12-1977

An Analysis of East Tennessee Dalton Projectile Points

Wayne D. Roberts
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Wayne D. Roberts entitled "An Analysis of East Tennessee Dalton Projectile Points." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Anthropology.

Charles H. Faulkner, Major Professor

We have read this thesis and recommend its acceptance:

Jeff Chapman, C. R. McCollough

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Graduate Studies and Research

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A Thesis

Presented for the

Master of Arts

Degree

The University of Tennessee, Knoxville

Wayne D. Roberts

December 1977

ACKNOWLEDGMENTS

I wish to express my appreciation to my thesis committee, Dr. Charles H. Faulkner (Chairman), Dr. Major C. R. McCollough, and Dr. Jefferson Chapman. Their advice, criticisms and aid were invaluable. I am especially indepted to Dr. Faulkner who suggested this thesis topic. I also wish to thank Dr. William M. Bass, Chairman, Department of Anthropology, for providing financial assistance for my comparative research in Alabama.

I am grateful to Dr. Alfred K. Guthe and Dr. John Walthall for making collections available at the Frank H. McClung and Mound State Monument Museums respectively. This thesis would not have been possible without the gracious cooperation of people who made their private collections available. I wish to thank in Tennessee, Messrs. Beverly Burbage, Al Carrol, James E. Cobb, Jack East, Ralph Garland, Frank Hodges, Herman McGhee, Richard Polhemus, Cleve Smith, and John Woolsey; in Alabama, Messrs. James W. Cambron, Ralph Allen, David C. Hulse, and Harry Smith; and in North Carolina, Mr. David O. Rich.

I am indebted to Mr. Tracy Brown for assistance while examining the Alabama collections. Ms. Pat Cridlebaugh's proofreading is greatly appreciated. Ms. Nelta Sain generously permitted the use of her type-writer. The photographs used in this thesis were developed by Mr. Miles Wright. Special thanks are extended to my parents and to my aunt, Ms. Laura Roberts. Their support and encouragement made this thesis possible.

Finally, I cannot begin to express my gratitude and appreciation

for all of the many contributions made by my wife, Carol. She has assisted in examining collections, typed the rough and final drafts of this thesis, and in general preserved my sanity and assured a smooth flow of work.

ABSTRACT

East Tennessee projectile points, previously described as the Early Woodland period Candy Creek type, are analyzed. Through the intensive examination of 17 continuous attributes and three discrete attributes reflecting morphology, function and manufacturing techniques, 112 of these East Tennessee projectile points are compared with 46 Dalton and Quad projectile points from northern Alabama and 37 Hardaway-Dalton projectile points from the Piedmont of North Carolina. As a result of the observations and a linear discriminant function program, it is determined that the Candy Creek projectile point is a regional variant of the Dalton projectile point type. Dalton manifestations described in the literature and the significance of the newly identified East Tennessee Dalton projectile point variant are summarized.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FIGURE PAGE

"If the labeling system does not keep up with thought, it is demonstrably a short time before thought ceases ... Putting the label on is only half the game; taking it off again is the other half." (Movius 1962:48).

CHAPTER I

HISTORICAL BACKGROUND

The Development of the Candy Creek Projectile Point Type

Candy Creek is the name of a projectile point type which is found in the Great Valley of East Tennessee. This projectile point type has traditionally been assigned to the Early Woodland period. The Candy Creek projectile point type received its name from the Candy Creek site (40BY14) in Bradley County, Tennessee (Kneberg 1956:23). The Candy Creek site was one of several sites excavated between 1936 and 1939 as part of the Chickamauga Basin project. At the time of the excavation of the site, projectile points later to be known as Candy Creek points were described as "Folsomoid" (Loyster *et al.*, n.d.). The first published description of a projectile point type later called Candy Creek occurred in the *Prehistory of the Chickamauga Basin in Tennessee* (Lewis and Kneberg 1941). In describing the stonework of the Candy Creek culture, Lewis and Kneberg (1941:31) reported that:

> Stemless projectile points were frequent, an important type being an elongate shield-shaped, small to medium sized blade which has often been attributed to a very ancient culture of the so-called "Folsom" horizon. The type frequently shares with the Folsom point the incurved base and the presence of a channel on one or both faces, but the outline shape differs by having a tendency to flare near the base. (A few points do have the parallel sides characteristic of the Folsom point). On the basis of the Candy Creek culture we can state rather definitely that at least a great many of the so-called "Folsom-like" points found in the Southeast should be identified as products of the early Woodland peoples.

The next printed reference to the Candy Creek point occurred in 1952. Rowe (1952:201), in describing the chipped stone artifacts of the

Candy Creek focus, stated that:

> Stemless points are also fairly common. In general they are shield shaped or are broad, have excurved sides and either a straight or incurved base. Many of these points exhibit longitudinal channeling on one or both sides in the tradition of the Folsom point.

In 1955 seven illustrated points were described in the Tennessee Archaeologist as:

> the early Woodland type with ground basal edges, which we designate as the Candy Creek point. They suggest a chipped stone technique derived from the Paleo-Indian tradition (Lewis 1955:91).

The first complete statement about the Candy Creek projectile point type appeared the following year:

> Candy Creek: an Early Woodland type known chiefly from eastern Tennessee at present. Named from the Candy Creek site in Bradley County. Probable age from 1000 B.C. to 500 A.D. This type may be descended from the Paleo-Indian tradition of flint chipping; nature of relationship is not known at present.
>
> Basic shape is trianguloid with recurvate side edges, and usually incurvate basal edge. Basal edge and adjacent side edges sometimes are ground. Blade is occasionally fluted on one or both faces, with multiple small flutes on some examples. When not fluted, the base is always well thinned. Pressure chipping always evident. Some examples are made from milky or sugar quartz. These quartz points are never fluted but often have ground edges. Size varies from small to medium, and breadth from narrow to broad (Kneberg 1956:23).

The next printed reference concerning the Candy Creek projectile point appeared in the report on the Camp Creek site:

> The general shape with its recurved side edges and flaring ears is similar to the Cumberland and Quad points, although the Candy Creek points have thinned bases and some have short flutes, either single or multiple. Basal edges are sometimes ground and sometimes not (Lewis and Kneberg 1957:19).

By the time this article appeared, the Candy Creek projectile point was seemingly firmly established as being of Woodland period manufacture. Lewis and Kneberg (1957:19) stated that the repeated occurrence of Candy Creek points on Early Woodland sites in East Tennessee was

evidence of their definite association with the Early Woodland culture. However, Mason (1962:239) noted the similarity of Quad and Candy Creek points.

In addition to the printed references to the Candy Creek projectile points just mentioned, Lewis and Kneberg (1958a:47) illustrate a Candy Creek point along with others as "Early Woodland Arrowpoints." The illustrated Candy Creek point exhibits basal thinning scars and slightly flaring ears. Also illustrated as "Early Woodland Arrowpoints" are a Late Archaic Savannah River point (Claflin 1931) and an Early Archaic Palmer point (Coe 1964:67).

While realizing that the Candy Creek point type was closer to certain Paleo-Indian period projectile point types, Lewis and Kneberg (1957:19) stated that resemblance to the Nolichucky projectile point type (a triangular Woodland point) showed a definite relationship. Citing what they believed to be a rarity to near absence of Archaic period projectile points in East Tennessee, Lewis and Kneberg (1957:20) suggested that Archaic cultures were practically absent from this area. They theorized that the Paleo-Indian period was best represented in the central and western parts of Tennessee (Kneberg 1952:192; Lewis and Kneberg 1957:20). Lewis and Kneberg felt that in East Tennessee the cultural sequence went from Paleo-Indian to Woodland without interruption with actual contact between Paleo-Indian people and Woodland people:

> The various (projectile point) types which have been discussed--Greeneville, Nolichucky, Camp Creek, Hamilton, and Candy Creek, as well as the undifferentiated triangular points--appear to represent a chronological development of the basic trianguloid or lanceolate projectile point tradition which starts in the Paleo-Indian period. The Candy Creek point, on typological grounds is the closest to Paleo-Indian points, particularly

> the Cumberland and Quad types. We believe that its consistent presence in early Woodland sites is evidence of contact between early Woodland peoples and surviving remnants of Paleo-Indian groups. Although in the Southeast in general an Archaic culture period separates the Paleo-Indian horizon from the Woodland, in eastern Tennessee the evidence of Archaic culture is extremely rare, except in the Cumberland Plateau area. The LeCroy site and possibly others in eastern Tennessee indicate both Paleo-Indian and Woodland components (Lewis and Kneberg 1957: 19-20).

The identification of the Candy Creek projectile point type and its assignment to the Early Woodland period of East Tennessee prehistory occurred during a period when American archaeology was undergoing tremendous changes in both method and theory. A better understanding of the problems concerning the Candy Creek projectile point type can be gained by viewing this period of American archaeology in historical perspective. At this time there were two new concepts which had important roles in the identification and cultural assignment of the Candy Creek projectile point type. These two concepts were (1) the ideas of early man in America and time depth in the eastern United States, and (2) typology.

The Concept of Time Depth in the Eastern United States

The Candy Creek site was excavated between 1936 and 1939 and the report on this site, The Prehistory of the Chickamauga Basin in Tennessee, was written in 1941. The study of this site occurred during a time when the concepts of Pleistocene Man in North America and great time depth in the eastern United States were in an embryonic state. Several important articles on Paleo-Indian discoveries were just appearing in the literature at this time. Jesse D. Figgins had published "The Antiquity of Man in America" only ten years earlier in 1927. Frank H. H. Roberts published "A Folsom Complex: Preliminary Report on Investigations at the Lindenmeier Site in Northern Colorado" in 1935 and

"Developments in the Problems of the North American Paleo-Indian" in 1940.

However, these new discoveries were not easily accepted by many archaeologists. The association of artifacts with Pleistocene fossils was not widely believed at first. At the meeting of the American Anthropological Association in 1927 there was great discussion about the reported association of artifacts with Pleistocene bison remains. There were several explanations to demonstrate how the artifacts might have become associated with the fossil bison without the two actually being contemporary. There were others who accepted the association but felt the bison remains were of more recent age than suggested (Roberts 1935:5).

Also during the 1927 meeting of the American Anthropological Association it was revealed that numerous points of the Folsom type were found at mound sites and village sites in New York State and elsewhere in the East (Roberts 1935:5). Lewis and Kneberg were faced with this very situation in their research in the Chickamauga Basin. A fluted point was recovered from a Hamilton burial mound at Hiwassee Island (Lewis and Kneberg 1941:Plate IV; 1946:112).

Further evidence of the lack of the concept of time depth in the eastern United States and particularly in Tennessee can be found in publications and articles by Lewis and Kneberg. Kneberg (1952:192) stated that the earliest people in the East Tennessee valley were the Early Woodland Watts Bar people. Even though Archaic cultures were known in other areas, Lewis and Kneberg felt that these cultures were practically absent from East Tennessee. They theorized that the Paleo-Indian culture existed longer in East Tennessee than in other regions. Peoples with an Archaic lifeway, they postulated, existed in Middle and West Tennessee coeval first with Paleo-Indian peoples and later with Woodland peoples in

East Tennessee. By the late 1950's the Candy Creek projectile point type was seemingly firmly established in the Early Woodland period.

During the 1950's and 1960's a number of important sites were excavated which altered many of the traditional ideas concerning time depth in the East. These sites provided evidence of Archaic culture dating as early as the eighth millenium B.C. Results of the excavations at Graham Cave in Missouri established a cultural sequence of a Dalton horizon followed by later Archaic horizons (Logan 1952; Chapman 1957). This work was duplicated at the Stanfield-Worley Bluff Shelter in northern Alabama (DeJarnette et al. 1962) and Modoc Rock Shelter in Illinois (Fowler 1959a; 1959b). An Archaic cultural sequence for the Carolina Piedmont was established with a Hardaway-Dalton horizon (Coe 1964). St. Albans, an Early Archaic site buried in an alluvial terrace of the Kanawha River, provided an early cultural sequence for West Virginia (Broyles 1966). Russell Cave in northern Alabama provided a cultural sequence from the Mississippian tradition back to the Early Archaic period (Miller 1956; 1957a; 1957b; Griffin 1974). One Dalton projectile point was recovered at Russell Cave (Griffin 1974:41).

Thus Lewis and Kneberg were formulating their ideas before the time depth of the Archaic period was fully understood. There is no question now that East Tennessee was inhabited by Archaic peoples. That a long Archaic sequence occurred in East Tennessee is evidenced by the excavations at the Higgs (40LD45) and Doughty (40LD46) sites (McCollough and Faulkner 1973) and the Rose Island site (40MR44) (Chapman 1975). Recent excavations and testing at the Icehouse Bottom (40MR23), Patrick (40MR40), Harrison Branch (40MR21), Howard (40MR66), Calloway Island (40MR41), Bacon Farm (40LD35), Bussell Island (40LD17), and Iddins

(40LD38) sites have produced further stratified Late, Middle and Early Archaic components.

The Relevance of Typology to the Problem

The second archaeological concept pertinent to the classification of the Candy Creek projectile point type, in its infancy at the time of the Chickamauga Basin fieldwork and report, was the concept of typology. In fact, some of the most important articles concerning typology were published between 1935 and 1945. James A. Ford published "Analysis of Indian Village Site Collections From Louisiana and Mississippi" in 1936 and "A Chronological Method Applicable to the Southeast" in 1938. Irving Rouse published "Prehistory in Haiti, A Study in Method" in 1939. It was not until 1944 that Alex D. Kreiger published "The Typological Concept." Therefore, the concept of typology in archaeology was undergoing refinement and was not fully understood by many at the time the Candy Creek projectile point began to emerge as a type. Evidence that confusion existed concerning typology can be found in the Ford-Spaulding "debates" which continued in the literature until the mid-1950's (Ford 1954a; 1954b; Spaulding 1954a; 1954b).

The author recognized three categories of type among the various definitions appearing in the archaeological literature. Basically, the three categories in this paper follow those of Steward (1954). Steward's "types of types" are "morphological," "historical-index," and "functional."

The morphological or descriptive type. The "morphological" type is the most elementary kind since it is based solely on form--on physical or external properties (Steward 1954:54). Rouse (1960:317) sees this as composed of modes referring primarily to the nature of the

artifacts. Rouse (1972:50) refers to this as an intrinsic type, designed to bring out the nature of the artifacts under study. Spaulding (1960: 443) explains the descriptive type by describing a three point classification system; (1) broad classes, (2) complete attribute comparison, and (3) cluster analysis.

The morphological type is the earliest "type of types" in American archaeological literature. Morphological typology was born in the "Classificatory-Descriptive" period (Willey and Sabloff 1974) of American archaeology and is reflective of the emphasis on classification and description. At this time typology was regarded only as a useful tool for organizing and dealing with artifacts.

The historical or historical-index type. With the establishment of time depth in North American archaeology came the development of the historical type. Steward (1954:54) states that the

> historical-index type, is defined by form but, whereas the morphological type is considered as a characteristic of the culture, this second type has chronological, not cultural, significance. It is a time-marker.

Krieger (1944:272) reflects the views of both the Classificatory-Descriptive and Classificatory-Historical periods when he states that

> the purpose of a type in archaeology must be to provide an organizational tool which will enable the investigator to group specimens into bodies which have demonstrable historical meaning in terms of behavior patterns.

The important distinction for the historical type is that it has temporal and spatial significance.

The functional type. "Functional types are those based on cultural use or role rather than on outward form or chronological position" (Steward 1954:55).

Functional typology is concerned with the utilization of the implements (Bordes 1969:1). Functional typology has always been present to some extent in the archaeological literature. This presence has ranged from blind speculation to educated hypotheses. Functional typology came into its own in the 1950's and 1960's with sophisticated edge-wear analysis. However, there is a sometimes confusing aspect to functional terminology. As Bordes (1969:2) points out, there are functional terms for morphological types. The term projectile point calls to mind a particular morphological form regardless of its functional assignment as a knife or drill.

That projectile point typology was not fully understood by Lewis and Kneberg is evidenced by their favorable comparison of two dissimilar specimens (Lewis and Kneberg 1941:34,Plate IV,no. 16 and 17). These two specimens are clearly of different and unrelated types. One specimen is obviously a fluted Paleo-Indian projectile point. The second is a point belonging to the Woodland period and is somewhat similar to the Copena type (Webb and DeJarnette 1942). The only similarity between the two is that they are both lanceolate points with recurvate blade edges. However, the two specimens differ in several ways reflecting different manufacturing techniques. The Paleo-Indian point is characterized by a single flute extending along the center from the base over two-thirds of the entire length. The specimen has a concave base and the flaking is fine and well controlled.

The Woodland point has a straight base and the flaking consists of large irregular flakes extending into and across the center of the specimen.

Further evidence of typological error on the part of Lewis and Kneberg can be seen in an examination of the projectile points from the Candy Creek site. According to the artifact catalogue from the Candy Creek site, 31 projectile points were assigned to the Candy Creek type (Frank H. McClung Museum files). Of these specimens, 27 could be located for the present study. These 27 specimens certainly do not represent an homogeneous group. Several different projectile point types are represented in this group. These specimens seem to form several different formal clusters. There are two specimens that do indeed belong in the late Paleo-Indian/Early Archaic category. Neither is a complete specimen but both are well manufactured projectile points with well defined basal thinning scars reflecting the technique of the late Paleo-Indian/Early Archaic transitional period. One of the points appears to be a Beaver Lake point (DeJarnette et al. 1962:47) and the other appears to be a Dalton point (Chapman 1948:138).

There is a cluster of three specimens of diagnostic Early Woodland triangular projectile points. These specimens have fairly straight blade edges (one specimen has one incurvate blade edge) and incurvate bases. These three examples fall within the Camp Creek type defined by Kneberg (1956:23). All three specimens are nearly complete.

A group of ten specimens from the Candy Creek site forms a cluster less homogeneous than the clusters discussed above. This group is generally triangular to lanceolate with recurved blade edges. Several of these specimens belong within the Nolichucky type described by Kneberg (1957:65). All of the specimens in this cluster are complete or nearly complete. The largest percentage of these specimens are crude, poorly made points. These may be unfinished specimens. One specimen does appear to have

been aborted. The points in this cluster have retouch along the basal concavity but this does not approach formal basal thinning.

There are two specimens catalogued as Candy Creek points which belong in classes by themselves. One of these is a short thick broken specimen which appears to be the stem of a large stemmed projectile point. The second specimen which belongs in its own class is a broken specimen which appears to be side notched. Closer examination reveals that the shoulders are broken and that it is actually a Kirk corner notched projectile point (Coe 1964).

There are a number of attributes shared by the Candy Creek site specimens. The most common attribute shared by this group is grinding. Grinding is not unusual on the basal edges of the Nolichucky projectile point type (Kneberg 1957:65). An examination of Nolichucky, Greeneville, and Camp Creek projectile point types by the author revealed that grinding occurs on the basal edges of all of these Early Woodland point types. Another trait shared by most of the specimens is breakage. Most of these points are incomplete. Accurate reconstruction of some of the specimens would be difficult if not impossible. Most of the specimens have the recurvate blade edges reported by Kneberg (1956:23) to be characteristic of the Candy Creek type. However, this trait is also characteristic of the Nolichucky type (Kneberg 1957:65). There are also specimens in this group that do not have recurvate blade edges. There are triangular points with straight blade edges and even one example of a corner notched projectile point. In summary, the projectile points from the Candy Creek site, which were classified according to the catalogue in the Frank H. McClung Museum as Candy Creek types, are a very heterogeneous group.

