3	-	-	-	-
Williamsburg	1	1	-	-	-	-
Dillon	2	-	-	-	-	-
Florence	8	-	3	-	-	-
Horry	2	-	-	-	-	-
Marlboro	11	2	-	-	-	1
Georgetown	1	1	-	-	-	-

(continued)

Appendix D.1 (continued). Hardaway-Dalton and Hardaway Side-Notched Point Frequencies from Collections Survey Cross Tabulated By Raw Material and County.

State: County	Quartz	Ortho-quartxite	Chert: Coastal Plain	Chert: Jasper	Chert: Unidentified	Quartz Crystal
North Carolina:						
Alamance	-	-	-	-	-	-
Anson	1	-	-	-	-	-
Chatham	-	-	-	-	-	-
Durham	-	-	-	-	-	-
Davie	-	-	-	-	-	-
Davidson	-	-	-	-	-	-
Forsyth	-	-	-	-	-	-
Granville	1	-	-	-	-	-
Montgomery	-	-	-	-	-	-
Mecklenburg	3	-	-	-	-	-
Moore	2	-	-	-	-	-
Randolph	-	-	-	1	-	-
Orange	-	-	-	-	-	-
Richmond	6	1	1	-	-	-
Stanly	-	-	-	1	-	-
Union	2	-	-	-	-	1
Vance	1	-	-	-	-	-
Warren	1	-	-	-	-	-
Granville	1	-	-	-	-	-
South Carolina:						
Chesterfield	4	-	-	-	-	-
Marion	-	-	1	-	-	-
Williamsburg	1	-	1	-	-	-
Dillon	5	-	1	-	-	-
Florence	1	-	-	-	-	-
Horry	-	-	-	-	-	-
Marlboro	-	-	-	-	-	-
Georgetown	-	-	-	-	-	-

(continued)

Appendix D.1 (continued). Hardaway-Dalton and Hardaway Side-Notched Point Frequencies from Collections Survey Cross Tabulated By Raw Material and County.

State: County	Green Metasiltstone	Argillite
North Carolina:		
Alamance	-	-
Anson	-	-
Chatham	-	-
Durham	-	-
Davie	-	-
Davidson	-	-
Forsyth	-	-
Granville	-	-
Montgomery	-	-
Mecklenburg	-	-
Moore	-	-
Randolph	-	-
Orange	-	-
Richmond	-	-
Stanly	2	-
Union	-	-
Vance	-	-
Warren	-	-
Granville	-	-
South Carolina:		
Chesterfield	1	-
Marion	-	-
Williamsburg	-	-
Dillon	-	-
Florence	-	2
Horry	-	-
Marlboro	-	-
Georgetown	-	-

Appendix D.2. Palmer and Kirk Corner-Notched Point Frequencies from Collections Survey Cross Tabulated By Raw Material and County.

State: County	Aphyric Rhyolite	Weathered Rhyolite	Porphyritic Rhyolite: Plagioclase	Quartz	Plagioclase-Quartz	Rhyolitic Tuff
North Carolina:						
Alamance	9	-	1	-	1	-
Anson	2	1	2	1	-	1
Chatham	25	82	7	-	2	15
Durham	70	80	8	1	1	10
Davie	56	65	12	-	1	11
Davidson	57	19	7	-	2	17
Forsyth	99	61	6	1	4	25
Granville	30	21	8	-	-	8
Montgomery	90	33	13	-	-	2
Randolph	32	21	10	-	3	4
Orange	14	18	3	-	1	2
Richmond	72	20	5	-	10	2
Stanly	38	23	1	-	-	3
Union	55	97	5	1	5	7
Vance	2	3	6	-	-	4
Warren	10	9	7	-	-	1
Granville	30	3	6	-	-	4
Rowan	30	15	1	-	2	1
South Carolina:						
Chesterfield	241	15	13	-	-	-
Marion	12	9	2	-	-	-
Williamsburg	2	-	1	-	-	-
Dillon	91	11	25	-	-	4
Florence	101	1	6	-	-	-
Horry	13	-	10	-	-	-
Marlboro	123	-	2	-	-	-
Georgetown	1	1	-	-	-	-

(continued)

Appendix D.2 (continued). Palmer and Kirk Corner-Notched Point Frequencies from Collections Survey Cross Tabulated By Raw Material and County.

State: County	Quartz	Quartz Crystal	Ortho-quartzite	Quartzite	Green Metasiltstone	Argillite
North Carolina:						
Alamance	-	-	-	-	1	-
Anson	-	-	-	1	-	-
Chatham	7	1	-	-	-	-
Durham	5	2	-	1	-	-
Davie	-	-	-	-	-	-
Davidson	1	-	-	-	-	-
Forsyth	4	-	-	-	2	-
Granville	5	-	-	-	-	-
Montgomery	1	-	-	-	-	-
Randolph	5	-	-	-	2	-
Orange	-	-	-	-	-	-
Richmond	9	-	-	-	2	-
Stanly	-	-	-	-	-	-
Union	41	1	-	-	-	-
Vance	-	-	-	-	-	-
Warren	9	-	1	1	-	-
Granville	5	1	-	-	-	-
Rowan	-	-	-	-	1	-
South Carolina:						
Chesterfield	181	-	2	-	-	2
Marion	3	-	-	-	1	-
Williamsburg	5	-	-	-	-	-
Dillon	33	-	3	-	-	-
Florence	40	-	5	-	-	1
Horry	12	-	-	-	-	-
Marlboro	28	-	1	-	-	1
Georgetown	-	-	-	-	-	-

(continued)

Appendix D.2 (continued). Palmer and Kirk Corner-Notched Point Frequencies from Collections Survey Cross Tabulated By Raw Material and County.

			Chert			
State: County	Rhyolitic Breccia	Other Metavolcanic	Coastal Plain	Ridge and Valley	Jasper	Unidentified Chert
North Carolina:						
Alamance	-	-	-	-	-	-
Anson	-	-	-	-	-	-
Chatham	7	-	-	-	-	-
Durham	8	-	-	-	-	-
Davie	-	-	-	-	-	-
Davidson	-	-	-	2	-	-
Forsyth	-	-	-	-	-	-
Granville	-	-	-	-	-	-
Montgomery	-	-	-	1	-	-
Mecklenburg	-	-	-	-	-	-
Moore	-	-	-	-	-	-
Randolph	1	-	-	-	-	-
Orange	1	-	-	-	-	-
Richmond	1	-	-	-	-	-
Stanly	-	-	-	-	-	-
Union	-	-	-	2	1	1 [b]
Vance	4 ?	-	-	-	-	-
Warren	1 ?	-	-	-	-	-
Granville	2 ?	-	-	-	-	-
Rowan	-	-	-	-	-	-
South Carolina:						
Chesterfield	-	4 [a]	14	3	-	-
Marion	-	-	3	-	-	-
Williamsburg	-	-	5	-	-	2
Dillon	-	2	6	-	-	-
Florence	-	3 [a]	11	-	-	-
Horry	-	-	9	-	-	2
Marlboro	-	1 [a]	1	-	-	-
Georgetown	-	-	2	-	-	-

[a] 1 basalt

[b] chalcedony ?