8-1984

Contextual Studies of the Middle Archaic Component at Cave Spring in Middle Tennessee

Jack L. Hofman
University of Tennessee, Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Jack L. Hofman entitled "Contextual Studies of the Middle Archaic Component at Cave Spring in Middle Tennessee." 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.

Walter E. Klippel, Major Professor

We have read this thesis and recommend its acceptance:

Michael H. Logan, Gerald F. Schroedl

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

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

ANTHROPOLOGY

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CONTEXTUAL STUDIES OF THE MIDDLE ARCHAIC COMPONENT AT CAVE SPRING IN MIDDLE TENNESSEE

A Thesis

Presented for the

Master of Arts

Degree

The University of Tennessee, Knoxville

Jack L. Hofman

August 1984

to

Jay W. Hofman

ACKNOWLEDGEMENTS

Research involving the Cave Spring materials and field work at the site have been conducted under Tennessee Valley Authority Contract TV-49244A. Dr. Walter E. Klippel has served as Principle Investigator and Project Director. This work represents part of the ongoing Columbia Archaeological Project in the proposed Columbia Reservoir area in Middle Tennessee. Tennessee Valley Authority archaeologists Julia (Jill) Elmendorf and J. Bennett Graham have endeavored to keep the Columbia Archaeological Project operating smoothly. Their efforts have been of considerable importance to this research and are heartily acknowledged.

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Lucile, Russell, Carolyn, Jay and Rosalee Hofman have allowed me to remain in the fold and have always helped me keep things in perspective. Don Wyckoff, Larry Todd, Craig Gerlach and Will Hines have always been there when it mattered most and I am fortunate to have such friends.

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ABSTRACT

Research in 1980 and 1981 at the Cave Spring site, located on the Duck River in the Nashville Basin of Middle Tennessee, revealed a buried paleosol in a Holocene terrace which contained charcoal, river gravel and chipped stone artifacts. Radiocarbon dates from this buried stratum range from 6500 to 7300 years before present. Evaluating the potential of this buried deposit for yielding behaviorally significant information depended upon learning (1) whether the cultural materials were undisturbed or were redeposited by the river, (2) whether one or several periods of deposition or occupation were represented, and (3) whether material from one or more than one cultural group was included in the deposit. Gravel from the excavation was studied and compared to control samples from a nearby gravel bar and from a Pleistocene terrace. A significantly higher percentage of reddened and broken gravel occurred with the artifacts than in the control situations. This information, in conjunction with a gravel concentration exposed during excavation, suggests that the gravel had been culturally introduced for use in stone boiling or as hearth stones.

Refitting analysis was conducted using chipped stone artifacts and debris to determine if the highly leptokurtic vertical distribution of artifacts resulted from disturbance processes or sequent occupations. Reconstructed flake sequences and conjoined artifact fragments documented that vertical post depositional movement of these buried materials had occurred. Pieces from the same refitted set had dispersed as much as 40 cm vertically through silty clay during the past 7,000

years. Horizontal movement of pieces and systematic size sorting, as would result from stream action, had not occurred.

The problem of how many cultural groups were responsible for the archaeological remains was confronted using the Cave Spring projectile point-knife sample. Given the perspective of systematic chipped stone reduction, the concept of multistage types is developed. The Eva biface reduction system is proposed with the Eva multistage type encompassing a variety of morphological and functional states which reflect expectable variation in the reduction or uselife sequences of particular artifacts within the overall system. The variability observed in the Cave Spring projectile point-knife sample, including specimens traditionally classified as Morrow Mountain points, can be attributed to a single biface reduction system and we need not infer the activities of two distinct cultural groups in accounting for the observed variability. The Morrow Mountain type in the southern Appalachian region apparently represents a biface reduction system distinct from that in the Middle Tennessee region commonly denoted as the Eva-Morrow Mountain cluster. This conclusion has significant ramifications for the assignment of assemblages to specific archaeological taxonomic units, and for making appropriate assemblage comparisons. It is not tenable to refer variability in the archaeological record directly to cultural variability. The situational nature of behaviors which operated to create the archaeological record must also be considered.

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CHAPTER I

INTRODUCTION

This study is directed toward interpretation of archaeological remains from a buried mid-Holocene stratum at the Cave Spring site in middle Tennessee (Figure 1.1). The Cave Spring site, 40MU141, is located by the Duck River in east central Maury County. The artifact-bearing deposit of concern here is radiocarbon dated between 6,500 and 7,300 years before present (Hofman 1982a). The materials of interest are chipped stone artifacts and debris, river gravel, and charred botanical remains.