Now that the uses, misuses, and definitions of typology have been reviewed, it would be useful to explore its application to the questions raised in this paper. The Dalton projectile point is obviously a morphological type. Its morphological attributes make it easily distinguishable. It is also an historical type. The Dalton projectile point occupies a unique niche in the cultural sequence of the southeastern United States. The Dalton complex bridges the gap between the Paleo-Indian and Archaic periods. The Dalton complex contains elements of both periods. And as Morse (1971; 1973) and Goodyear (1974) have demonstrated, the Dalton projectile point can be linked to a specific function. However, what light can a typological study shed on problems during this era of "processual archaeology?" The results of the research reported in this thesis will provide ample evidence for the value of typological studies. However, an overemphasis on typology must be cautioned against. As Bordes (1969:3) points out:

> One of the dangers of the use of morphological typology is that one can occasionally get lost in insignificant details, or else not know how to separate what is important from what is not.

When one becomes overly concerned with minor, insignificant details, the result may be several different variants of one type in a very restricted area. This is the case concerning the Dalton variants in the Stanfield-Worley report (DeJarnette et al. 1962). This also results when different type names are given to the same projectile point type in its various resharpened forms. Such is the case concerning the Kirk projectile point type in Cambron and Hulse (1962). Resharpened Kirk specimens appear illustrated under such type names as Ecusta, Pine Tree, and Pine Tree Corner Notched. Work at the Icehouse Bottom site (Chapman 1977) found all of these types in the context of an Early

Archaic Kirk component with no apparent separation of the types.

The Dalton Variants of Alabama and North Carolina

The concept of a Dalton projectile point type developed coeval with the concept of a Candy Creek type. The Dalton projectile point type developed out of several different types, all included in a description of "Dalton Culture" by Chapman (1948:138). Included in the "Dalton Culture" were lanceolate projectile points, corner notched projectile points, stemmed projectile points, and side notched points (Chapman 1948:138).

The discovery of the Nuckolls site (Lewis and Kneberg 1958b) in Tennessee and the Stanfield-Worley Bluff Shelter in Alabama contributed to a better understanding of the Dalton assemblage and its place in the cultural sequence. However, these sites also created confusion concerning Dalton typology. These two sites produced three new Dalton variants. These variants are the Colbert Dalton (DeJarnette et al. 1962:51), Nuckolls Dalton (DeJarnette et al. 1962:65), and Greenbriar Dalton (DeJarnette et al. 1962:57).

The Colbert Dalton projectile point type is described as:

> A small to medium-sized Dalton point with a square, ground basal section and a triangular blade ... The sides of the basal portion may be straight or concave. There is usually a sharp break in the contour where the blade edges join the basal edges. The blade edges are usually straight and may be serrated and/or beveled. The base may be straight or concave. The ground basal portion is rectanguloid ... known locally as Square Based Dalton (DeJarnette et al. 1962:51).

The Nuckolls Dalton is:

> A small to medium-sized trianguloid point with straight tangs ... Usually has parallel-edged ground basal portion. The blade edges are excurvate or straight toward the point tip; the base is usually concave ... Similar to Greenbriar Dalton except for the parallel basal edges, and they tend to merge typologically (DeJarnette et al. 1962:65).

The Greenbriar Dalton is described as:

> a small to medium-sized, trianguloid point with expanded tangs or "ears" ... The blade is usually incurvate or recurvate. The basal edge is concave and ground. There is breadth in the blade contour at the junction of blade and basal area. The distinguishing feature of this type is the expanded, rounded tangs (DeJarnette et al. 1962:57).

As previously stated in the description, the Colbert Dalton is distinguished by a square, ground haft element (DeJarnette et al. 1962:51). The Nuckolls Dalton has a parallel-edged ground haft element (DeJarnette et al. 1962:65). Obviously, a parallel-edged haft element will result in a square base. By examining the photographs and drawings of Nuckolls Daltons (DeJarnette et al. 1962:Fig.39), Colbert Daltons (DeJarnette et al. 1962:Fig.37), and all Dalton variants (DeJarnette et al. 1962:Fig.47), it would appear that there is questionable validity in distinguishing between Colbert and Nuckolls variants. There does not seem to be a basis for distinguishing the Greenbriar Dalton variant. The Greenbriar variant is distinguished by its flaring ears (DeJarnette et al. 1962:57). However, there is also confusion concerning the Greenbriar variant. Specimens identified as belonging to the Colbert variant are shown with flaring ears and without square haft elements (DeJarnette et al. 1962:Fig.37).

In summary, the division of the Dalton specimens from the Stanfield-Worley Bluff Shelter seems questionable. The Colbert and Nuckolls variants appear to be nearly identical. While there seems to be validity in separating the Greenbriar variant from the square base or parallel-edged base Daltons, the actual separation appears inconsistent. A thorough examination of the attributes of these three variants and a discriminant function program may prove useful in answering this question.

Some specimens from northern Alabama identified as belonging to the Quad projectile point type were included in the Alabama sample examined in this thesis. The Quad projectile point type was first described in the literature as:

> a medium sized point with an average length of two or two and a half inches, a width of about one inch, and a maximum thickness of slightly more than one-quarter inch. Some examples are fluted but the majority are unfluted. Its outline is approximately triangular, with flaring "ears." It has a concave base, and the sides may be parallel or slightly incurved for a short distance above the "ears." The lateral edges adjacent to the base are usually ground for about one-third the length of the point, and the grinding often continues across the basal concavity. The flaking is typical of Paleo points, being well executed with careful chipping (Cambron and Waters 1959:77-79).

When discussing the difference between Dalton and Quad points with the author, Cambron and Hulse (personal communication) distinguished between the two, with Quad having excurvate blade edges and Daltons having resharpened blade edges with a noticeable reduction of the blade margins just above the shoulders.

Rounding out the list of traditional projectile point types included in this thesis is the Hardaway-Dalton type found in the Carolina Piedmont. Receiving its name from the Hardaway site (31ST4), the Hardaway-Dalton projectile point type is described as:

> a broad, thin blade with deeply concave bases and shallow side-notches. Bases and side-notches were ground and edges were frequently serrated ... There appears to be a definite connection between the Dalton or Meserve type in Missouri and the Hardaway type in the Carolina Piedmont (Coe 1964:64).

In summary, the definition of the Candy Creek projectile point type developed during a time when time depth and typology were not fully understood. The specimens from the Candy Creek site, classified by Lewis and Kneberg as Candy Creek types, are a very heterogeneous group.

The variety of specimens included in this group reflects the understanding of time depth and typology during the 1930's. The concept of the Dalton projectile point type and Dalton variants developed after the Chickamauga Basin fieldwork. The development of the concept of the Candy Creek projectile point type resulted in the erroneous placement of this type within the Early Woodland period.

CHAPTER II

THE STUDY

The central theme of this thesis is to demonstrate that the Candy Creek projectile point type is actually a Dalton variant. To accomplish this, a total of 112 points corresponding to the Candy Creek description from East Tennessee was examined. These specimens were obtained from a number of sources. The majority of these specimens were obtained from private collectors in East Tennessee. The remainder of the specimens were obtained from collections housed in the Frank H. McClung Museum at The University of Tennessee, Knoxville.

For the purposes of this study, only specimens from the Ridge and Valley physiographic province of East Tennessee were included because: (1) the Candy Creek projectile point type was first identified in the aforementioned area, (2) this point type is found widely in this area, (3) Candy Creek points are seldom mentioned in the literature outside of this area (except in northern Alabama), and (4) comparisons can be made with similar point types in adjoining physiographic provinces when this approach is taken. For the remainder of this thesis the Tennessee points under analysis (Candy Creek) will be referred to as East Tennessee Daltons, or, the Tennessee sample.

For the purposes of comparison, collections from two other physiographic provinces were examined. A total of 46 specimens identified as either Quad (Cambron and Waters 1959) or Dalton (Chapman 1948: 138) projectile point types from the Tennessee River Valley of northern Alabama, and 37 specimens identified as Hardaway-Dalton (Coe 1964:64)

from the Piedmont of North Carolina were also examined.

Each specimen was thoroughly examined and the pre-selected attributes were observed and measured. The attributes selected for the study were chosen because they were judged to be the most important in reflecting regional and typological variation, or manufacturing techniques. The discrete attributes for the most part could be noted only as present or absent. These could not be further quantified. Grinding is the exception to this. When grinding was present it was noted whether this was light, medium, or heavy. The continuous attributes could, however, be quantified. All continuous attributes except inclination angles were measured in millimeters with a sliding caliper. The material from which the specimen was made was noted and any comments were recorded on note cards. The outline of each specimen was drawn as nearly as possible to the exact shape and size. Whenever possible, lateral cross-sections were drawn showing the cross-section of the specimen at the mid-point as well as reflecting the results of beveling and basal thinning. After each group or collection of specimens was examined they were photographed. A list and definition of the attributes will appear later in this thesis.

After all of the specimens were examined, the totals, means, and standard deviations were tabulated for each attribute within each of the three samples (Tennessee, Alabama, and North Carolina). After this was accomplished all incomplete specimens were excluded from the sample. A new set of note cards was filled out for the complete and nearly complete specimens. The information from these cards was transferred to keypunch cards and a linear discriminant function analysis was performed with a computer to gain further information about the three

samples. The computer program and related information will be discussed in Chapter VI. With the computer program completed the data collecting phase of the study ended. It was then possible to examine the results and determine what information was gained and what statements could be made concerning Dalton projectile points in East Tennessee.

CHAPTER III

PROJECTILE POINT MORPHOLOGY

Before progressing to a description of the attributes, it is essential to examine the morphology of the Dalton projectile point. It would be difficult to understand the location and significance of the attributes if the form and structure of the projectile point itself is not understood.

As demonstrated in Chapter I, projectile point typology and morphology can be very confusing. Deciding which attributes are important is a problem. Binford (1963) sought to relieve some of this confusion with his very thorough treatment of projectile point typology, morphology, and attributes. However, Binford did not specifically deal with Dalton or similar lanceolate projectile points. Ahler (1970) and Luchterhand (1970) specifically deal with Dalton projectile points. For these reasons, a combination of Binford (1963), Ahler (1970), and Luchterhand (1970) will be roughly followed in the projectile point morphology and attributes used in this thesis.

In this study, the Dalton projectile point is oriented as follows (Figure 1). The specimen should be on the dorsal surface with the proximal end down and the distal end pointing up. The proximal end is that segment which contains the haft element. The distal end is that part with the tip or working end. The ventral or inner surface is that part of the original flake which was last in contact with the core (Crabtree 1972:59; White 1963:Fig.5). The ventral surface is flatter and sometimes contains a remnant of the original flake surface.

(A)

(B)

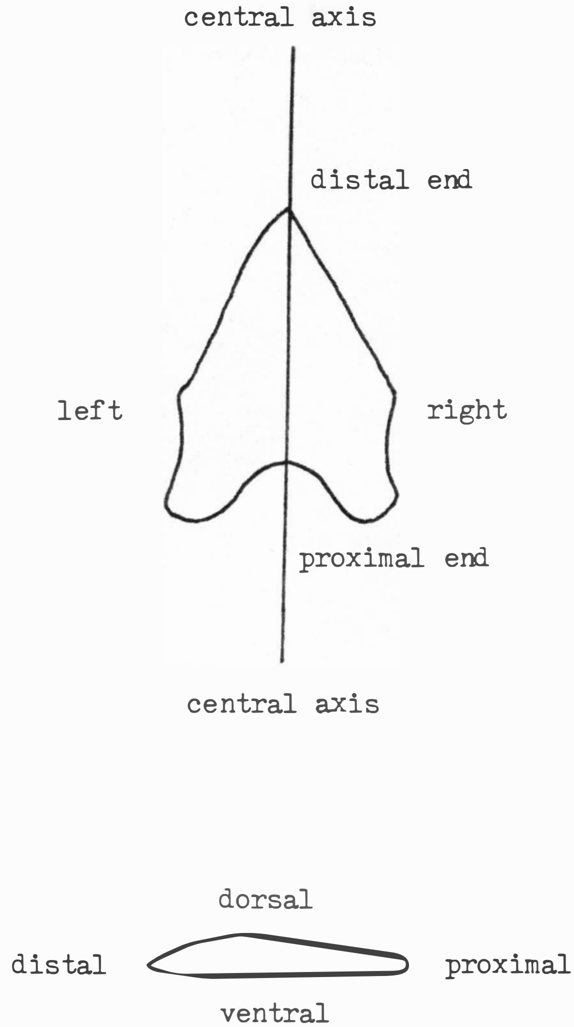


Figure 1. Dalton projectile point orientation. (A) Proper orientation of a projectile point; (B) longitudinal section showing the dorsal and ventral surfaces.

The dorsal surface often has a keel or hump present.

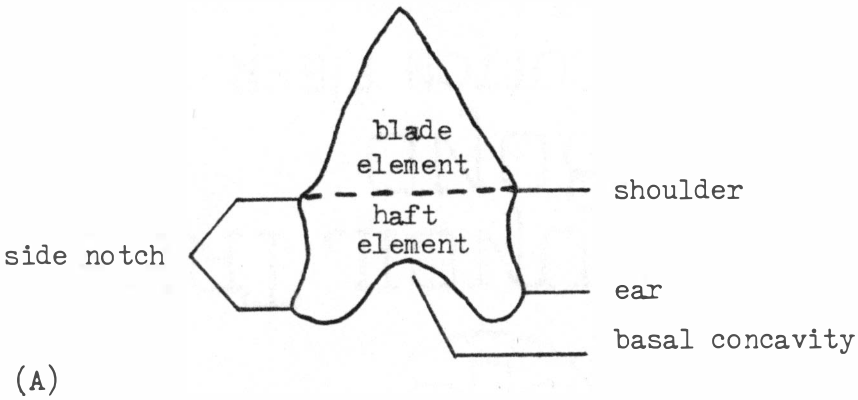
The haft element (Figure 2) is that segment of the specimen which was hafted or attached to a shaft or handle of some sort. For Dalton points the haft element is that portion of the specimen proximal from a line connecting the shoulders (Ahler 1970:Fig.4). This corresponds to Luchterhand's (1970:Fig.4) tang portion and Binford's (1963:197-199) tang element. The remainder of the specimen, distal from the shoulders, is defined as the blade element or portion (Ahler 1970:Fig.4; Luchterhand 1970:Fig.4).

The shoulders of a Dalton point are the two points on the lateral margins where the blade element meets the haft element. This is the most distal part of the haft element. Immediately distal from the shoulders of most Dalton points the blade edges taper to the distal end or tip. This leaves the shoulder as an exposed point along the margin of the specimen.

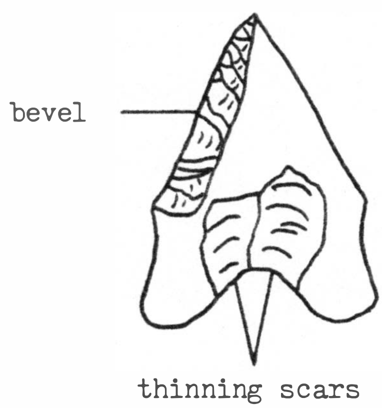
The side notches of Dalton points are located along the lateral margins of the haft element. The side notches are the ground incurvate edges between the shoulder and the most proximal part of the specimen. Luchterhand (1970) does not define side notch. However, his illustration of the attribute notch width (1970:Fig.5) amply demonstrates that our concepts of side notch correspond.

The ears of a Dalton point are the most proximal segment of the specimen. These are the slightly flared projections on the base of a point. The basal concavity is the notch on the base of a specimen flanked by the two ears.

The segments of a Dalton point mentioned so far all concern the



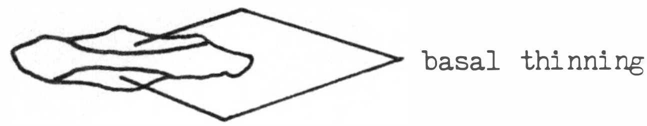
(A)



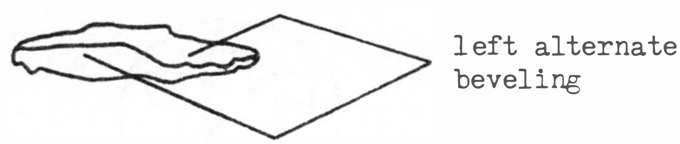
(B)

Figure 2. Morphology of a Dalton projectile point. (A) side notch, blade element, haft element, shoulder, ear, basal concavity; (B) bevel, thinning scars

shape or form of the specimen. However, the remaining components are all reflections of the manufacture of the specimen. The thinning scars (Figure 3) are the scars of flakes removed from the base to accomplish thinning of the haft element. The thinning scars extend from the basal concavity into the body of the specimen. A bevel is retouch along the blade margin resulting in a steepening of the blade margin on one surface only. For the purposes of this study, a specimen is considered beveled if resharpening resulted in the blade edge breaking a plane from one edge to the other through the center of the specimen when viewed in transverse or cross section. Alternate beveling is when the beveling occurs on the same margin on both surfaces. Serrations sometimes occur along the blade edges. These denticulate edges were often worn away leaving only faint remnants.



(A)



(B)

Figure 3. Transverse sections of a Dalton specimen. (A) Transverse section showing the result of basal thinning compared with the maximum thickness; (B) transverse section demonstrating the effects of beveling in relation to the normal placement of the blade edges (at the extreme margins of the specimen).

CHAPTER IV

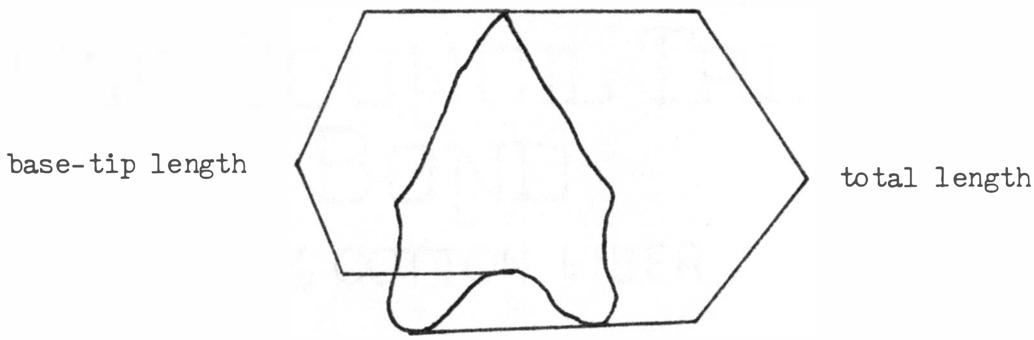
THE ATTRIBUTES

The attributes used in this study can be divided into two groups; continuous attributes and discrete attributes. Runyon and Haber (1971:17) define continuous attributes as those variables which may take on an unlimited number of intermediate values, and discrete attributes as those variables which can take on a finite number of values. The continuous attributes in this thesis were metrically quantified, while the detection of discrete attributes was usually based on either their presence or absence or subjectively by degree.

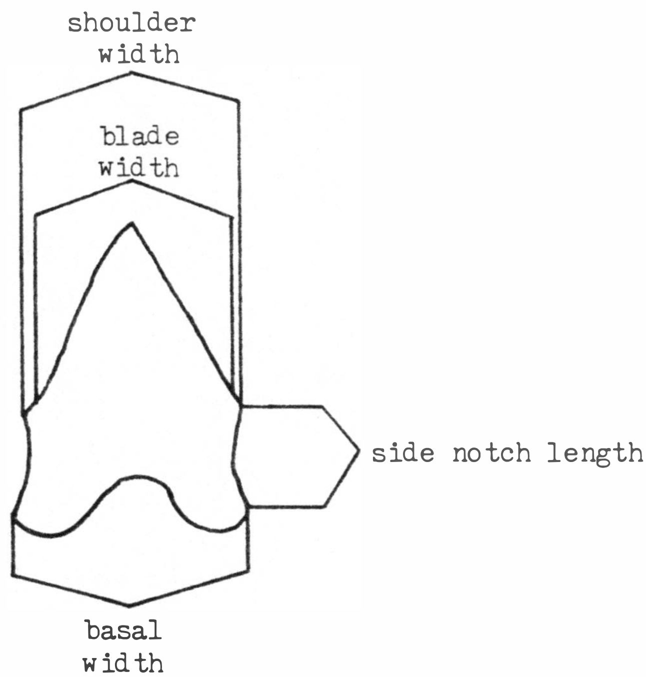
Continuous attributes (Figures 4,5,6, and 7)

Total length. Following Ahler's (1970:21) attribute of total length, this measurement is taken perpendicularly from the baseline to the distal blade tip. Total length as defined here corresponds to Luchterhand's (1970:18) attribute of axial length. Binford (1963:219) defines axial length as the measurement along the longitudinal axis of the specimen between the tip and the basal edge. There is some discrepancy and confusion with Binford's definition because Dalton and other projectile point types have concave bases. The Binford measurement would disregard the additional distance consisting of the ears of the point which extend below the basal concavity.

Base-tip length. This measurement is defined as the shortest distance from the basal concavity to the distal end of the point. This attribute corresponds to Binford's (1963:219) attribute axial length

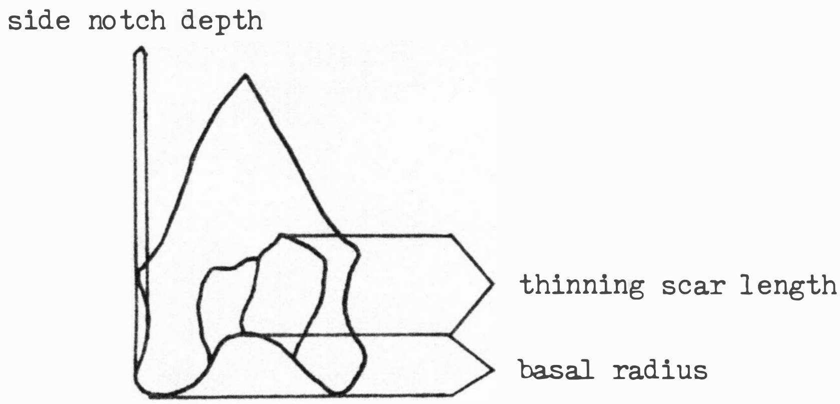


(A)

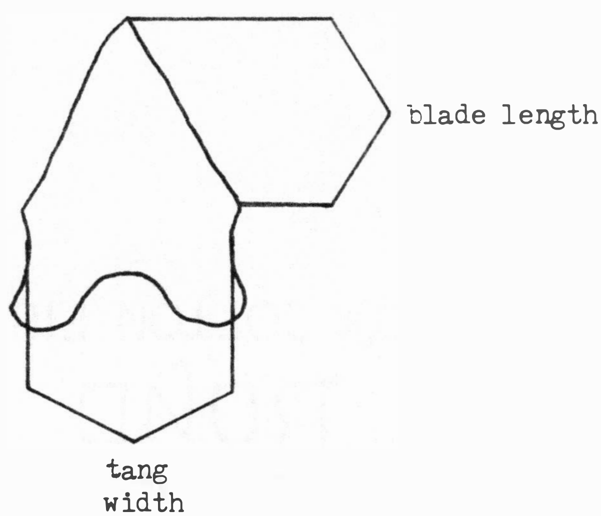


(B)

Figure 4. The location of continuous attributes. (A) total length and base-tip length; (B) side notch length, shoulder width, blade width and basal width.



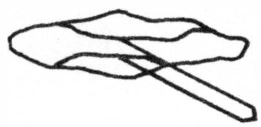
(A)



(B)

Figure 5. The location of five continuous attributes. (A) thinning scar length, basal radius, and side notch depth; (B) blade length and tang width.

(A)



(B)

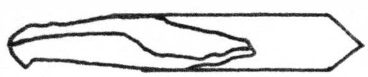


Figure 6. The location of continuous attributes (A) basal thickness; (B) thickness (maximum thickness).

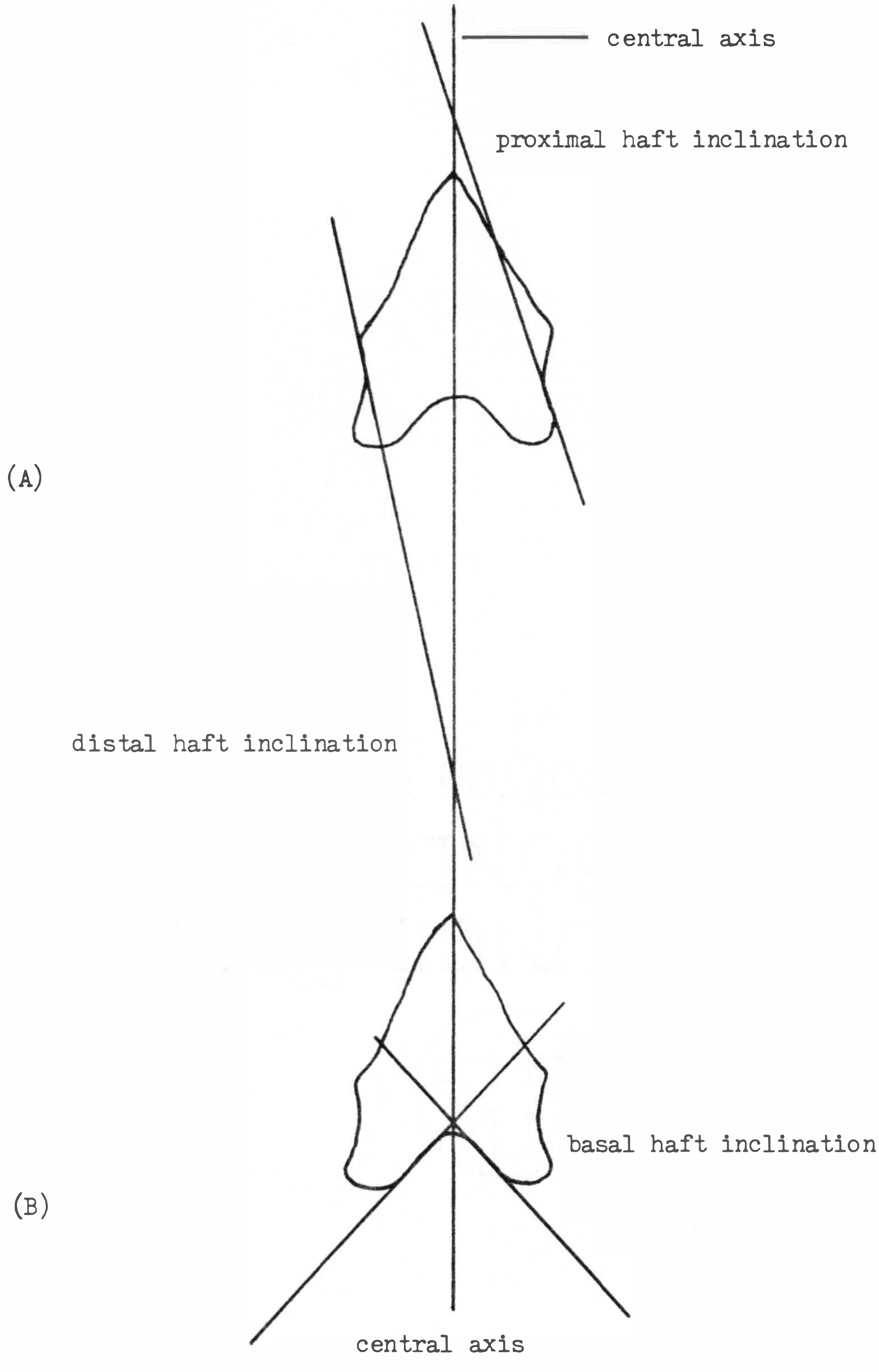


Figure 7. The location of the haft inclination angles. (A) proximal haft inclination and distal haft inclination; (B) basal haft inclination.

outlined above. Base-tip length was measured but not intended as an attribute in itself although it can be considered as such. When this measurement on a specimen is subtracted from the total length of the same point, the basal radius is determined.

Blade length. Blade length is the measurement of the blade element along the longitudinal axis (Luchterhand 1970:18; Binford 1963:219). In other words, blade length is the distance from the shoulders to the distal end of the point.

Side notch length. Stated simply, side notch length is the proximal-distance along the lateral edges of the haft element. This measurement is taken from the shoulder of the specimen to the point at which the ear begins to become rounded. In other words, when the lateral edge of the haft element of a Dalton point is rested on a plane there will be two points on the specimen which touch the plane. The distance along this plane between the two points is the side notch length. Measurements were taken of both the left and right side notch lengths in this study. The side notch length described above corresponds to the notch width described by Luchterhand (1970:18) as the distance between the two points at which a line is tangent to the base and blade. However, since the measurement is taken roughly parallel to the central axis it is referred to as length in this study. Side notch length is also equivalent to Binford's (1963:219) attribute notch length.

Basal radius. Basal radius is the depth of the basal concavity. This measurement is the distance from a line drawn between the most

proximal points of the base to the deepest point of the basal concavity. The basal radius is determined by subtracting the base-tip length from the total length. Basal radius here corresponds to Luchterhand's (1970:21) attribute basal radius and to Ahler's (1970:22) attribute basal center point length.

Thickness. Thickness is defined as the maximum thickness of a specimen. This measurement is identical to Luchterhand's (1970:18) attribute thickness and Ahler's (1970:22) attribute maximum thickness.

Basal thickness. Basal thickness is defined as the thickness measured 5 mm. toward the distal end from the basal concavity. This measurement was taken to determine the amount of basal thinning performed during manufacture.

Side notch depth. Side notch depth is defined as the perpendicular distance from a line tangent to the projectile point at both its base and its shoulder to a line parallel to it and tangent to the interior extremity of the notch (Luchterhand 1970:18). This measurement was taken on both the right and left margins of the specimen.

Thinning scar length. The thinning scar length of a specimen is the distance between the basal concavity and the point at which the longest thinning scars end. This measurement was taken to give information on the manufacture of the projectile point. In the case of multiple thinning scars, the longest measurement was recorded. Thinning scar length is identical to the basal thinning length defined by Ahler (1970:22). This measurement was recorded for both dorsal and ventral thinning scars.

Basal width. Basal width, or the width at the ears, was determined by taking a measurement of the greatest width at the proximal part of the haft element. This attribute corresponds to Luchterhand's (1970:18) attribute base width and to Ahler's (1970:22) attribute proximal haft element width. This is usually the greatest width on the Dalton projectile points studied.

Tang width. Tang width, or the width of the tang, is defined as the minimum width on the haft element of a specimen (Luchterhand 1970:18; Binford 1963:219). This measurement corresponds to Ahler's (1970:22) attribute distal haft element width. This measurement, therefore, is the least distance from one side notch to the other.

Shoulder width. This attribute is defined as the measurement of width taken where the haft element joins the blade of a specimen (Luchterhand 1970:18; Binford 1963:219). Ahler (1970:22) calls this attribute blade base width and defines it as the distance between two points; one on each lateral blade margin, nearest the baseline, measured parallel to the baseline. This would be the point at the shoulders.

Blade width. For the purposes of this study this attribute is defined as the greatest width of the blade element of a specimen. Since Dalton projectile points were continually resharpened, this measurement was nearly always taken only slightly toward the distal end of the specimen from its shoulders. After the study was completed, this attribute was determined to provide little information. It is urged that in future studies of this nature at least two, and possibly three,

measurements of blade width should be taken at different locations on the blade element. This procedure would more accurately reflect the shape of the blade and the results of resharpening.

Proximal haft inclination. Proximal haft inclination on Dalton points is defined by Luchterhand (1970:21) as the angle formed by a line tangent to the proximal end of the haft element (side notch) with the central axis of the specimen. Proximal haft inclination was taken on both the left and right proximal edges of the side notch.

Distal haft inclination. This attribute is defined for Dalton points by Luchterhand (1970:21) as the angle formed by the line tangent to the distal part of the haft element (side notch) with the central axis of the specimen. This measurement was taken on both the left and right distal haft elements.

Basal haft inclination. Basal haft inclination is defined by the author as the angle formed by lines parallel to the edges of the basal concavity. This angle is usually bisected by the central axis. When a broken specimen prevented measurement of the whole angle, half of the angle was measured on the unbroken side of the base. The partial angle, measured on either side of the basal concavity, is the angle formed by a line parallel to the edge of the basal concavity intersecting the central axis. Basal haft inclination was measured on the left and right angles as well as total angles whenever possible.

Length/width ratio. The length/width ratio is determined by dividing the length of the specimen by its width. In this study, the

length/width ratio was calculated for the shoulder width and the basal width. Since the greatest width varied from specimen to specimen between the shoulder width and basal width, the length/greatest width ratio was also calculated.

Discrete Attributes

Grinding. A study of grinding was carried beyond simply noting whether or not this attribute was present or absent. Since virtually all of the specimens observed exhibit some form of ground bases, it was felt necessary to qualify this attribute. Grinding was noted as either light, medium, or heavy. Although subjective, the intensity of grinding corresponds metrically as light--less than 0.5 mm.; medium--0.5 mm. to 1.0 mm.; and heavy--greater than 1.0 mm. This is an attempt to provide quantitative information on a subjective determination. Therefore, future researchers will have a clearer understanding of this procedure.

Beveling. For the purposes of this study, beveling is defined as any resharpening of the blade which results in the blade edges breaking a horizontal plane when viewed in cross section.

Serration. Serration is defined as notches in the blade edge resulting in a denticulate blade margin.

CHAPTER V

RESULTS OF THE OBSERVATIONS AND MEASUREMENTS

The results of the measurements of continuous attributes are shown in Table 1. The results of the observation of discrete attributes are shown in Tables 2, 3 and 4. The three main groups; Tennessee, North Carolina, and Alabama, appear as the top three rows for each attribute. The Alabama group is then broken down into Dalton and Quad projectile point types. The last row in each column is the collection of specimens from the Candy Creek site. According to the files at the Frank H. McClung Museum at The University of Tennessee, Knoxville, each of these specimens is identified as belonging to the Candy Creek projectile point type.

Even though the points from the Candy Creek site seem to fit within the range of many of the measurements in the study, their total morphology is radically different. The Candy Creek site attributes whose means are similar to those of the Dalton groups include total length, basal width, tang width, shoulder width, blade width, and blade length. However, the closeness of these attributes is not unexpected. The means of these attributes may be close on a number of different lanceolate projectile point types. In fact, attribute means of gross size may be close between Dalton groups and radically different projectile point types, such as corner notched, bifurcated base or stemmed. The group from the Candy Creek site does not differ radically from the Dalton groups on other attributes such as basal radius, thickness, basal thickness, thinning scar lengths and especially proximal, distal, and basal

Table 1. Summary of the Continuous Attributes.

Group	Number of Specimens	Mean (mm)	Range (mm)	Standard Deviation
TOTAL LENGTH				
Tennessee	76	36.20	25.50-50.30	4.89
North Carolina	18	56.44	40.00-88.15	13.32
Total Alabama	23	51.73	26.70-68.50	10.16
North Alabama Daltons	8	53.08	43.60-68.50	6.93
Quad Points	9	58.24	42.50-66.95	6.77
Stanfield-Worley	6	40.15	26.70-48.20	7.92
Candy Creek Site	12	45.98	30.95-64.25	9.66
BASE-TIP LENGTH				
Tennessee	76	31.91	21.65-42.50	4.49
North Carolina	17	48.75	33.45-80.00	13.27
Total Alabama	23	47.99	23.60-64.00	9.75
North Alabama Daltons	8	49.31	41.50-64.00	6.54
Quad Points	9	54.18	41.50-62.25	6.05
Stanfield-Worley	6	36.93	23.60-45.65	8.39
Candy Creek Site	12	45.05	29.80-64.25	9.58

Table 1 (continued)

Group	Number of Specimens	Mean (mm)	Range (mm)	Standard Deviation
BASAL WIDTH				
Tennessee	91	25.47	17.50-30.55	2.58
North Carolina	30	32.36	25.10-39.00	3.87
Total Alabama	26	25.24	19.20-37.10	4.13
North Alabama Daltons	5	24.22	19.30-30.20	3.67
Quad Points	13	27.16	21.30-37.10	4.33
Stanfield-Worley	8	22.77	19.20-25.70	1.98
Candy Creek Site	20	22.68	18.70-28.00	2.70
TANG WIDTH				
Tennessee	106	22.86	16.20-27.10	2.31
North Carolina	32	28.24	23.85-33.90	3.08
Total Alabama	38	21.60	14.90-30.70	3.28
North Alabama Daltons	9	21.14	16.40-25.50	2.96
Quad Points	16	23.45	19.00-30.70	3.14
Stanfield-Worley	13	19.64	14.90-22.90	2.27
Candy Creek Site	24	20.86	17.00-25.60	2.04

Table 1 (continued)

Group	Number of Specimens	Mean (mm)	Range (mm)	Standard Deviation
SHOULDER WIDTH				
Tennessee	94	24.02	19.00-28.60	2.22
North Carolina	35	30.99	23.35-43.95	4.47
Total Alabama	32	22.98	15.00-32.90	3.55
North Alabama Daltons	9	23.26	18.60-26.95	2.68
Quad Points	12	25.18	21.10-32.90	3.58
Stanfield-Worley	11	20.34	15.00-23.10	2.14
Candy Creek Site	16	24.56	19.75-31.50	3.43
BLADE WIDTH				
Tennessee	95	22.65	18.40-28.60	2.18
North Carolina	34	30.25	21.45-44.05	5.30
Total Alabama	36	21.66	14.00-29.15	3.28
North Alabama Daltons	11	21.98	18.80-26.00	2.23
Quad Points	13	23.87	19.30-29.15	3.05
Stanfield-Worley	12	18.96	14.00-21.70	2.22
Candy Creek Site	16	25.04	16.15-31.15	3.67

Table 1 (continued)

Group	Number of Specimens	Mean (mm)	Range (mm)	Standard Deviation
BLADE LENGTH				
Tennessee	76	21.84	11.95-32.80	4.65
North Carolina	18	40.15	26.60-70.45	12.37
Total Alabama	23	32.25	13.70-45.80	7.65
North Alabama Daltons	8	33.54	28.65-45.80	5.46
Quad Points	9	36.05	24.85-43.15	5.79
Stanfield-Worley	6	24.81	13.70-38.10	7.41
Candy Creek Site	11	28.82	21.40-47.80	6.97
SIDE NOTCH LENGTH (LEFT)				
Tennessee	93	13.40	7.90-20.05	2.25
North Carolina	34	14.57	8.00-22.48	3.41
Total Alabama	31	17.45	8.00-27.25	4.22
North Alabama Daltons	8	17.70	12.50-20.90	2.54
Quad Points	13	19.88	15.10-27.25	3.35
Stanfield-Worley	10	14.09	8.00-20.00	4.05
Candy Creek Site	13	19.57	12.10-33.20	5.68

Table 1 (continued)

Group	Number of Specimens	Mean (mm)	Range (mm)	Standard Deviation
SIDE NOTCH LENGTH (RIGHT)				
Tennessee	90	13.00	7.15-18.55	2.15
North Carolina	31	14.21	9.00-21.70	3.00
Total Alabama	26	18.59	9.60-29.80	4.62
North Alabama Daltons	7	18.50	15.40-23.30	2.88
Quad Points	11	21.25	12.90-29.80	4.51
Stanfield-Worley	8	15.00	9.60-20.60	3.41
Candy Creek Site	15	19.15	12.30-33.10	4.97
BASAL RADIUS				
Tennessee	108	4.17	0.50-8.00	1.43
North Carolina	36	8.04	4.25-13.15	2.12
Total Alabama	44	3.68	1.00-8.00	1.58
North Alabama Daltons	11	3.58	2.00-6.00	1.24
Quad Points	20	4.20	1.00-8.00	1.83
Stanfield-Worley	13	2.97	1.10-4.75	1.05
Candy Creek Site	24	1.30	0.00-3.30	0.83