Several interrelated problems relevant to interpreting the Cave Spring site are investigated, including:

1. Whether these remains were deposited by humans or redeposited by natural factors such as flooding.
2. What affect natural processes have had on post depositional movements of these materials during the past 7,000 years.
3. Determination of the number of cultural groups responsible for the recovered artifacts.
4. Evaluation of the activities which resulted in the discard and loss of this material.
5. Consideration of the position of Cave Spring within the adaptive system of the region's mid-Holocene hunter-gatherers and within the archaeological framework established for the Middle South.

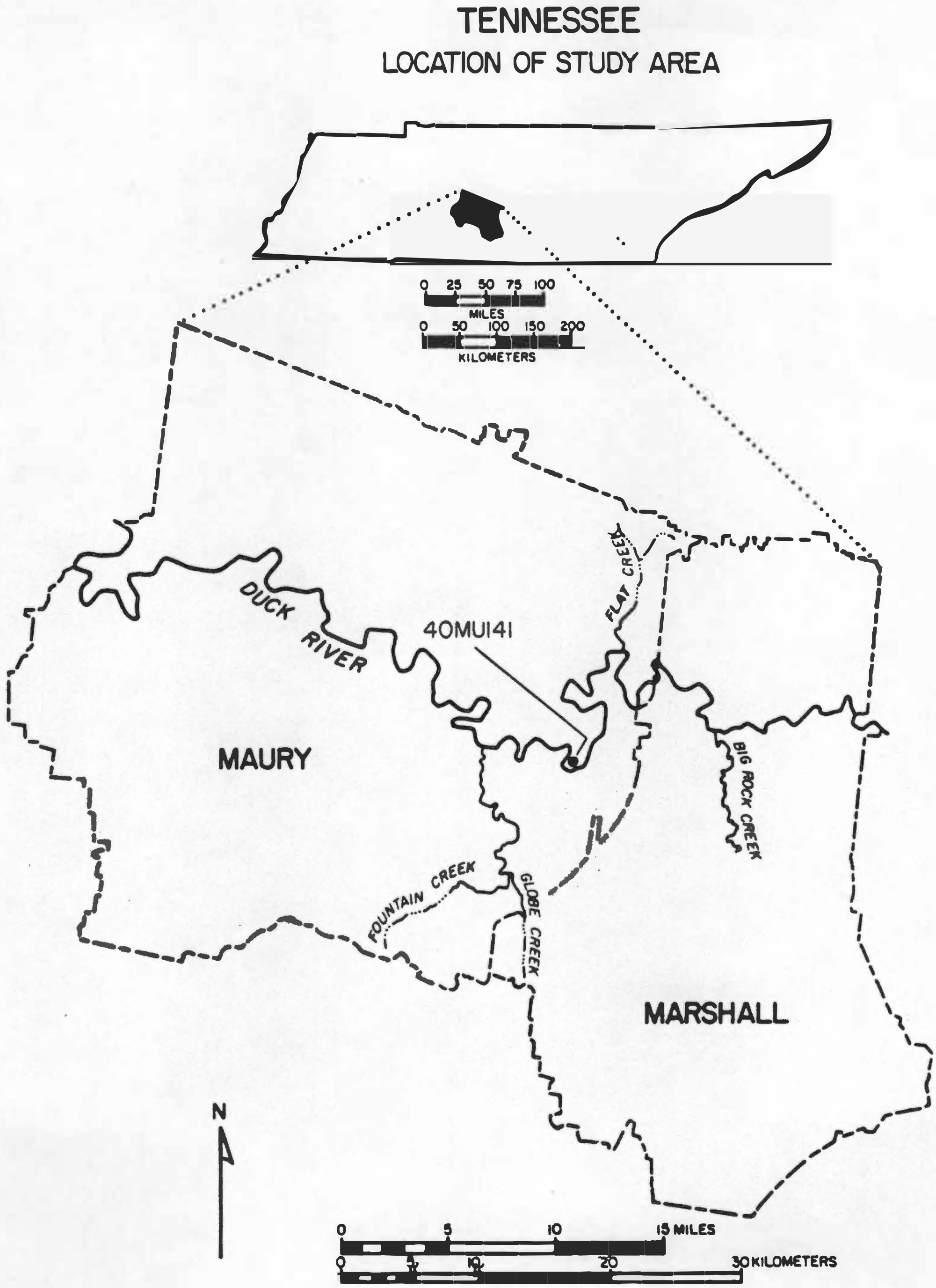


Figure 1.1 Location of the Cave Spring site on the Duck River in Maury County, Tennessee.