Table 1 (continued)

Group	Number of Specimens	Mean (mm)	Range (mm)	Standard Deviation
THICKNESS				
Tennessee	101	6.41	4.95-9.00	0.71
North Carolina	37	6.66	5.10-9.00	0.92
Total Alabama	45	6.77	5.00-9.40	1.07
North Alabama Daltons	12	6.41	5.20-8.50	0.82
Quad Points	21	7.43	5.50-9.40	1.00
Stanfield-Worley	12	6.05	5.00-7.70	0.67
Candy Creek Site	24	8.29	5.70-11.40	1.50
BASAL THICKNESS				
Tennessee	112	3.97	2.75-5.65	0.52
North Carolina	36	3.77	2.55-5.00	0.60
Total Alabama	45	3.90	2.70-5.90	0.62
North Alabama Daltons	12	3.63	3.00-4.10	0.39
Quad Points	20	4.05	2.80-5.90	0.73
Stanfield-Worley	13	3.92	2.70-4.60	0.50
Candy Creek Site	27	4.56	3.55-5.90	0.51

Table 1 (continued)

Group	Number of Specimens	Mean (mm)	Range (mm)	Standard Deviation
SIDE NOTCH DEPTH (LEFT)				
Tennessee	95	0.91	0.30-1.75	0.33
North Carolina	34	1.46	0.50-3.10	0.60
Total Alabama	32	1.22	0.60-2.20	0.41
North Alabama Daltons	8	1.09	0.80-1.50	0.25
Quad Points	13	1.32	0.60-2.20	0.43
Stanfield-Worley	11	1.20	0.70-1.90	0.44
Candy Creek Site	13	1.10	0.50-2.40	0.51
SIDE NOTCH DEPTH (RIGHT)				
Tennessee	86	0.91	0.10-1.95	0.37
North Carolina	31	1.54	0.70-4.45	0.78
Total Alabama	26	1.17	0.75-2.00	0.32
North Alabama Daltons	8	1.16	0.80-1.40	0.21
Quad Points	11	1.24	0.80-2.00	0.36
Stanfield-Worley	7	1.08	0.75-1.80	0.33
Candy Creek Site	14	0.92	0.20-1.80	0.47

Table 1 (continued)

Group	Number of Specimens	Mean (mm)	Range (mm)	Standard Deviation
DORSAL THINNING SCAR LENGTH				
Tennessee	103	10.06	4.45-20.00	3.36
North Carolina	35	13.43	5.00-24.85	4.45
Total Alabama	45	10.26	4.00-23.70	3.90
North Alabama Daltons	11	9.66	5.20-15.30	3.76
Quad Points	21	11.00	4.00-23.70	4.55
Stanfield-Worley	13	9.55	6.10-14.05	2.38
Candy Creek Site	27	9.10	3.60-17.80	3.63
VENTRAL THINNING SCA LENGTH				
Tennessee	107	9.92	4.00-25.80	3.74
North Carolina	35	13.52	6.30-29.60	4.98
Total Alabama	45	12.08	5.20-22.00	4.09
North Alabama Daltons	12	12.39	6.70-19.60	3.16
Quad Points	20	12.92	6.50-22.00	4.29
Stanfield-Worley	13	10.52	5.20-21.50	4.09
Candy Creek Site	25	8.74	0.40-23.60	5.28

Table 1 (continued)

Group	Number of Specimens	Mean (mm)	Range (mm)	Standard Deviation
LENGTH WIDTH RATIO (LENGTH:BASE)				
Tennessee	71	1.42:1	0.97:1-2.11:1	0.22
North Carolina	14	1.73:1	1.42:1-2.36:1	0.26
Total Alabama	13	2.12:1	1.39:1-2.80:1	0.31
North Alabama Daltons	4	2.17:1	1.91:1-2.38:1	0.17
Quad Points	6	2.22:1	1.93:1-2.80:1	0.28
Stanfield-Worley	3	1.83:1	1.39:1-2.18:1	0.33
Candy Creek Site	8	1.80:1	1.34:1-2.25:1	0.34
LENGTH WIDTH RATIO (LENGTH:SHOULDER)				
Tennessee	73	1.51:1	1.05:1-2.06:1	0.22
North Carolina	17	1.83:1	1.39:1-2.49:1	0.33
Total Alabama	19	2.26:1	1.78:1-2.89:1	0.38
North Alabama Daltons	7	2.34:1	2.02:1-2.71:1	0.28
Quad Points	7	2.40:1	1.85:1-2.89:1	0.36
Standield-Worley	5	1.95:1	1.78:1-2.43:1	0.34
Candy Creek Site	10	2.04:1	1.58:1-2.80:1	0.35

Table 1 (continued)

Group	Number of Specimens	Mean (mm)	Range (mm)	Standard Deviation
LENGTH WIDTH RATIO (LENGTH:GREATEST WIDTH)				
Tennessee	66	1.39:1	0.97:1-2.06:1	0.21
North Carolina	14	1.70:1	1.39:1-2.32:1	0.26
Total Alabama	11	2.12:1	1.39:1-2.80:1	0.33
North Alabama Daltons	4	2.11:1	1.91:1-2.38:1	0.17
Quad Points	5	2.26:1	1.93:1-2.80:1	0.29
Stanfield-Worley	2	1.79:1	1.39:1-2.18:1	0.40
Candy Creek Site	5	1.86:1	1.50:1-2.25:1	0.26
PROXIMAL HAFT INCLINATION (LEFT)		(degrees)	(degrees)	
Tennessee	96	18.09	5.00-43.00	6.99
North Carolina	35	27.37	2.00-58.00	11.31
Total Alabama	40	19.83	4.00-37.00	9.23
North Alabama Daltons	10	17.90	7.00-37.00	9.93
Quad Points	18	21.44	5.00-35.00	8.25
Stanfield-Worley	12	19.00	4.00-33.00	9.57
Candy Creek Site	23	12.50	2.00-45.00	10.82

Table 1 (continued)

Group	Number of Specimens	Mean (degrees)	Range (degrees)	Standard Deviation
PROXIMAL HAFT INCLINATION (RIGHT)				
Tennessee	94	16.13	2.00-37.00	7.56
North Carolina	30	22.87	4.00-45.00	10.25
Total Alabama	35	17.40	2.00-38.00	8.17
North Alabama Daltons	8	15.13	5.00-29.00	6.60
Quad Points	17	19.00	6.00-38.00	8.15
Stanfield-Worley	10	16.50	2.00-29.00	8.74
Candy Creek Site	22	13.89	1.00-37.00	8.77
DISTAL HAFT INCLINATION (LEFT)				
Tennessee	90	171.94	131.00-179.00	6.79
North Carolina	35	166.97	145.00-179.00	8.42
Total Alabama	40	174.40	161.00-179.00	4.02
North Alabama Daltons	10	172.70	161.00-179.00	5.00
Quad Points	17	176.35	175.00-178.00	1.03
Stanfield-Worley	13	172.38	162.00-178.00	4.43
Candy Creek Site	20	170.03	161.00-178.50	5.13

Table 1 (continued)

Group	Number of Specimens	Mean (degrees)	Range (degrees)	Standard Deviation
DISTAL HAFT INCLINATION (RIGHT)				
Tennessee	89	171.37	136.00-179.00	6.39
North Carolina	35	166.77	147.00-178.00	8.71
Total Alabama	36	173.17	165.00-179.00	4.09
North Alabama Daltons	8	172.00	165.00-179.00	5.20
Quad Points	16	174.07	166.00-178.00	3.21
Stanfield-Worley	12	172.75	165.00-179.00	4.02
Candy Creek Site	23	167.46	147.00-179.00	6.89
BASAL HAFT INCLINATION INCLINATION (LEFT)				
Tennessee	100	59.29	32.00-88.00	10.48
North Carolina	34	44.06	32.00-66.00	7.70
Total Alabama	41	62.56	36.00-80.00	11.61
North Alabama Daltons	10	60.40	45.00-72.00	8.33
Quad Points	19	59.53	36.00-80.00	13.83
Stanfield-Worley	12	69.17	52.00-76.00	6.16
Candy Creek Site	24	81.69	69.00-102.00	7.25

Table 1 (continued)

Group	Number of Specimens	Mean (degrees)	Range (degrees)	Standard Deviation
BASAL HAFT INCLINATION (RIGHT)				
Tennessee	99	57.78	37.00-82.00	9.67
North Carolina	32	42.59	27.00-58.00	7.52
Total Alabama	37	61.03	37.00-77.00	11.34
North Alabama Daltons	8	60.13	41.00-73.00	10.66
Quad Points	16	56.50	37.00-77.00	12.61
Stanfield-Worley	13	67.15	58.00-77.00	6.06
Candy Creek Site	25	78.80	69.00-93.00	6.91
TOTAL BASAL ANGLE				
Tennessee	93	116.98	78.00-157.00	18.69
North Carolina	30	87.80	59.00-124.00	13.17
Total Alabama	35	125.00	78.00-157.00	21.60
North Alabama Daltons	7	120.57	86.00-145.00	17.97
Quad Points	16	118.19	78.00-157.00	25.27
Stanfield-Worley	12	136.67	112.00-150.00	10.57
Candy Creek Site	22	161.18	139.00-195.00	13.40

Table 2. Beveling.

Group	Number of Specimens	Left Alternate	Right Alternate	Left Unifacially	None
Tennessee	91	66 (72.52%)	1 (1.09%)	2 (2.19%)	22 (24.10%)
North Carolina	25	2 (8.00%)	8 (32.00%)	0	15 (60.00%)
Total Alabama	31	18 (58.06%)	0	0	13 (41.94%)
North Alabama Daltons	11	8 (72.73%)	0	0	3 (27.27%)
Quad Points	10	4 (40.00%)	0	0	6 (60.00%)
Stanfield-Worley	10	6 (60.00%)	0	0	4 (40.00%)
Candy Creek Site	13	1 (7.69%)	1 (7.69%)	0	11 (84.62%)

Table 3. Grinding.

Group	Number of Specimens	Light	Medium	Heavy	None
LEFT SIDE NOTCH					
Tennessee	111	33 (29.73%)	61 (54.95%)	17 (15.32%)	0
North Carolina	36	14 (38.89%)	14 (38.89%)	8 (21.62%)	0
Total Alabama	45	9 (20.00%)	27 (60.00%)	9 (20.00%)	0
North Alabama Daltons	11	3 (27.27%)	6 (54.55%)	2 (18.18%)	0
Quad Points	21	5 (23.81%)	15 (71.43%)	1 (4.76%)	0
Stanfield-Worley	13	1 (7.70%)	6 (46.15%)	6 (46.15%)	0
Candy Creek Site	27	19 (70.37%)	3 (11.11%)	0	5 (18.52%)

Table 3 (continued)

Group	Number of Specimens	Light	Medium	Heavy	None
RIGHT SIDE NOTCH					
Tennessee	109	32 (29.36%)	55 (50.46%)	22 (20.18%)	0
North Carolina	36	15 (41.67%)	14 (38.89%)	7 (19.44%)	0
Total Alabama	44	10 (22.73%)	24 (54.54%)	10 (22.73%)	0
North Alabama Daltons	11	2 (18.18%)	6 (54.55%)	3 (27.27%)	0
Quad Points	20	5 (25.00%)	13 (65.00%)	2 (10.00%)	0
Stanfield-Worley	13	3 (23.08%)	5 (38.46%)	5 (38.46%)	0
Candy Creek Site	27	19 (70.37%)	2 (7.41%)	0	6 (22.22%)

Table 3 (continued)

Group	Number of Specimens	Light	Medium	Heavy	None
BASAL CONCAVITY					
Tennessee	112	38 (33.93%)	59 (52.68%)	14 (12.50%)	1 (0.89%)
North Carolina	37	20 (54.05%)	15 (40.54%)	2 (5.41%)	0
Total Alabama	46	10 (21.74%)	29 (63.04%)	7 (15.22%)	0
North Alabama Daltons	12	3 (25.00%)	7 (58.33%)	2 (16.67%)	0
Quad Points	21	5 (23.81%)	16 (76.19%)	0	0
Stanfield-Worley	13	2 (15.39%)	6 (46.15%)	5 (38.46%)	0
Candy Creek Site	27	18 (66.67%)	0	0	9 (33.33%)

Table 4. Serration.

Group	Number of Specimens	Number Serrated	Number Not Serrated
Tennessee	92	40 (43.48%)	52 (56.52%)
North Carolina	36	23 (63.89%)	13 (36.11%)
Total Alabama	36	30 (83.33%)	8 (16.67%)
North Alabama Daltons	11	10 (90.91%)	1 (9.09%)
Quad Points	13	8 (61.54%)	5 (38.46%)
Stanfield-Worley	12	12 (100.00%)	0
Candy Creek Site	27	3 (11.11%)	24 (88.89%)

haft inclinations, and beveling. Thus, certain attribute means separate the group from the Candy Creek site as does total morphology when these specimens are visually examined (Figure 8).

Tennessee Group (Figures 9,10,11,12,13,14, and 15)

It is now possible to give a general description of the Dalton projectile point variant provisionally called the East Tennessee Dalton. The East Tennessee Daltons are characterized by the same resharpening techniques as demonstrated for Arkansas Daltons by Morse and Goodyear (Morse 1971, 1973; Goodyear 1974). However, the East Tennessee points differ from the Arkansas specimens with respect to the resulting blade outline. The Arkansas specimens were resharpened, resulting in first a steeple-shaped blade and later a drill-shaped blade (Morse 1973:25; Goodyear 1974:26-30). The East Tennessee variants were modified through resharpening resulting in a progressively shorter and more rounded blade (Figure 16). Steeple-shaped resharpening, though very rare, does occur in the Tennessee group. No drill-shaped resharpening was observed.

The East Tennessee Dalton specimens are much smaller than the other variants in the study. The East Tennessee specimens had the smallest means for total length, base-tip length, blade length, side notch lengths, side notch depths, and length/width ratios. The small size of the group is probably the result of the raw material utilized. Practically all of the specimens examined were made of local chert. Most of the chert in the Ridge and Valley Province of East Tennessee, utilized by prehistoric peoples, occurs in small nodules. Recent research on chert resources in the Little Tennessee River Valley has determined that

Figure 8. The Candy Creek projectile points from the Candy Creek site (40BY14) as classified by Lewis and Kneberg (Frank H. McClung Museum files).

Figure 9. East Tennessee Dalton specimens collected from the McGhee site (40MR65) on the Little Tennessee River (McGhee collection).

Figure 10. Top; Dalton specimens from various East Tennessee locations. Bottom; Dalton specimens from the LeCroy site (40HA43). (Frank H. McClung Museum collection).

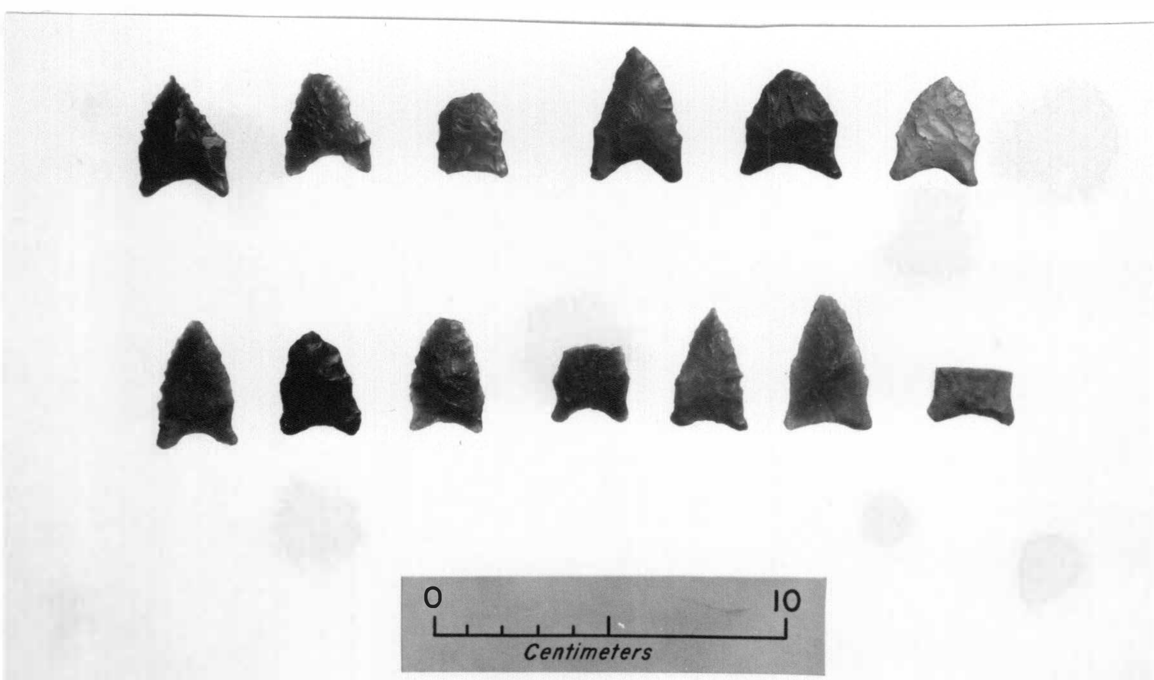


Figure 11. Top; The first three specimens of the top row are from the Little Tennessee River Valley, the rest are from various East Tennessee sites. Bottom; Dalton specimens from the LeCroy site (40HA43). (Frank H. McClung Museum collection).

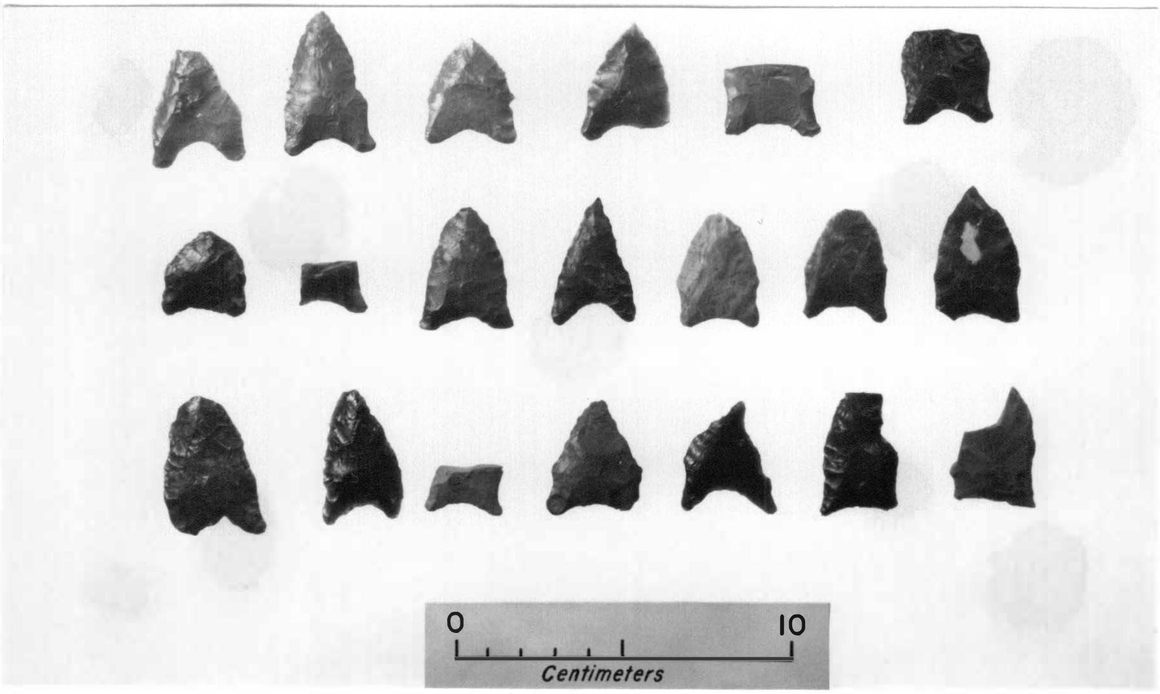


Figure 12. East Tennessee Dalton specimens from the Webster site (40HN49) on the Holston River (Cobb collection).

Figure 13. East Tennessee Dalton specimens from the Holston River Valley (Polhemus collection).

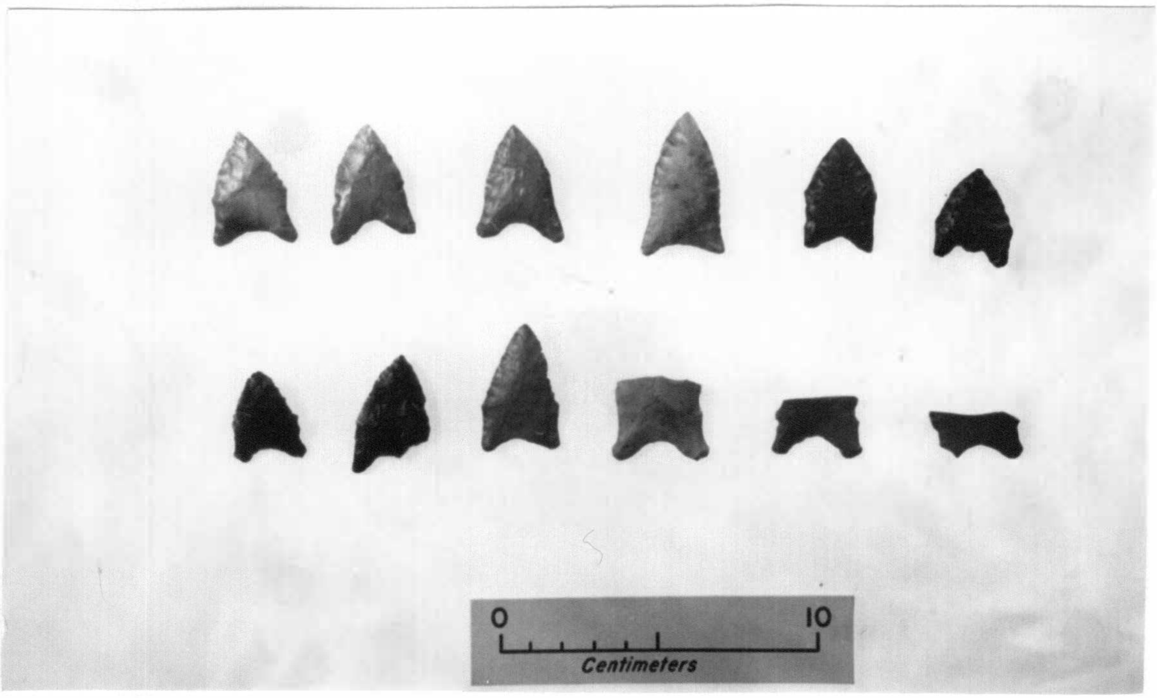


Figure 14. Dalton specimens from various upper East Tennessee sites (Smith collection).

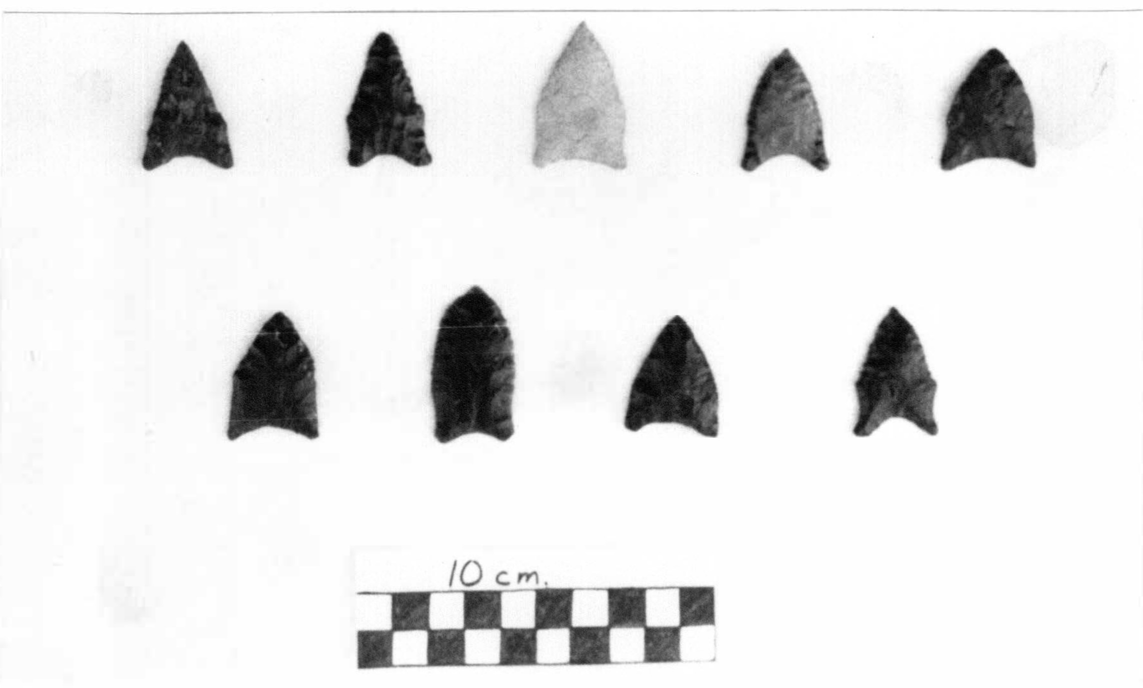
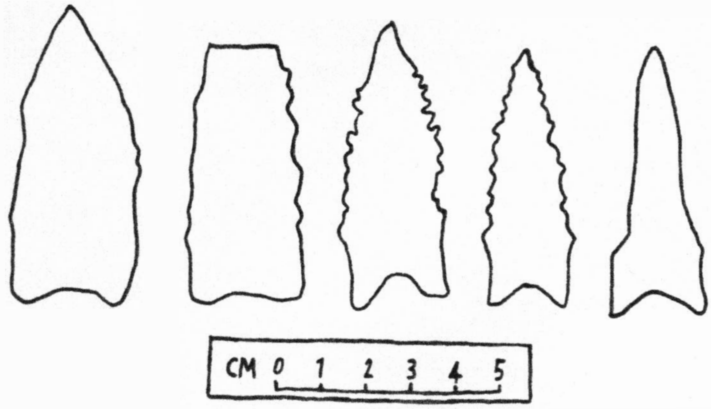
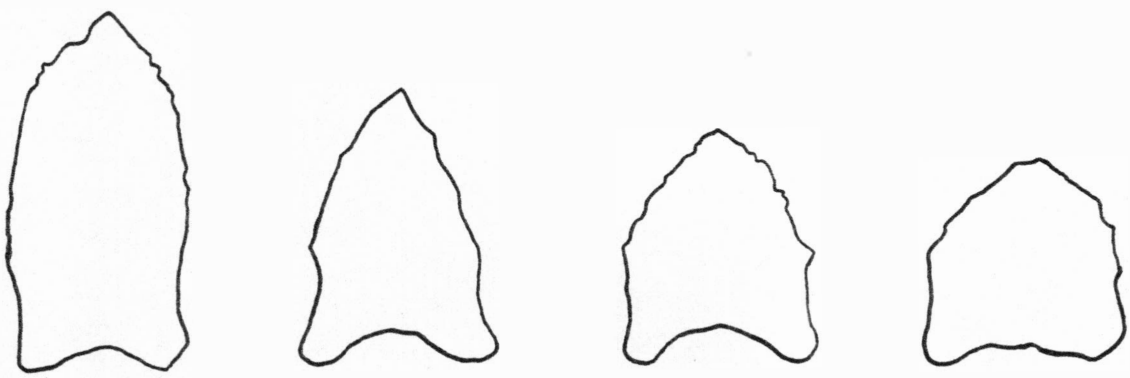


Figure 15. Dalton specimens from various upper East Tennessee locations (Garland collection).



Row 1. After Morse (1973:35).



Row 2. Actual size.

Figure 16. Comparison of the blade outline during the resharpening stages of the Arkansas Dalton variant (Row 1), and the East Tennessee Dalton variant (Row 2).

the black banded sub-nodular chert from the Knox formation is generally three to six inches in diameter (Larry Kimball, personal communication). Milici (1973:14) describes the chert from the Chepultepec Dolomite in Knox County as flattened oval nodules eight inches across and two inches thick. One of the few specimens thought to be made of an exotic material was actually made of chert from the Poor Valley Creek area of Clinch Mountain which occurs in nodules rarely over two inches in diameter (Major C. R. McCollough, personal communication).

The East Tennessee Dalton projectile point variant is a lanceolate projectile point. Resharpening often alters the outline to a pentagonal shape. The haft element, or base, is characterized by two roughly parallel shallow side notches, a basal concavity and flaring ears. The widest point usually occurs at the ears. The side notches and basal concavity usually exhibit some degree of grinding. Multiple thinning scars are present on both surfaces extending from the basal concavity for about 10 mm. rarely past the shoulders. The blade is roughly triangular in outline, usually with excurvate, or sometimes straight blade edges. The blade is usually beveled. The serrations are usually small and fine, nothing like the large serration on types such as the Kirk corner-notched (Coe 1964). Of the 92 specimens on which the presence or absence of serrations could be determined, 43.48% were serrated. Of the 92 specimens, 30.43% exhibited well-defined serrations. The remaining 13.04% exhibited poorly defined or remnant serrations. Many of the remnant serrations appeared as a serration point which had been crushed off with ridges from the serration scars on opposite surfaces meeting at the same point along the blade edge. The East

Tennessee specimens are biconvex in cross section. Several of the steeply beveled specimens have blades approaching a rhomboid cross section. The cross section of the base, taken about 5 mm. from the deepest point of the basal concavity is biconcave.

Although the specification of lithic manufacturing techniques was not a primary aim of this study, certain observations can be made about the manufacture of the East Tennessee Dalton projectile point variant. The flaking of these projectile points resembles Crabtree's (1972:87) less regular parallel and collateral flaking. More specifically, the primary chipping primarily corresponds to Binford's (1963:204-206) expanding scars and to some extent lamellar scars, while the secondary chipping results principally in lamellar scars though expanding scars do occur. Apparently all secondary chipping and serration was accomplished with direct percussion but determination was difficult. The flake scar long axes are generally at a 90 degree angle to the central axis of the specimen. As the blade is resharpened, the angle of the resharpening flakes and the blade edge to the central axis is altered.

Though precise figures are lacking (this trait was not detected until midway through the study), these points were commonly, if not usually, made on flakes. A number of specimens were examined with large areas of original flake surface present, usually the ventral surface. A few other specimens exhibited cortex on the dorsal surface. If a preform stage preceded the completed point, original flake surfaces would usually be obliterated. This observation does not rule out the possibility of a preform stage. However, from the specimens

examined in this study, it does not seem that finished specimens were preceded by a formalized preform stage. There are two uncompleted and apparently aborted specimens from the Webster site (40KN49). Both specimens were broken with the distal ends missing. The blade edges were excurvate with no resharpening evident. Neither specimen was basally thinned, although both bore evidence of unsuccessful thinning attempts.

Further evidence that these projectile points were made on flakes can be found on the ears of a number of specimens. These specimens are characterized by the occurrence of either cortex or a flat surface on one of the ears. This trait was observed on 38 of the 112 specimens studied. The actual number may have been slightly higher since some of the collections were examined before this trait was detected. This appears to be a remnant of the direct percussion striking platform of the flake from which the point was made. If the ear with the cortex, or flat surface, does represent a remnant of the striking platform, it should tend to be at least slightly thicker than the other ear since it would be in the center of the bulb of percussion and relatively difficult to reduce in thickness. To test this hypothesis, specimens exhibiting striking platform remnants were measured for thickness on each ear and near each shoulder.

Of the 30 specimens measured for thickness on the ear 24, or 80%, of the specimens were thicker on the ear exhibiting a remnant of the striking platform. Three specimens (10%) measured less on the ear with the striking platform, and three more (10%) measured the same. Of the 26 specimens measured for thickness on each side at the approximate

mid-point, 15 (57.69%) were thicker on the side of the striking platform. Nine (34.62%) were thinner on the side with the striking platform and on two (7.69%) the measurements were identical.

Therefore, the hypothesis still stands. The ears of the specimens containing cortex and flat surfaces appear to be remnants of striking platforms. With the striking platform established it is possible to reconstruct the flake-point orientation. Flake-point orientation conforms to Binford's (1963:208-209) flake-blank orientation. Flake-point orientation is the term preferred by the author. Both terms refer to the orientation of the finished projectile point to the original flake from which it was made. Figure 17 shows the possible flake-point orientation of two specimens, both exhibiting cortex on one ear. This does not mean that all East Tennessee Dalton points have this same flake-point orientation. A number of different orientations are possible. However, since at least one-third of the sample exhibited remnants of the striking platform on the ears, this may have been a preferred flake-point orientation.

While most of the East Tennessee Dalton points are basally thinned and are not fluted, the technique is derived from the Paleo-Indian fluted point tradition. Fluting, while rare, does occur. Crabtree (1972:66) describes a flute as a flake scar resembling a concave trough on the artifact from the proximal end toward the distal, related to basal thinning of projectile points for hafting purposes. Most specimens exhibit one or two thinning scars on each surface. However, as many as four thinning scars have been noted on one basal surface. The thinning technique is very similar to the fluting technique outlined

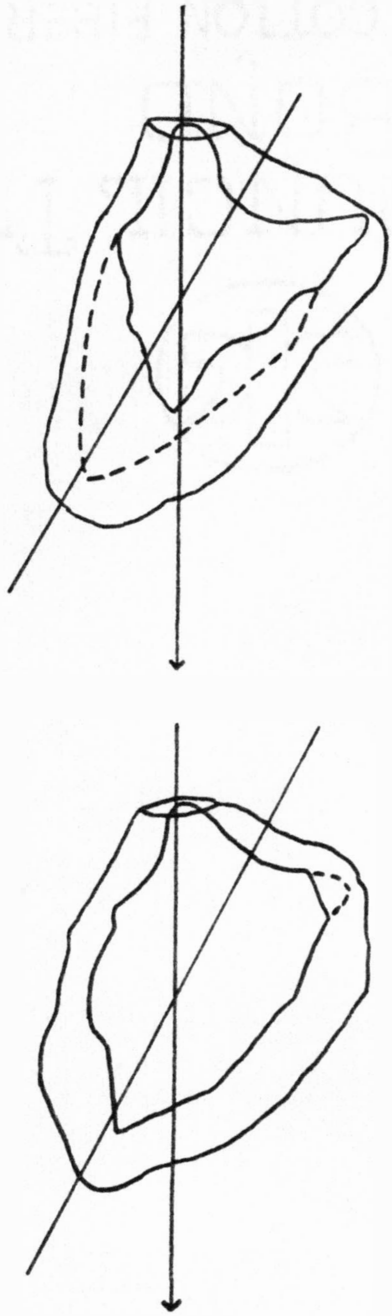


Figure 17. Typical examples of the flake-point orientation of the East Tennessee Dalton variant.

by Josselyn (1954) and Witthoft (1952). Longitudinal flakes were detached on either side of the central axis on the base. These flakes varied in length from less than 5 mm. to over 10 mm. These two flakes produced a nipple. The nipple was utilized to detach the thinning scars. The thinning process was apparently accomplished with pressure flaking.

North Carolina Group (Figures 18,19, and 20)

The data compliled in this study compared favorably with the published data on the Hardaway-Dalton variant. Coe (1964:64) gives the following measurements for specimens from the Hardaway site:

Length: mean - 60 mm.; range - 50 mm.-80 mm.
Width: mean - 35 mm.; range - 30 mm.-40 mm.
Thickness: mean - 7 mm.; range - 5mm.-8mm.
Side notch length: mean 20 mm.
Beveling: 10%
Length/width ratio: 2:1

Close correspondence of measurements is to be expected since the specimens in the present study came from the same area as the Hardaway site. The major difference between the specimens in this study and those from the Hardaway site excavations is found in the occurrence of beveling. While 40% of the points in the study were beveled, only 10% of the Hardaway site sample were beveled. Of the 37 Hardaway-Dalton points examined, all but two specimens were manufactured from the volcaniclastic rocks of the Carolina "slate belt" (Butler and Ragland 1969).

Coe (1964:64) states that the manufacturing technique of the Hardaway-Dalton and Hardaway Blade types is characterized by broad, shallow flakes that extend well into the center of the blade, apparently the result of direct percussion. The Hardaway-Dalton is more finely

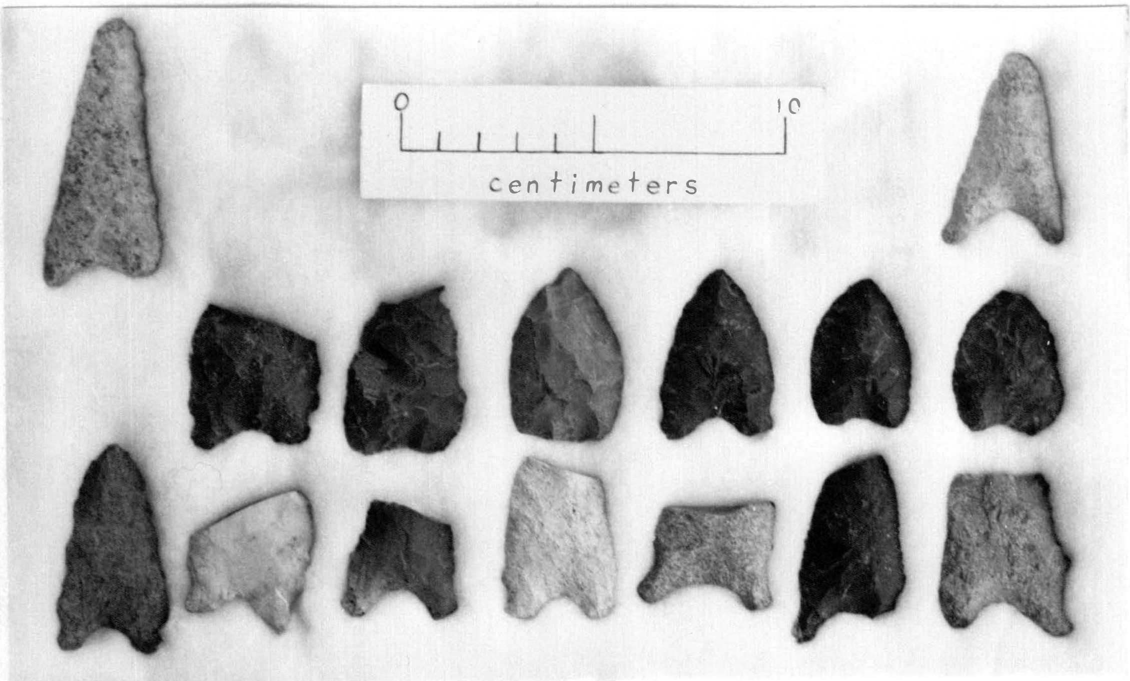


Figure 18. Fifteen Hardaway-Dalton projectile points from the North Carolina Piedmont (Rich collection).