These problems are approached sequentially as listed. Priority is given to evaluating the context, integrity, and resolution of the artifact aggregate and to determining the number of cultural groups responsible for the recovered materials.

Evaluation of the integrity of the artifacts and other materials, whether they are in primary or secondary context, was first approached through a study of the river gravel. The presence of gravel initially brought into question the manner of deposition of the artifacts in the buried stratum (Hofman 1981a; Hofman and Brakenridge 1982a, 1982b). The gravel analysis was aimed at resolving several problems: (a) was the gravel river deposited or the result of cultural activity, (b) was the gravel deposited on one or more than one surface, and (c) was the gravel culturally significant and if so what purpose did it serve?

In attempting to answer these questions several kinds of information were considered. Color, condition, and size of the gravel were analyzed in attempting to evaluate its origin and potential function. If the gravel was used for heating or stone-boiling purposes (Chapman 1977a, 1979; Lewis and Lewis 1961; Webb 1974), then evidence of thermal alteration, such as color change from tan to red and breakage, can be predicted. As a comparative control, gravel samples from a nearby modern gravel bar and a Pleistocene age terrace deposit were also studied. The study revealed a significantly higher frequency of thermally altered (red and broken) gravel associated with the artifacts than in the other gravel samples. This evidence supported the interpretation that the gravel had been culturally modified and was potentially the result of human activity at the site.

The gravel and chipped stone artifacts were dispersed, however, through a stratum 35-50 cm in thickness. Therefore, the vertical distribution of gravel was studied in an attempt to identify the number of depositional surfaces represented. Vertical density histograms indicated a highly peaked unimodal distribution. This was interpreted to reflect a single primary depositional surface, though not necessarily a single depositional event.

To further evaluate the significance of the vertical distribution of materials and the possibility of horizontal displacement due to flooding or erosion, a refitting study of chipped stone artifacts was undertaken (Hofman 1981b). Refitting was conducted to evaluate the extent and intensity of horizontal displacement of pieces after they were laid down, as well as vertical movement of pieces after they were buried. The refitting analysis provided good evidence for a lack of horizontal size sorting, but documented that post depositional vertical movement of conjoinable pieces had occurred. Flakes from individual reduction episodes were commonly displaced 20 cm and as much as 40 cm. The vertical distribution of chipped stone pieces mirrored that of the gravel, and it was concluded that all these materials were originally deposited on the same surface and were subsequently vertically distorted.

The contextual studies provided evidence for a single occupational or depositional surface and for a horizontally intact collection. It remained to be determined how many occupations had occurred or how many cultural groups were represented. This problem was approached through

study of diagnostic artifacts which at Cave Spring were limited to chipped stone projectile point-knives. Most points belonged to two recognized morphological types, Eva and Morrow Mountain. These Middle Archaic types have been repeatedly found together in the Middle Tennessee region (Lewis and Lewis 1961; Faulkner and McCollough 1973). The only other diagnostics at Cave Spring were several Early Archaic artifacts apparently reworked by Middle Archaic occupants.

The co-occurrence of Eva and Morrow Mountain projectile points at Cave Spring raised a problem. This problem, whether two truly distinct types are represented or simply variations on a theme, was approached on a series of analytical levels. Consideration was first given to chipped stone artifact typology in general, and to biface reduction sequences in particular. An initial step was made toward evaluation of the hypothesis that the Eva and Morrow Mountain "types" in Middle Tennessee represent a continuum of variation within a single biface reduction system. This study suggests that Eva and Morrow Mountain projectile point-knives in the region represent artifacts of a single culture and are not temporally or culturally distinct types. These artifacts may represent what is here designated a multistage type. These are chipped stone artifact types which undergo considerable morphological and/or functional variability during their period of use.

Based on the interpretation that one cultural group was responsible for the occupation(s) at Cave Spring, it remained to determine the nature of the occupation(s) or the activities represented. Analysis of the Cave Spring component assemblage revealed that the most common

artifacts were projectile point-knives (even more common than flake tools), and the predominant debris was very small biface thinning flakes. The Cave Spring assemblage reflects the activities of hunters who were engaged in refurbishing and retooling hunting equipment, initial processing, and domestic activities such as heating or cooking. Cave Spring is interpreted as a limited activity camp, which was probably occupied repeatedly by Middle Archaic hunters-foragers. It represents only one of several site types attributable to these mid-Holocene people.