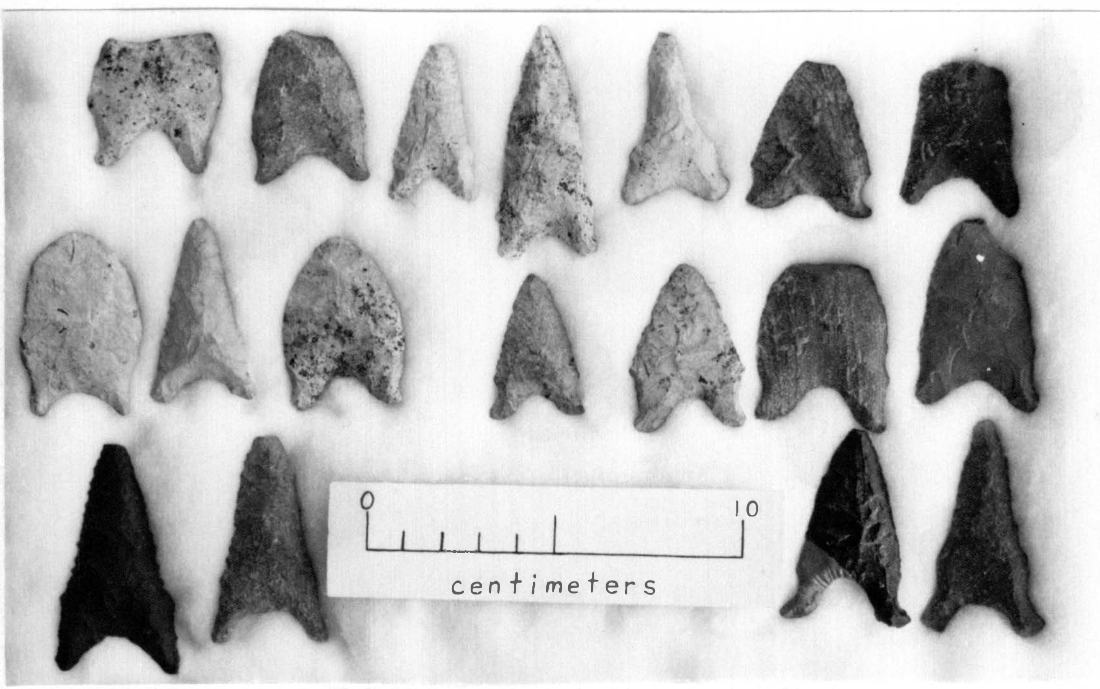


Figure 19. Eighteen Hardaway-Dalton projectile points from the North Carolina Piedmont (Rich collection).

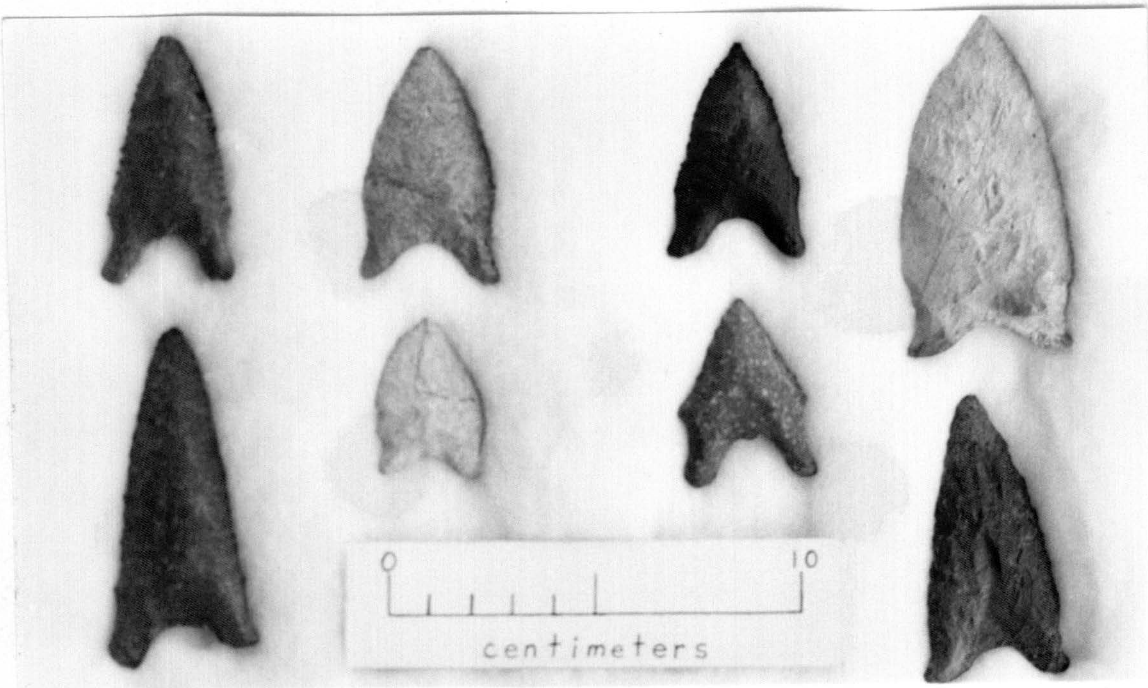


Figure 20. Eight Hardaway-Dalton projectile points from the North Carolina Piedmont (Rich collection).

retouched and frequently finished with fine serration. The basal concavity and side-notches are ground.

As a result of this study, additional information concerning manufacturing technique can be added. Of 36 specimens 23, or 63.89%, were serrated. Thirteen, or 36.11%, were not serrated. The North Carolina variants apparently underwent a resharpening sequence similar to that observed in Arkansas. Two specimens were observed in the Rich collection which were resharpened resulting in a drill-like shape. The Hardaway-Dalton variant exhibits fluting more frequently than other Dalton variants observed. Most specimens exhibited one or two thinning-fluting scars. As many as three thinning scars on one surface were noted. Actual flutes were not uncommon. Four specimens were observed with remnants of fluting nipples. Two points were observed which had been reworked into different tool types. On one specimen, the distal end had been reworked into an end scraper. Another specimen exhibited a blade that had been rounded and reduced to a point where a drill bit or punch had been broken off. In addition, a third specimen exhibited burinated ears. This might have been an alternative to grinding for hafting purposes.

Alabama Group (Figures 21,22,23,24, and 25)

As previously stated, the specimens comprising the Alabama group include several published types and variants. However, the geographic distribution of the sample utilized in this investigation is restricted. These specimens came from the Tennessee River Valley in northwestern Alabama. Even though these projectile points comprise different types

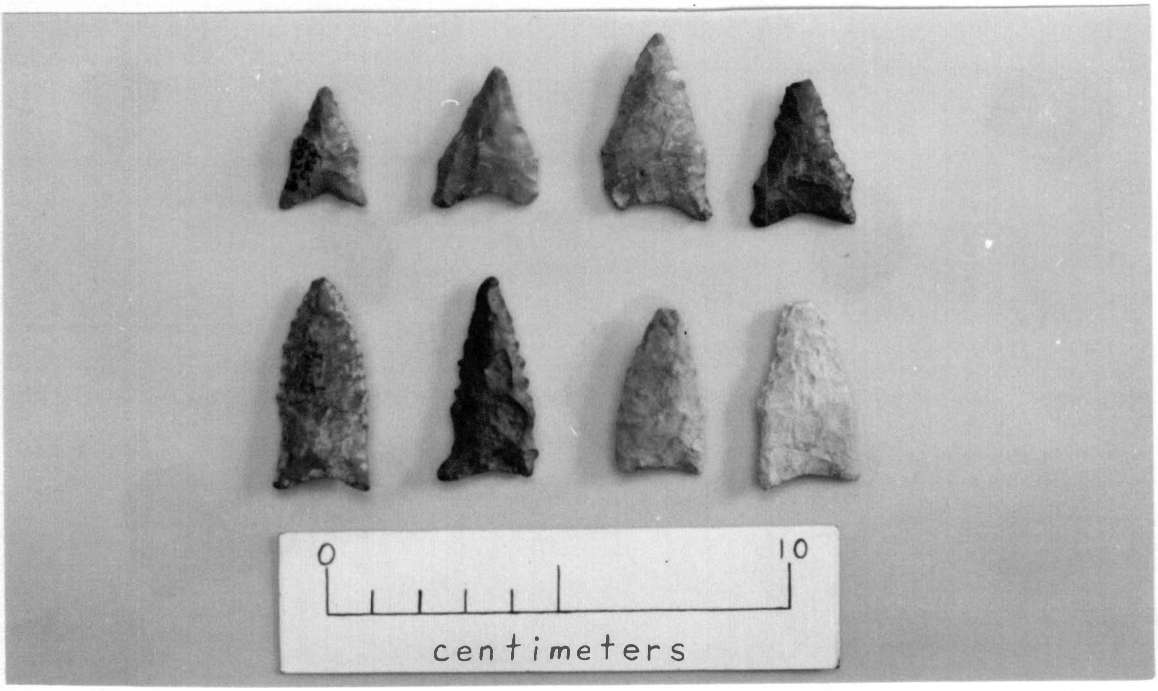


Figure 21. Dalton projectile points from the Stanfield-Worley Bluff Shelter (Mound State Monument Museum collection).

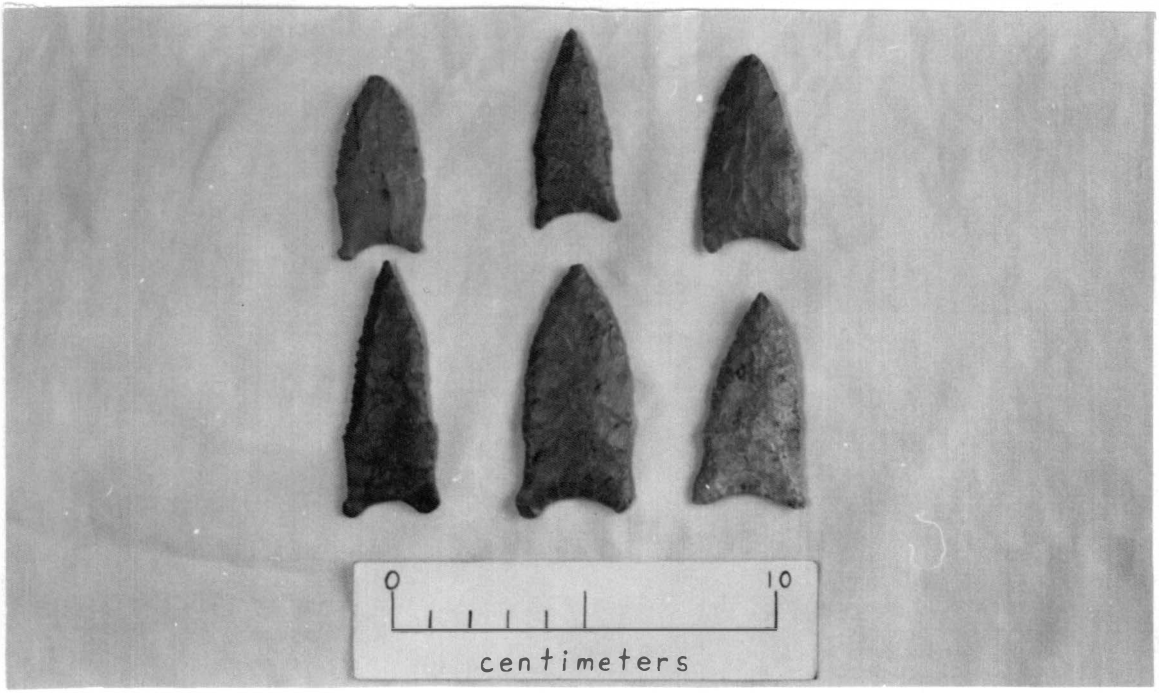


Figure 22. Five Quad and Dalton points from northern Alabama. Wheeler point (top right) was excluded from study (Hulse collection).

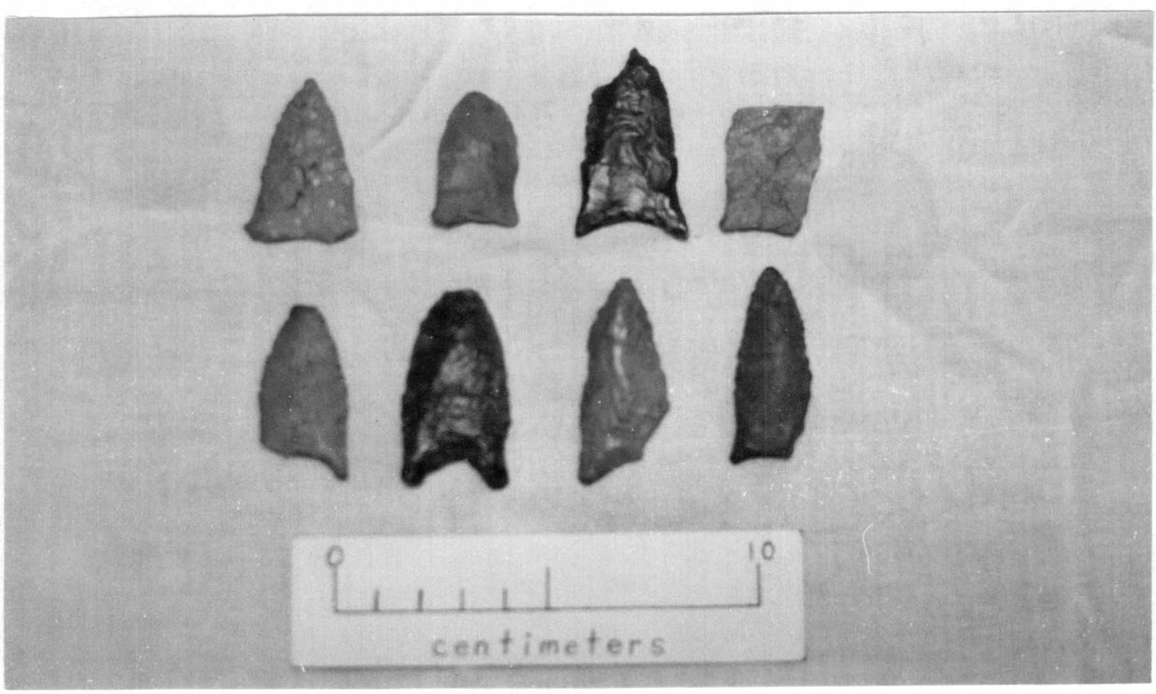


Figure 23. Eight Quad and Dalton points from northern Alabama. The third and fourth on the top row and the second, third, and fourth on the bottom row are from the Quad site (Smith collection).

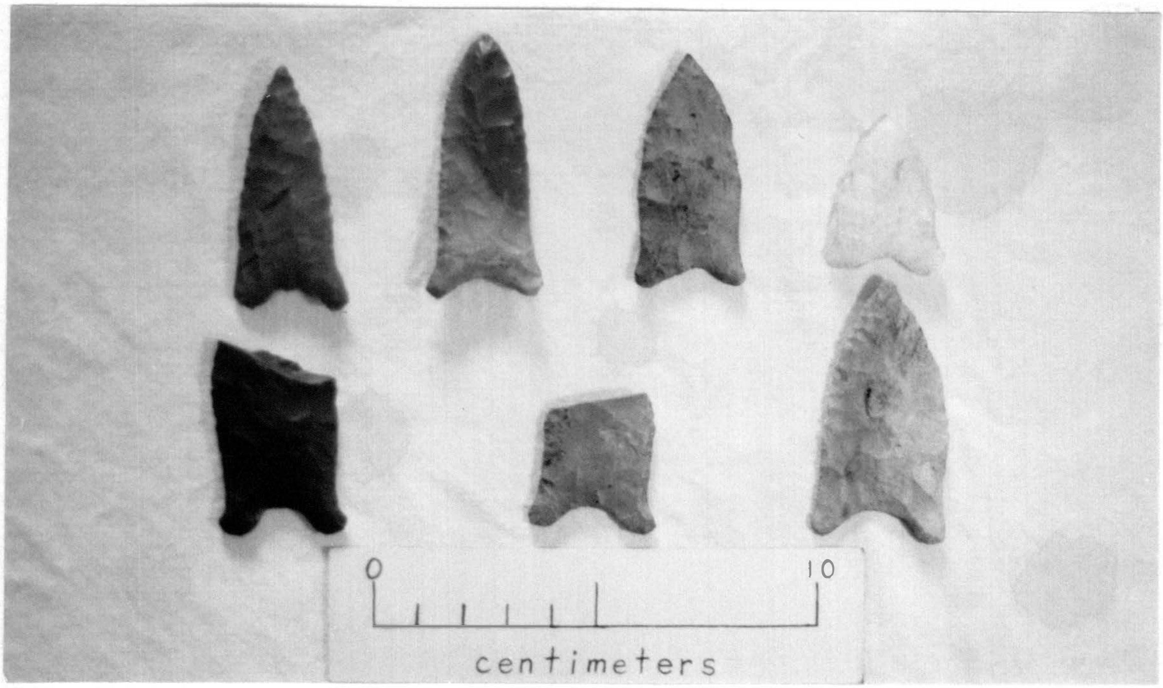


Figure 24. Six Quad projectile points from northern Alabama. The upper right hand specimen was excluded from the study (Allen collection).

Figure 25. Quad projectile points from northern Alabama (Allen collection).

and variants, they constitute a fairly homogeneous formal group. The standard deviation for metrical attributes of the Alabama group was usually less than that of the North Carolina group.

The Alabama group cannot be discussed without addressing the confusion of types and variants in the literature. This matter was treated in Chapter I. Another question alluded to in Chapter I is the relationship between Quad and Dalton projectile point types. In discussing the difference between Dalton and Quad points with the author, Cambron and Hulse distinguished the Daltons as resharpened with reduced blade margins. If resharpening is the main criterion used to distinguish the two, then the distinction between Dalton and Quad would not be typologically valid. Morse (1971; 1973) and Goodyear (1974) have demonstrated that Dalton projectile points undergo successive resharpening stages, resulting in reduction of the blade margin (Figure 16). It is possible then that a Quad point could be a Dalton point that has not been resharpened. It is interesting that Coe (1964:65) refers to two illustrated examples of his Hardaway Blade projectile point type as "typical Quad." Goodyear (1974:24) concludes that Coe's Hardaway Blade type is the preform for the Hardaway-Dalton.

An examination of the metrical attributes in Table 1 could perhaps shed light on this question. Basically, Quad points seem slightly larger and thicker than the north Alabama and Stanfield-Worley Daltons. This would be expected if the other two groups had been resharpened and reduced and the Quad specimens had not. This could conceivably be the case concerning such attributes as total length, base-tip length, basal width, shoulder width, blade width, blade length, side-notch length,

thickness, side-notch depth, and length/width ratio. However, the Quad group still has greater measurements for basal width, tang width, basal thickness, and the haft inclination angles. The differences between these means is minute in all cases and may be of little or no significance. The difference of means of the total basal angles of the two Dalton groups is 16.1 degrees. Therefore, the differences between the Quad group and the two Alabama Dalton groups may not be typologically significant. Keep in mind, however, that the Quad and north Alabama groups represent a number of sites while the Stanfield-Worley specimens are from one site.

As a result of this research, two hypotheses can be offered for further testing concerning the Quad projectile point type: (1) the Quad projectile point type is actually an unresharpened Dalton projectile point; (2) the Quad projectile point type can be temporally isolated from other variants within the Dalton horizon. Neither of these two hypotheses can be adequately tested with present data. A larger metrical study would be helpful in testing the first hypothesis, and excavation of more sites with sealed Dalton and/or Quad components would aid testing the second hypothesis.

Returning to a general discussion of the Alabama group, the the blade edges on the projectile points were generally straight to excurvate. There were only two examples of slightly incurvate blade edges. As might be expected, all Quad points had excurvate blade edges. Out of 36 Alabama specimens complete enough for determination, 83.33% were serrated. One specimen had been resharpened resulting in a drill-like appearance. Most specimens displayed two or three thinning scars

on each surface, with as many as seven observed on one surface. Fluting was not common but did occur. In seventeen cases, the thinning scars/ flutes ended in hinge fractures. The remains of a fluting nipple was noted on one specimen. There was one case of reworking of a projectile point. In this instance the distal end had been reworked into an awl or punch. Polish was evident on the tip of this example. As nearly as can be determined, all specimens were manufactured from locally available Fort Payne formation chert.