In the framework of Middle Archaic archaeological units in the Middle South, Cave Spring is considered in relation to established phases and horizons. It is argued that there is a need for definition of an Eva Horizon in the middle and western Tennessee region as distinct from the Morrow Mountain Horizon of the southern Appalachian region. A preliminary definition of the Eva Horizon is presented, and the need for defining local phases related to the Eva Horizon is discussed. An initial definition of the Cave Spring complex, representing Eva components in the Central Duck River Basin, is presented.

In summary, this study proceeds from an investigation of the context and integrity of an artifact aggregate in river terrace sediments, to consideration of the number of components or assemblages represented, then to an outline of the prehistoric activities indicated and finally to an evaluation of the place of the site within the archaeological taxonomic framework in the Middle South. The primary contributions of this study are: (a) use of several methodological

approaches to evaluate the context of archaeological materials buried in terrace deposits, (b) development of the concept of multistage lithic types which promotes reconsideration of traditional chipped stone artifact typologies, and (c) clarification of Middle Archaic archaeological taxonomy in the Middle South, which should encourage more systematic use and application of phase and horizon unit concepts in the Middle and Western Tennessee region.

CHAPTER II

THE ECOLOGICAL SETTING OF CAVE SPRING: PAST AND PRESENT

The Region in Modern Times

The modern climate of the Central Duck River Basin (hereafter abbreviated CDRB) is humid and temperate. The growing season averages about 192 days between the last frost in early April and the first frost in late October. Snow falls in small amounts a few times each winter and generally lasts no more than a few days. Short droughts occur in the summer and fall, and excessive wet periods are common in winter and spring (Harmon *et al.* 1959). Figure 2.1 illustrates the average monthly temperatures for the region as recorded over an 83 year period ending in 1955. Figure 2.2 indicates average monthly precipitation and evaporation rates. The combination of high temperatures, high evaporation potential, and relatively low rainfall can make the summer months exceedingly dry for short periods or during the entire season. The effects of these dry periods are most severe in upland, shallow soil, glade areas. Deciduous trees on these shallow soils have been observed to defoliate by late July or early August after extended dry periods.

Natural vegetation has been significantly altered since European settlement of the region in the early 1800s (Harmon *et al.* 1959). Logging, land clearance, agriculture, and hunting and trapping have had considerable impact on species diversity and density. In addition to altering wildlife habitats, deforestation has resulted in considerable

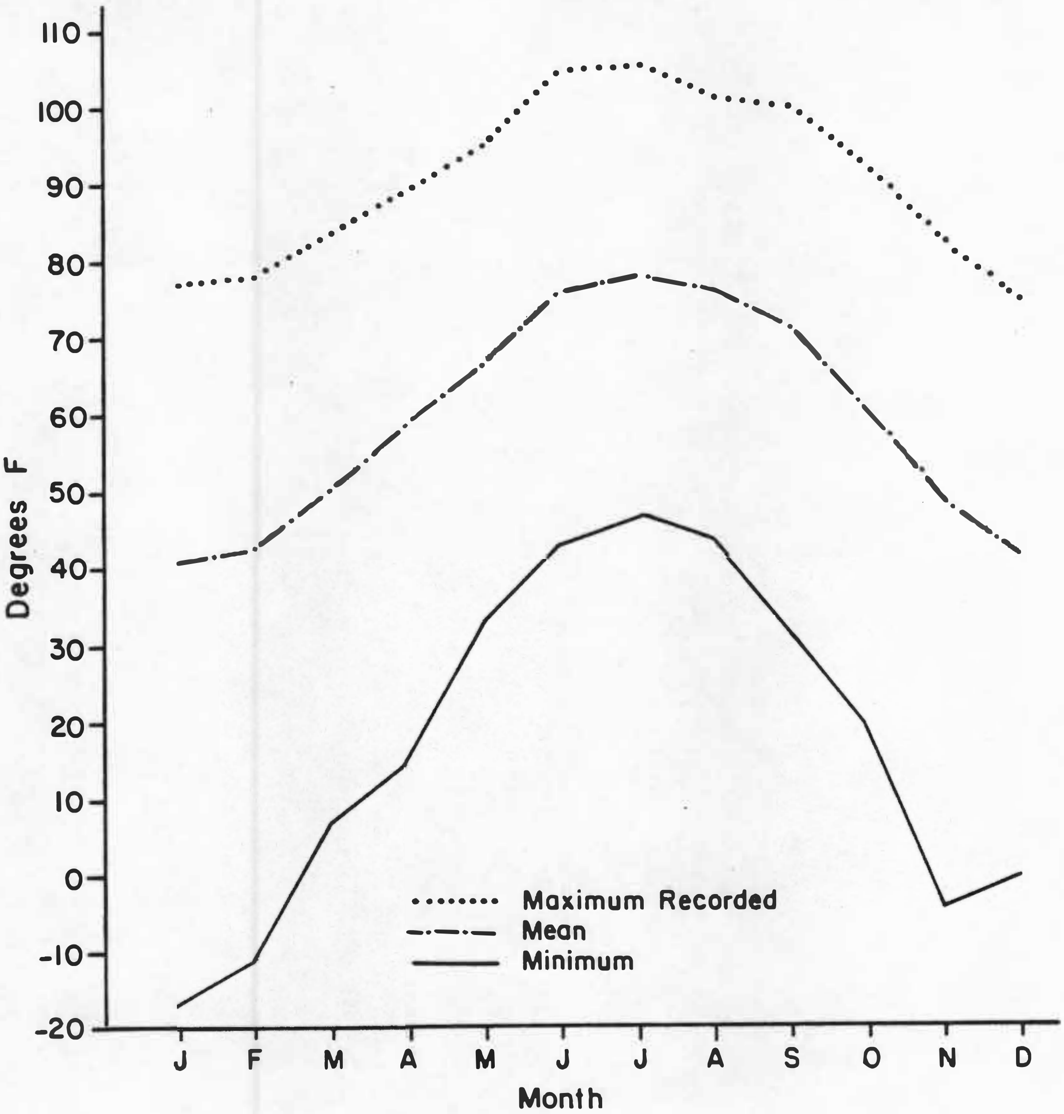


Figure 2.1 Average monthly temperatures for Ashwood, Tennessee (located 16 km west of 40MU141) for an 83 year period ending in 1955 (based on Harman et al. 1959). Average annual temperature is 59.6 degrees F.

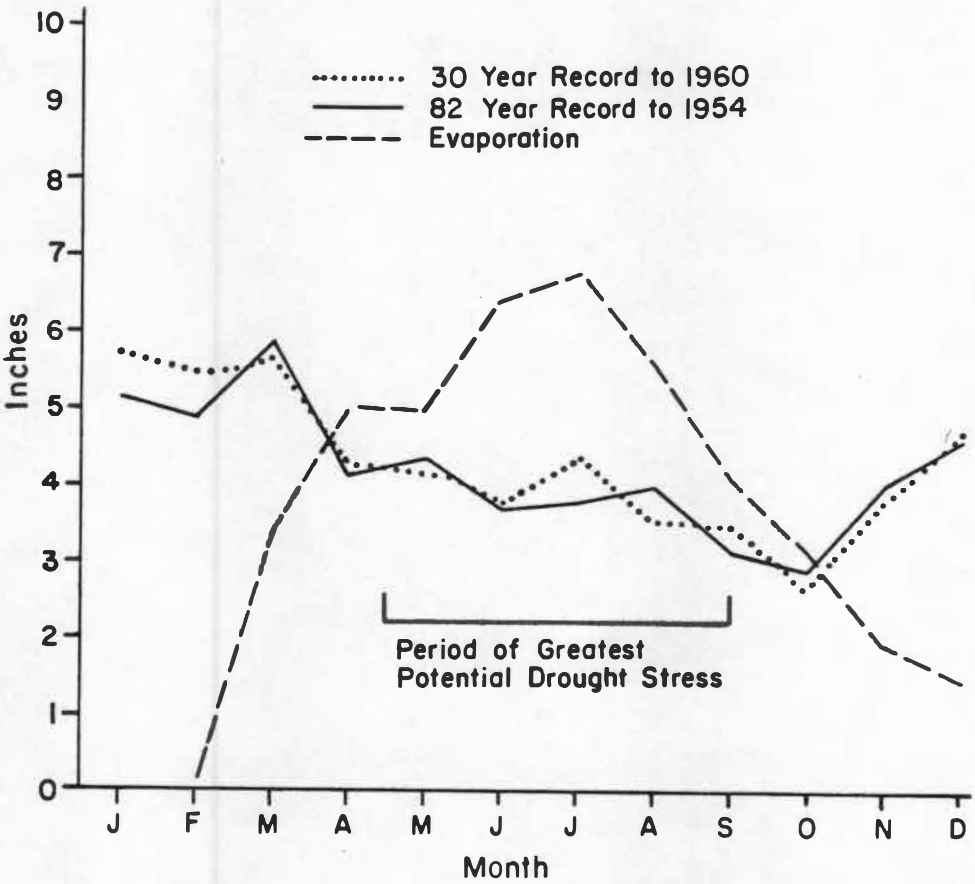


Figure 2.2 Average monthly precipitation for Ashwood, Tennessee (located 16 km west of 40MU141) for an 82 year period ending in 1954 (based on Harmon et al. 1959). Average annual precipitation is 50.62 inches (128.6 cm). Evaporation rate for central Tennessee is from the National Oceanic and Atmospheric Administration 1979.

terrace and upland erosion and alluviation of the modern floodplain (Borst *et al.* 1945; Brakenridge 1982; Copley *et al*. 1944; Entorf 1980).