CHAPTER VI

LINEAR DISCRIMINANT FUNCTION PROGRAM

The Program

A computer program, supplied by Dr. Richard Leggett, was run to determine the amount of similarity, or relatedness, between the three geographic groups in this study (Tennessee, North Carolina, and Alabama). Discriminant function programs have previously been used to test the similarity or relatedness of projectile point groups (Luchterhand 1970). The object was to take specimens of one of the groups and to determine which of the other two groups they are more similar to. A linear discriminant function was used to discriminate between two groups of specimens on the basis of four attributes of those specimens. These attributes, proximal haft inclination, distal haft inclination, basal haft inclination, and thickness, were selected after experimentation with seven attributes because they least reflect outside influences such as available raw material, and also were thought to more clearly reflect the mental template of the maker.

Two groups of projectile points were used to arrive at Z-numbers for the specimens of both groups. For example, the North Carolina and Alabama groups can be used to determine the constants λ_1, λ_2, λ_3, and λ_4 (for the four attributes used in this program), then for each specimen the values x_1, x_2, x_3, and x can be substituted into the equation

$$Z=\lambda_1 x+\lambda_2 x_2+\lambda_3 x_3+\lambda_4 x_4$$

to establish Z for that specimen. Then, for a specimen of the Tennessee group we can substitute its attributes x_1, x_2, x_3, and x_4 into the

equation to find its Z-number. The program then decides if this Tennessee specimen is closer to the Alabama group or the North Carolina group by comparing its Z-numbers with the means of the Z-numbers of the North Carolina group. This process is repeated for each specimen in the Tennessee group.

The process is then repeated with new Z-numbers calculated for all three groups by starting with a new pair of groups (Alabama and Tennessee). We get new values $\lambda_1, \lambda_2, \lambda_3$, and λ_4 so that substituting the same attributes x_1, x_2, x_3, and x_4 into the equation gives new Z-numbers for all specimens. We then compare the new Z-numbers of each specimen in the third group, North Carolina, with the means of the new Z-numbers of the Alabama group and with the means of the new Z-numbers of the Tennessee group. This determines which group each specimen in the North Carolina group is more similar to.

Finally, the same process is repeated by using the third pair of groups (North Carolina and Tennessee) to compute a third set of Z-numbers. This set of Z-numbers of each of the Alabama specimens is then compared with the means of the Z-numbers of the other two groups. Then it is determined which group each of the Alabama specimens is more similar to.

Thus the linear discriminant function provides a method of associating numbers with each specimen of two slightly dissimilar groups of projectile points so that the groups can be discriminated on the basis of their numerical values. Then, if one wishes to know whether some new specimen belongs to, or is closer to, one group or the other, its numerical value can be calculated from the same discriminant function

used to separate the two groups, and test the number for the new specimen against the numbers for the two groups.

Results of the Linear Discriminant Function Program

The result of the linear discriminant function program was a print-out in the form of a graph for each group (Figures 26, 27 and 28). The program plotted each specimen from each group to show how close it was to the means for the other two groups.

By taking a look first at the Tennessee group (Figure 26) we see that most specimens cluster fairly evenly around the Alabama mean. Only 13 specimens of the Tennessee group show more similarity to the North Carolina group. Thus, the Tennessee group appears more similar to the Alabama group.

In Figure 27 we see that the Alabama group is more similar to the Tennessee group. Only four points were plotted on the North Carolina side of the graph. Thus the Alabama and Tennessee groups appear closer to each other than either is to the North Carolina group.

In Figure 28 the relationship of the North Carolina group to the Tennessee and Alabama groups is plotted. With a few exceptions, the North Carolina specimens are plotted far to the left of the Alabama means or far to the right of the Tennessee means. Therefore most of the North Carolina specimens fall outside of either group.

The results of the linear discriminant function program are not unexpected. There are several explanations for the closer relationship of the Alabama and Tennessee groups. First of all, the specimens of these two groups all came from the greater Tennessee River Valley, whereas both are separated from the North Carolina group by the

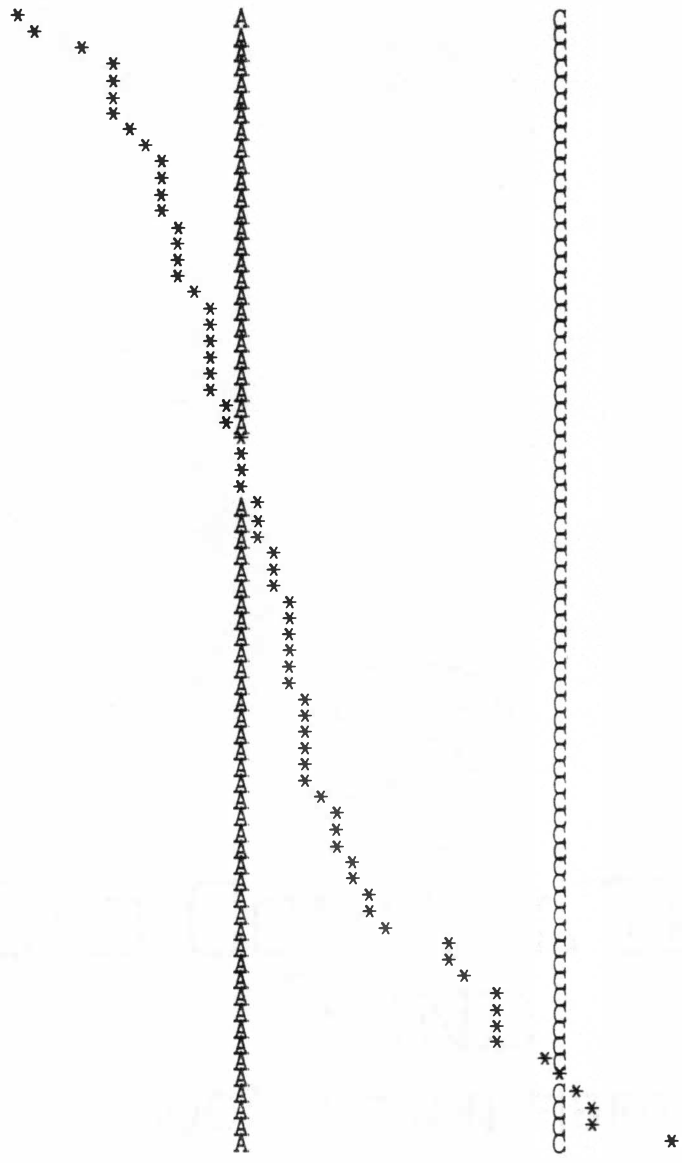


Figure 26. Graph of the relative distance of Z-numbers of the Tennessee Group from means of the other two groups. A=Alabama Group; C=North Carolina Group.

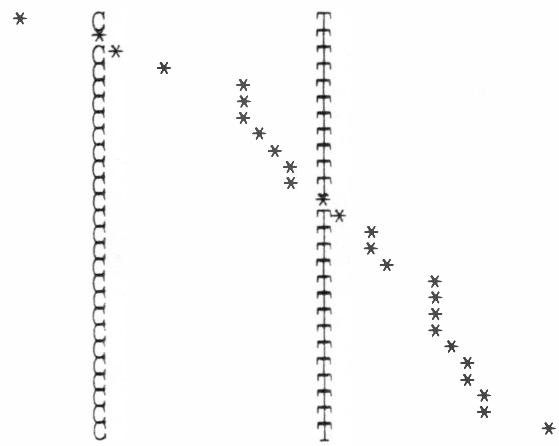


Figure 27. Graph of the relative distance of Z-numbers of the Alabama Group from means of the other two groups. C=North Carolina Group; T=Tennessee Group.

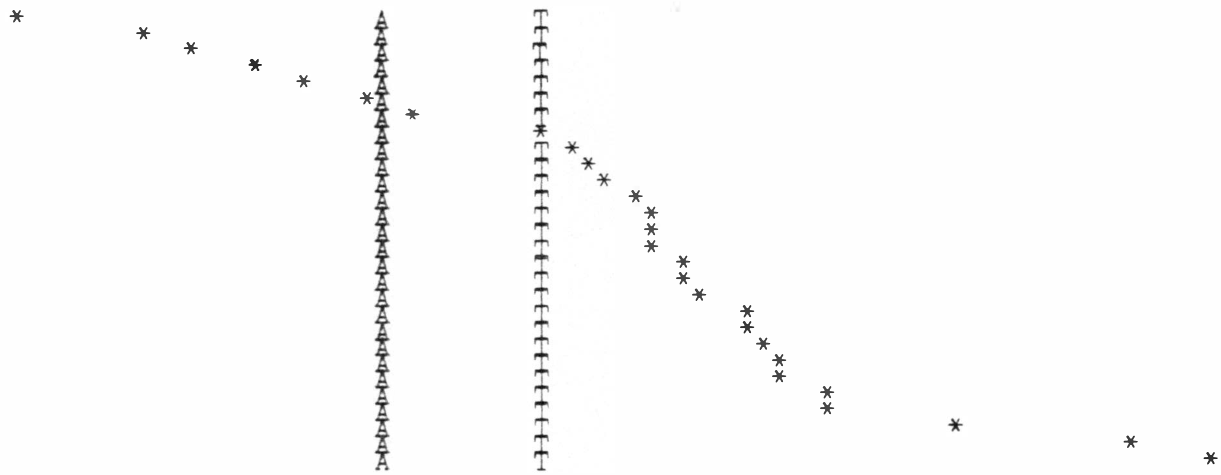


Figure 28. Graph of the relative distance of Z-numbers of the North Carolina Group from means of the other two groups. A=Alabama Group; T=Tennessee Group.

Appalachian Mountains. Related to the geographical difference is the difference in available raw material. Nearly all of the Alabama and Tennessee specimens were manufactured from locally available nodular and tabular chert. This chert occurs in limestone formations found throughout northern Alabama and Middle and East Tennessee. The actual formations yielding this chert differ between northwestern Alabama and East Tennessee. The Fort Payne chert of northern Alabama generally occurs in larger nodules and beds than the chert in East Tennessee. This may be an explanation for the shorter, smaller Tennessee specimens. The situation in the North Carolina Piedmont is quite different. All but two examples observed were made of volcaniclastic rocks from the Carolina "slate belt" (Butler and Ragland 1969). This material often becomes devitrified resulting in a slate-like appearance. Relatively speaking, there are no size restrictions in the use of this volcanic material. This material often occurs as masses extending for miles.

Another possibility to account for the differences between the three groups is functional variability. The primary function of these tools may have been different in the three regions. Although Dalton projectile points are multi-purpose tools, function as a knife is a trait shared by variants from different regions. However, the type of material they were used to cut could have differed--meat vs. wood vs. bone--for example. Intensive edge wear analysis could be of aid here. Still another explanation is simply stylistic differences. This involves differences in the manufacturing templates traditionally activated within contemporary groups separated by lesser or greater geographical and social distance. The last explanation offered concerns chronology.

It is possible that the differences between the groups may be due to temporal differences. At the present time scarcity of Dalton horizon radiocarbon dates and controlled excavation prevents exploration of this possibility.

The next step in analyzing the results of the linear discriminant function program was to geographically align the graphs. This was done to detect possible formal clustering within localities and sites. With the Tennessee sample the specimens were first broken down by river drainage and by site within each drainage (Figure 29). This manuever did meet with some success though the results were less than dramatic (Figure 30). Several sites such as Polhemus T-38 and Webster (40KN49) on the Holston River, Hodges C-10 on the Nolichucky River, and Del Rio (40CK7) and Dutch Bottom (40CK4) on the French Broad River do have tight clusters. However, the LeCroy site (40HA43) specimens were widely dispersed on the graph.

Since the Alabama group does not represent several different river basins, it was grouped only by sites yielding a number of specimens. First they were broken down into three sites (Figure 31). Then, conscious that the Quad and Pine Tree sites are interconnected and were arbitrarily divided at the location of a tree (Cambron and Hulse, personal communication), I combined the Quad and Pine Tree sites (Figure 32). This resulted in two distinct clusters--the Quad/Pine Tree sites and the Stanfield-Worley Bluff Shelter.

The situation of the North Carolina group is similar to that of Alabama. There were no separate river drainages and only two sites yielding more than one specimen (Figure 33). The "Arrowhead Trail"

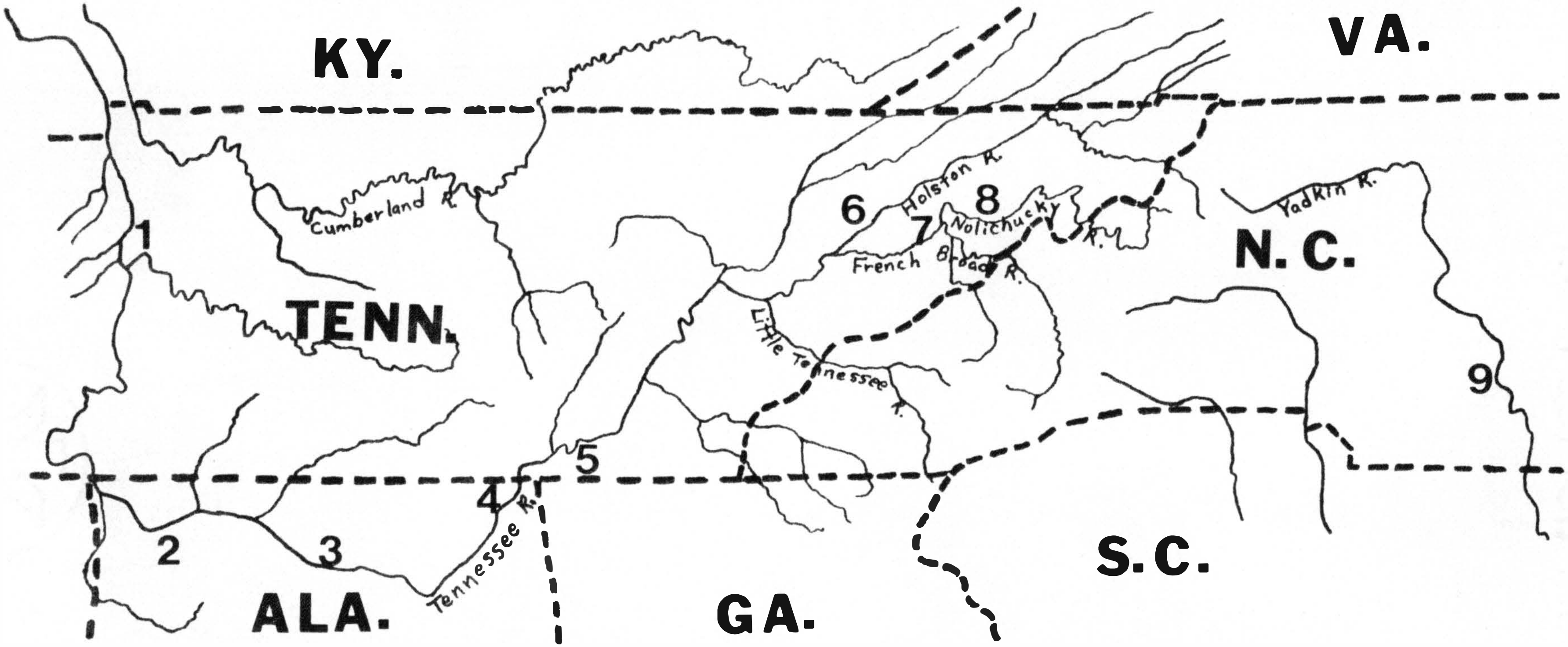


Figure 29. The location of the major river drainages and important Dalton sites discussed. (1) Nuckolls site, (2) Stanfield-Worley Bluff Shelter, (3) Quad site, (4) Russell Cave, (5) LeCroy site, (6) Webster site, (7) Dutch Bottoms site, (8) Camp Creek site, and (9) Hardaway site.

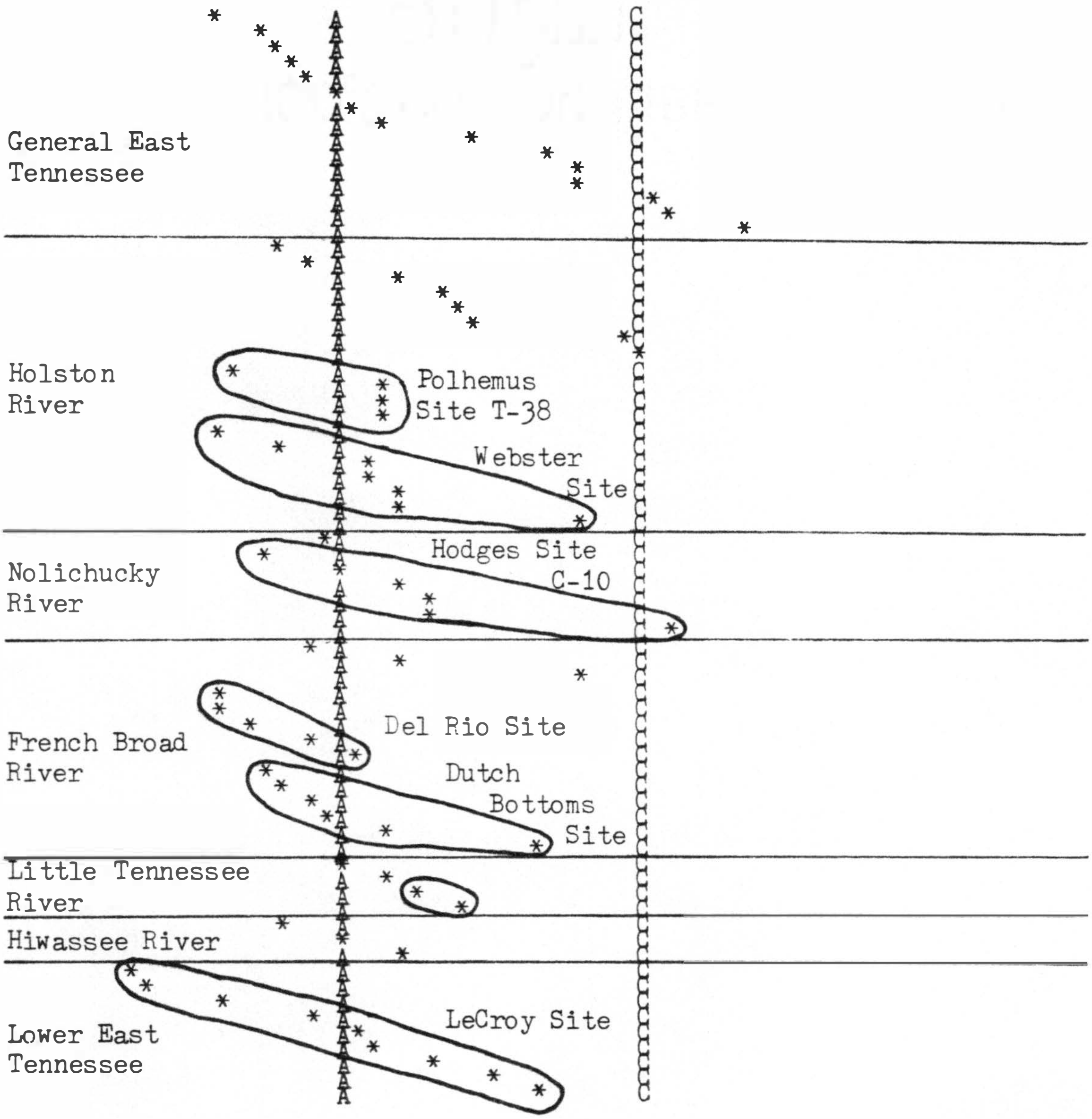


Figure 30. Graph of the relative distance of Z-numbers of the Tennessee Group from means of the other two groups when geographically aligned. A=Alabama Group; C=North Carolina Group.