Physiographically, the study area is within the Nashville or Central Basin (DeSelm 1959; Fenneman 1938), which is part of the Interior Low Plateau province. Elevation of the Central Basin is between about 150 and 210 m above sea level. The borders of the Central Basin are defined by the Highland Rim which encloses the Basin and which has an elevation of circa 300 m. The Highland Rim is capped by resistant cherty limestone of the Mississippian Fort Payne formation (Amick 1981; Harmon *et al.* 1959; Theis 1936). The Central Basin has been divided into inner and outer units or basins (Figure 2.3) each having distinctive geological and ecological characteristics (Amick 1981; DeSelm 1959; Harmon *et al.* 1959; Klippel 1980; Theis 1936:13). The outer basin is relatively homogeneous with generally deep, rich soils and western mesophytic forests (Braun 1950:35), much of which is now cleared for agricultural use. Much of the outer basin limestone and soil is high in phosphorus, and soil resting on the Bigby formation is in some places commercially mined for phosphate (Theis 1936:76). Soils on the Bigby and Hermitage formations are considered the richest agricultural lands in Tennessee, aside from the Mississippi bottoms on the western edge of the State (Theis 1936:14).

In contrast to the rich soils of the outer basin, the inner basin soils are comparatively shallow and rocky except in the fairly narrow river bottoms. Although deep, the river bottom soils in the inner basin are not as rich as those in the outer basin. The border between the

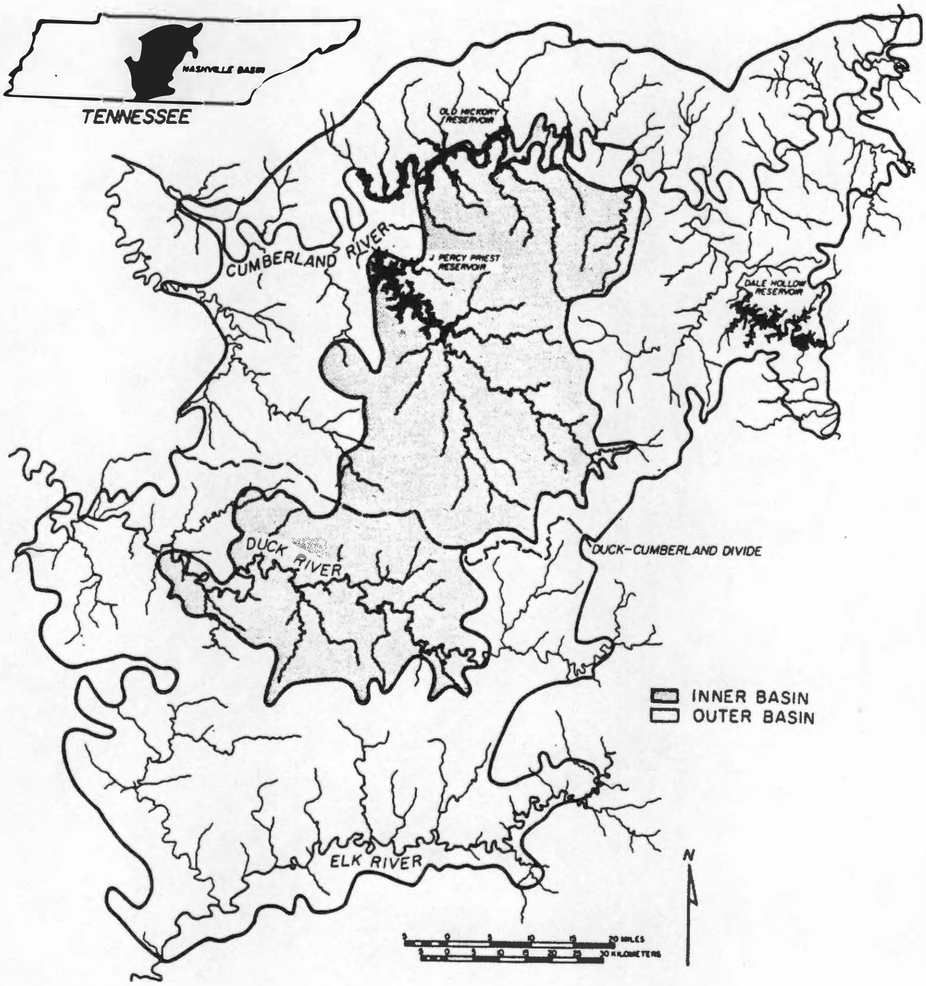


Figure 2.3 The Central Basin or Nashville Basin of Middle Tennessee showing the inner and outer portions.

inner and outer portions of the Central Basin is generally taken as the base of the Hermitage formation (Theis 1936:14), although the transition zone between the two is several miles wide in some places.

Much of the inner basin is in pasture or woods and the percentage of agricultural lands is considerably less than the outer basin (Harmon et al. 1959). Parts of the inner basin exhibit distinctive karst topography and patches of bare limestone. Xerophytic plants, including species of grasses, yucca, prickley pear cactus and winged elm, are locally common with red cedar (*Juniperus virginiana*) dominant in well drained and rocky areas. Cedar glades or barrens and savanna-like situations occur naturally in the inner basin (Harper 1926; Quarterman 1950a, 1950b). However, red cedar is gradually replaced by oak-hickory forest as one moves from shallow-rocky soil areas to locales with deeper sediments.

Modern land use reflects the distinctiveness of the inner and outer basins with goat and pig farms common in the rocky areas of the inner basin, while a much higher percentage of outer basin lands are under cultivation. In late prehistoric times a similar difference has been recognized (Klippel and Reed 1982), with Middle Cumberland culture stone box cemetery sites and associated Mississippian habitation sites common in the outer basin, especially in the richly phosphytic western part of the outer basin (Dowd 1972; Ferguson 1972; Myer 1928; Reed 1979; Steverson 1981). Such sites are very rare or absent in the inner basin (Klippel and Reed 1982). Differential utilization of these two distinct geomorphic and ecological zones has apparently been practiced throughout the prehistoric habitation of the region (Klippel and Turner 1981).

The Cave Spring site is located within the more patchy environment of the inner basin. Trees common to the CDRB are listed in Table 2.1, and mammals which occur in the area today are listed in Table 2.2. Additional information on the modern and historic biota is available in several sources; see Kellogg (1939) for mammals, Tennessee Valley Authority (1972) for most small and aquatic animals, Ortmann (1924), Isom and Yokley (1968) and Van der Schalie (1973) for mussels and gastropods, Harper (1926) and Quarterman (1950a, 1950b) for plant life.

The climate and ecology of the region have been roughly similar to that of early historic times for the past several thousand years, since the end of the Hypsithermal interval about 4000 years ago (Delcourt 1979:268; Delcourt and Delcourt 1979; Wright 1976). During the early Holocene, circa 12,500 to 8000 years ago, the Middle South was dominated by a cool-temperate climate with mixed mesophytic forest (Delcourt 1979; Delcourt and Delcourt 1979; Klippel and Parmalee 1982a). The mid-Holocene Hypsithermal interval (Deevey and Flint 1957) lasted from about 8000 to 4500 or 4000 years B.P., with the peak of this generally dryer and warmer period occurring around 7000 years B.P. (Delcourt 1979:267; Wright 1976). This period of climatic change and environmental "deterioration" is reflected in the faunal, palynological, paleobotanical, and sedimentary records for the Middle Tennessee region. The Hypsithermal interval is evidenced by an increase in oak, ash and hickory indicating a general warming and drying trend on the eastern Highland Rim adjacent to the Central Basin (Delcourt 1979), by a period of downcutting and floodplain stability along the Duck River (Brakenridge 1982), and by changes in species composition of