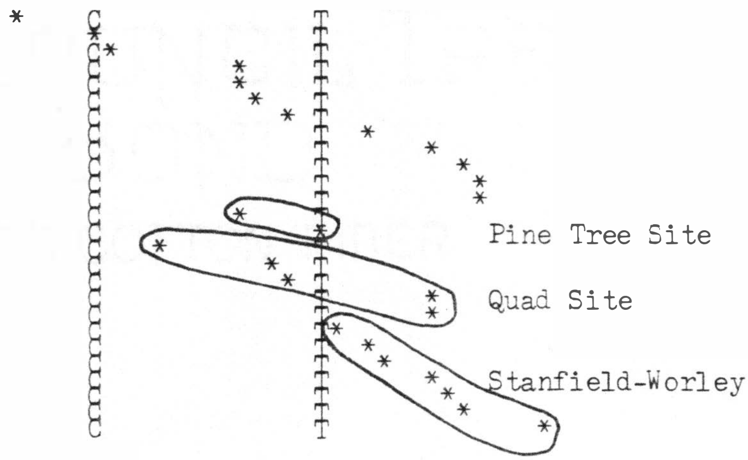


Figure 31. Graph of the relative distance of Z-numbers of the Alabama Group from means of the other two groups when geographically aligned. C=North Carolina Group; T=Tennessee Group.

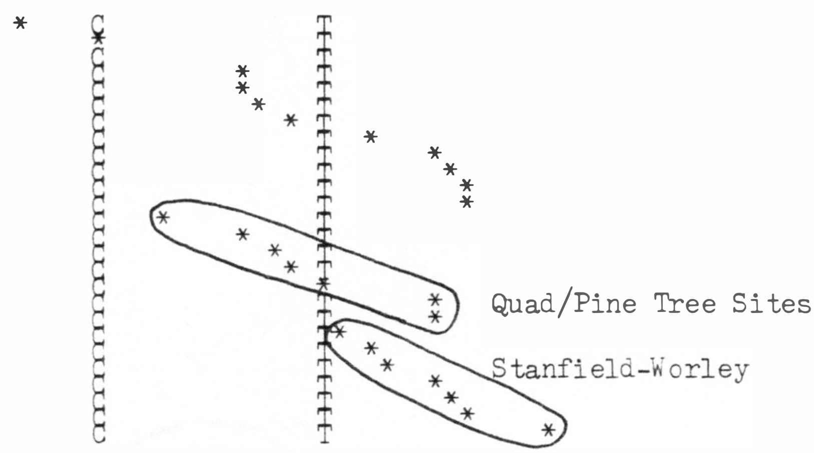


Figure 32. Graph of the relative distance of Z-numbers of the Alabama Group from means of the other two groups when geographically aligned and the Quad and Pine Tree sites are grouped together. C=North Carolina Group; T=Tennessee Group.

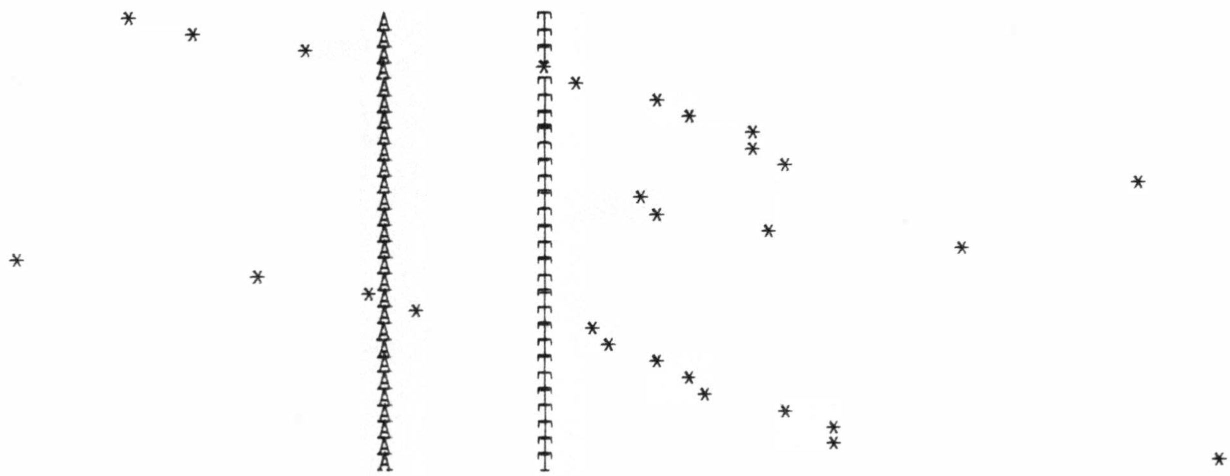


Figure 33. Graph of the relative distance of Z-numbers of the North Carolina Group from means of the other two groups when geographically aligned. A=Alabama Group; T=Tennessee Group.

site, with only four specimens, did not actually yield a tight cluster. Although the specimens from the Hardaway site ranged from one side of the graph to the other, there was a distinct cluster within the site sample.

CHAPTER VII

SUMMARY

Dalton Manifestations Outside the Study Area

Dalton is the name of a distinct projectile point type named after Judge S. P. Dalton of Jefferson City, Missouri. He collected a number of these points from a site over a period of years (Chapman 1948:138). The Dalton projectile point has often been considered synonymous with the Meserve projectile point type. The Meserve point was first identified at the Meserve Quarry site in Nebraska and was associated with fossil bison bones thought to be those of the extinct Pleistocene species Bison occidentalis (Wormington 1957:113). The Meserve point is described as lanceolate with alternate beveled blade edges usually to the right and often serrated. It has parallel stem edges, slightly expanded, or slightly contracted and laterally smoothed, and a base which is always concave (Suhm and Jelks 1962:217). The specimens from the type site have concave bases, prominent basal thinning scars, ground basal edges, and unifacially beveled blades with the bevel on the right (Wormington 1957:113). It has been suggested that Meserve points are resharpened Plainview projectile points (Suhm et al. 1954: 450; Wormington 1957:117). Points resembling the Meserve type have been found archaeologically associated with Plainview points at the Red Smoke site in Nebraska (Wormington 1957:109).

In review, the terms Dalton and Meserve seem to have been used interchangeably in the literature with the distinction being geographical--the name Meserve is applied primarily west of the Mississippi River,

except in the lower Mississippi Valley (Missouri, Arkansas and Louisiana), and in the Great Lakes region. It is important to note that Meserve points have been associated with extinct Pleistocene fauna while Dalton points have not. For this reason, Meserve points may be slightly earlier. It is tempting to see the development of this form in the west and spreading into the Southeast. However, there is no evidence to support this.

The Dalton phenomenon occurred at a unique point in the cultural sequence of the eastern United States. It occurred between the Paleo-Indian and Archaic periods in the cultural sequence. This unique position in the continuum has resulted in some authors regarding Dalton as Early Archaic (Morse 1969; 1973; Luchterhand 1970; Tuck 1974; Walthall n.d.) and others regarding Dalton as Paleo-Indian (Mason 1962; Williams and Stoltman 1965; MacDonald 1968).

Basically, the assignment of Dalton to the Paleo-Indian or Archaic periods is depedent on one's viewpoint and orientation. If one examines the technology and formal attributes of the Dalton projectile point one would be inclined to include this material with the Paleo-Indian period. However, when what little is known concerning Dalton settlement and subsistence is examined, inclusion with the Early Archaic period seems logical. It should be remembered that there is no known association of extinct Pleistocene megafauna with Dalton projectile points. On the other hand, there is an association of Meserve points with extinct Pleistocene bison (*Bison occidentalis*) at the Meserve site in Nebraska (Wormington 1957:113-114). With faunal material lacking at most excavated Dalton sites, a clear interpretation of hunting

patterns and animal exploitation is difficult. Information from the Stanfield-Worley Bluff Shelter indicates that the whitetailed deer (Odocoileus virginimus) is the main quarry represented in the Dalton zone (Parmalee 1962:516). Morse and Goodyear seem to have resolved this problem through their research in northeast Arkansas. Morse (1973:30) and Goodyear (1974:102) would tend to place Dalton within the Archaic period because the distribution of fluted points and Dalton points in northeastern Arkansas is mutually exclusive. Morse (1973:30) points out that at least in northeastern Arkansas, fluted points are concentrated along two major rivers while Dalton points occur on land surfaces known to be uninhabitable during the late Pleistocene.

One could avoid the issue of Archaic versus Paleo-Indian by defining Dalton as transitional. This solution has some merit because the Dalton complex certainly has elements characteristic of both periods. Goodyear (1974:102) objects to this:

> The construction of a transitional period as a means of resolving this dilemma (Paleo-Indian versus Archaic) is symptomatic of culture-historical units being strained to their limits.

While Goodyear may find the term "transitional period" objectionable, it does demonstrate cultural continuity and avoids the misconception that the Paleo-Indian and Archaic periods are distinct and unrelated entities.

In addition to the disagreement concerning which period to place the Dalton phenomenon, there is little agreement concerning the archaeological definition of Dalton. Over the years Dalton has been referred to by various archaeological terminology: Dalton culture (Morse 1973), Dalton horizon (Walthall n.d.; Tuck 1974), Dalton complex (DeJarnette

et al. 1962), Hardaway complex (Coe 1964) and Dalton phase (Goodyear 1974).

One factor possibly contributing to the disagreement over Dalton terminology could be that there is little temporal control over the Dalton complex. Sealed Dalton components are a rarity. The temporal relationships of Dalton variants is unknown. The radiocarbon dates available (Table 5) vary widely. This is probably due to undetected disturbance and contamination and the nature of many Dalton discoveries. The first excavations at Graham Cave, Missouri, were dug in arbitrary one foot cuts (Logan 1952:30). The later excavations were conducted using arbitrary six inch cuts (Klippel 1971:18). When several millinea of occupation are represented within only a few feet of deposit the depth of excavation cuts should be kept to a minimum.

Regardless of differences in terminology, Dalton projectile points and their related assemblages have been described in several areas. Dalton projectile points, first identified in Missouri, occur from that state across Illinois (Fowler 1959a; 1959b) and eastward into Virginia (Gardner 1974). From Virginia through the Carolina Piedmont (Coe 1964) Dalton points occur across northern Alabama (DeJarnette et al. 1962; Cambron and Hulse 1964; Walthall n.d.) and throughout Tennessee. Dalton specimens are found in Arkansas (Morse 1969; 1970; 1971; 1973; Goodyear 1974), in northern Louisiana (Webb et al. 1971) and into parts of Texas and Oklahoma (Suhm and Jelks 1962). This area covers nearly one fourth of the continental United States. These areas in which Dalton projectile points occur can be divided into physiographic and geographic regions.

Table 5. Summary of radiocarbon dates associated with Dalton type projectile points.

Site	Date C-14 Years B. P.	Reference
Stanfield-Worley	9,649 ± 450 (M-1152) 8,920 ± 400 (M-1153)	DeJarnette et al. 1962
Russell Cave	8,500 ± 320 (I-2239)	Griffin 1974
Graham Cave	9,700 ± 500 (M-130) 9,290 ± 300 (M-1889) 9,470 ± 400 (M-1928)	Chapman 1957 Klippel 1971
Modoc Rock Shelter	10,947 ± 900 (C-904) 11,200 ± 800 (C-905) 10,651 ± 650 (C-907) 9,101 ± 440 (C-908)	Fowler 1959a

Missouri and Illinois. Carl H. Chapman (1975:245) describes the Dalton variant in Missouri as lanceolate or pentagonal in shape with a triangular blade often exhibiting serrated, beveled blade edges. The Missouri variant is exemplified by finds at Graham Cave (Logan 1952; Klippel 1971) and Rodgers Shelter (Ahler 1970). I would include along with the Missouri specimens the Illinois Dalton material from Modoc Rock Shelter (Fowler 1959a; 1959b) and the lower Illinois Valley (Luchterhand 1970).

Arkansas. Closely resembling the Missouri specimens are Dalton finds in northeast Arkansas. Due to extensive research centering on Dalton sites in this area, this may be our best understanding of the Dalton horizon to date. Work by Morse (1969; 1970; 1971; 1973) and Goodyear (1974) has isolated a number of related activity sites within a limited geographical area centered around the drainages of the L'Anguille, St. Francis and Cache Rivers and along Crowley's Ridge. The Dalton projectile point in this region has an associated assemblage consisting of adzes, end scrapers, side scrapers, true blades, spokeshaves and pièces esquillées, slab abraders, hammerstones, anvils, choppers and pitted hammers (Morse 1973:26-29).

One idea to emerge from the Dalton research in this area is the previously discussed concept that Dalton points functioned as knives and underwent successive resharpening (Morse 1969;1971;1973; Goodyear 1974). That Dalton points could have served as knives and functioned well in butchering has been experimentally demonstrated by Michie (1973). Another concept to emerge from the L'Anguille area is that Dalton sites isolated from present day streams correlate with the high terraces of

old braided Mississippi River channels (Redfield and Moselage 1970:25).

Louisiana. Another regional Dalton variant occurs in northwestern Louisiana and parts of adjacent Oklahoma and Texas (Suhm and Jelks 1962:243). The Dalton manifestations in this region are primarily distinguished by the San Patrice variety hope projectile point type. The San Patrice Dalton variant is described by Suhm and Jelks (1962:243) as having a triangular blade, often stubby, with straight, convex,or concave edges. Occasionally the blade is leaf-shaped. The blade is sometimes beveled on the right or left edge of both faces but more often all four edges appear steep. Shoulders are weak and often absent. Stem edges are sometimes notched but are otherwise parallel or somewhat contracted. Bases are always concave, often deeply. Data from the John Pearce site (Webb et al. 1971) in northwestern Louisiana yields some surprises. San Patrice variety hope bears an uncanny similarity to the East Tennessee Dalton specimens. Mean measurements of the specimens from the John Pearce site are very close to the means of the East Tennessee group. The San Patrice variety st. johns projectile points bear an amazing resemblance to Hardaway projectile points from North Carolina.

Virginia and the Carolinas. The Hardaway-Dalton projectile point type and assemblage was defined by Coe (1964). At that time Coe placed the Hardaway complex within the Carolina Piedmont. Subsequent research shows that the Hardaway-Dalton type point occurs in the Piedmont of both Carolinas and into the Shenandoah Valley of northern Virginia as well (Gardner 1974). As a result of extensive work, James L. Michie

(personal communication) found that Hardaway-Dalton points in South Carolina occur almost exclusively along the fall line. The Hardaway-Dalton assemblage includes quarry blades, drills, end scrapers, side scrapers, oval scrapers and hammerstones (Coe 1964).

Western Tennessee and Kentucky. Several Dalton sites have been discovered in the Kentucky Lake region of western Tennessee and Kentucky (Lewis and Kneberg 1958; Rolingson and Schwartz 1966). This area includes the region surrounding the lower Tennessee and Cumberland Rivers in West Tennessee through Kentucky to where these rivers flow into the Ohio River. The Nuckolls site (40HS60) (Lewis and Kneberg 1958b), located on Kentucky Lake in Humphreys County, Tennessee, is one of the earlier Dalton sites reported and has yielded a great deal of artifactual material. Unfortunately, it is a surface site and the Dalton material is mixed with Paleo-Indian material. The Nuckolls site material contributed the Nuckolls and Greenbriar Dalton variants to the literature.

Northern Alabama. The Dalton specimens from northern Alabama share similarities with Dalton specimens found in both East and West Tennessee. The observations, measurements, and discriminant function program in this thesis have demonstrated a marked similarity between Dalton specimens from northern Alabama and East Tennessee. The literature provides abundant examples of specimens which share similarities and nomenclature between northern Alabama and West Tennessee. Thus, northern Alabama, geographically situated in the middle of the Tennessee River Valley, shares similarities with both the upper and lower Tennessee River Valley concerning Dalton projectile points. The Dalton variants

occurring in northern Alabama include the Colbert, Greenbriar and Nuckolls Daltons as well as the Quad type. These projectile piints have previously been described and their validity discussed in Chapter I.

Most of the important Dalton sites in northern Alabama are surface sites. However, from the Dalton zone at the Stanfield-Worley Bluff Shelter there is information about the Dalton assemblage. The Dalton assemblage includes the following unifacial tools: end scrapers, side scrapers, flake knives, gravers, and spokeshaves (DeJarnette et al. 1962).

East Tennessee. As a result of the investigations reported in this thesis, it can be stated that the previously described Early Woodland Candy Creek projectile point is actually a Dalton variant. It is urged that the name Candy Creek be eliminated and East Tennessee Dalton substituted in its place. This eliminates the confusion with the Middle Woodland Candy Creek ceramic type and the Early Woodland Candy Creek projectile point type in northern Alabama. The name East Tennessee Dalton also denotes the cultural affiliation and geographical distribution of the projectile point. The East Tennessee Dalton is by no means restricted to the Great Valley of East Tennessee. More research is needed to more accurately establish the range and distribution of this Dalton variant.

However, some preliminary statements can be made concerning the distribution of the East Tennessee Dalton variant. Such information can not only be of a preliminary nature because distribution was not a major aim of this research, and because better control over site location is desirable. When dealing with private collections lacking precise

recorded data, sometimes only a vague location for a specimen can be obtained.

The East Tennessee Dalton variant is usually found on the surface of the second and third terraces and surrounding uplands of the major rivers in East Tennessee. Other common diagnostic projectile points from sites yielding Dalton specimens include Early Archaic Kirk, Palmer, and Decatur corner notched points; St. Albans, LeCroy and Kanawha bifurcate base points; and numerous Late and Middle Archaic stemmed types. The author observed several Clovis and Cumberland fluted points from sites producing Dalton specimens. Unlike the situation in Arkansas (Goodyear 1974:102), Dalton and earlier fluted point sites in East Tennessee are not mutually exclusive.

In addition to the aforementioned surface finds, single Dalton specimens have been recovered from three buried, stratified, Early Archaic sites on the Little Tennessee River. Two specimens were recovered from St. Albans components, one at the Rose Island site (40MR44) (Chapman 1975:118-119) and one at the Icehouse Bottom site (40MR23) (Chapman 1977). Another specimen was recovered form the LeCroy component at the Calloway Island site (40MR41) (Chapman, personal communication). Until more intensive studies are conducted, with greater control over the data, a more complete statement concerning the distribution of Dalton specimens in East Tennessee cannot be made.

The East Tennessee Dalton projectile point can be described as lanceolate in shape with resharpening often resulting in a pentagonal outline. The East Tennessee Dalton is one of the smaller Dalton variants, similar in shape and size to the San Patrice Dalton in

Louisiana. The Tennessee group usually exhibited the smallest attribute means of the three groups examined in this thesis. The small size may be the result of the available raw material. The East Tennessee Dalton variant is commonly made on a flake. The specimens are always basally thinned and sometimes fluted by the same technique used to flute Paleo-Indian projectile points. Basal grinding is almost always present on the shallow side notches and basal concavity. The rough triangular blade, often rounded and stubby, is usually beveled and often serrated.

The present study has demonstrated that the East Tennessee and northern Alabama Daltons share more similarities with each other than either does with the Hardaway-Daltons of the North Carolina Piedmont. There are several possible explanations for this. One possibility is an unknown temporal difference between the three groups. A second explanation concerns geographical differences. East Tennessee and northern Alabama are both isolated from the North Carolina Piedmont by the Appalachian Mountains while they are linked together by the Tennessee River Valley. A third explanation for the differences is the available raw material. The East Tennessee and northern Alabama specimens are made from locally available nodular chert whereas the Piedmont specimens are made from the volcanic glass of the Carolina "slate belt."

In summary, the most important result of this thesis research is that after twenty years the East Tennessee Dalton projectile points have been placed correctly in the cultural sequence. After a thorough examination of over one hundred specimens, there is no doubt that the Candy Creek points (except the specimens from the Candy Creek site) are

actually Daltons. Now that Dalton projectile points have been identified in East Tennessee, the next step is to attempt to locate and to investigate sites with sealed Dalton components.

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