Table 2.1. Tree species of the Duck River area.*

Common Name	Scientific Name
Eastern Red Cedar	*Juniperus virginiana*
Black Oak	*Quercus velutina*
Northern Red Oak	*Quercus rubra*
Southern Red Oak	*Quercus falcata*
Blackjack Oak	*Quercus marilandica*
Scarlet Oak	*Quercus coccinea*
Shumard Oak	*Quercus shumardii*
Shingle Oak	*Quercus imbricaria*
Water Oak	*Quercus nigra*
Willow Oak	*Quercus phellos*
White Oak	*Quercus alba*
Chestnut Oak	*Quercus prinus*
Chinquapin Oak	*Quercus muehlenbergii*
Post Oak	*Quercus stellata*
Swamp Chestnut Oak	*Quercus michauxii*
Basswood	*Tilia americana*
Black Willow	*Salix nigra*
Buckeye	*Aesculus octandra*
Cucumber	*Magnolia acuminata*
Black Gum	*Nyssa sylvatica*
Sweet Gum	*Liquidambar styraciflua*
Red Maple	*Acer rubrum*
Boxelder	*Acernegundo*
Cottonwood	*Populus deltoides*
Ash	*Fraxinuss* spp.
Beech	*Fagus grandifolia*
Black Cherry	*Prunus serotina*
Dogwood	*Cornus florida*
Hard Maple	*Acer saccharum*
Black Walnut	*Juglans nigra*
River Birch	*Betula nigra*
Persimmon	*Diospyros virginiana*
Hickory	*Carya* spp.
American Elm	*Ulmus americana*
Rock Elm	*Ulmus thomasii*
Winged Elm	*Ulmus alata*
Slippery Elm	*Ulmus rubra*
Sourwood	*Oxydendrum arboreum*
Sycamore	*Platanus occidentalis*
Hackberry	*Celtis occidentalis*
Holly	*Ilex opaca*
Black Locust	*Robinia pseudoacacia*
Mulberry	*Morus rubra*

Table 2.1. (continued)

Common Name	Scientific Name
Sassafras	*Sassafrass albidum*
Osage Orange	*Maclura pomifera*
Honey Locust	*Gleditsia triancanthos*
Blue Beech	*Carpinus caroliniana*
Catalpa	*Catalpa bignonioides*
Redbud	*Cercis canadensis*
Ironwood	*Ostrya virginiana*
Yellow-poplar	*Liriodendron tulipifera*
Butternut	*Juglans cinerea*

*From Tennessee Valley Authority 1972.

Table 2.2. Mammals Known to Occur in the Duck River Area.*

Common Name	Scientific Name
Virginia opossum	Didelphis virginiana
Eastern mole	Scalopus aquaticus
Least shrew	Cryptotis parva
Southeastern shrew	Sorex longirostris
Shorttail shrew	Blarina brevicauda
Keen myotis	Myotis keeni
Little brown myotis	Myotis lucifugus
Indiana myotis	Myotis sodalis
Gray myotis	Myotis grisescens
Evening bat	Nycticeius humeralis
Eastern pipistrel	Pipistrellus subflovus
Big brown bat	Estesicus fuscus
Red bat	Lasiurus borealis
Hoary bat	Lasiurus cinereus
Silver-haired bat	Lasionycteris noctivagans
Eastern big-eared bat	Corynorhinus macrotis
Raccoon	Procyon lotor
Longtail weasel	Mustela frenata
Shorttail weasel	Mustela erminea
Mink	Mustela vison
River otter	Lutra canadensis
Spotted skunk	Spilogale putorius
Striped skunk	Mephitis mephitis
Red fox	Vulpes fulva
Gray fox	Urocyon cinereoargenteus
Bobcat	Lynx rufus
Woodchuck	Marmota monax
Eastern chipmunk	Tamias striatus
Eastern gray squirrel	Sciurus carolinensis
Eastern fox squirrel	Sciurus niger
Southern flying squirrel	Glaucomys volans
Beaver	Castor canadensis
Eastern harvest mouse	Reithrodontomys humulis
White-footed mouse	Peromyscus leucopus
Golden mouse	Peromyscus nuttalli
Cotton mouse	Peromyscus gossypinus
Rice rat	Oryzomys palustris
Hispid cottonrat	Sigmodon hispidus
Eastern woodrat	Neotoma floridana
Southern bog lemming	Synaptomys cooperi
Pine vole	Pitymys pinetorum
Prairie vole	Microtus ochrogaster
Muskrat	Ondatra zibethica

Table 2.2. (continued)

Common Name	Scientific Name
Norway rat	*Rattus norvegicus*
Black rat	*Rattus rattus*
House mouse	*Mus musculus*
Eastern cottontail	*Sylvilagus floridanus*
Whitetail deer	*Odocoileus virginianus*

*From Tennessee Valley Authority 1972.

insectivores from stratified paleontological deposits in Cheek Bend Cave (Klippel and Parmalee 1982a and 1982b). Based on their study of micromammals, Klippel and Parmalee suggest that the uplands of Cheek Bend were subjected to a reduction in summer precipitation, an increase in drought tolerant vegetation, and increased openings in the patchy glade environment.

The Hypsithermal is of considerable interest in the study of Middle Archaic groups who occupied the CDRB. What impact did the changing environment have on Archaic adaptations? Can the causes for cultural changes during this period be attributed directly to the changing environment? Detailed and locally specific information on Hypsithermal and early Holocene environmental conditions is increasing for the central Duck River. Critical climatic and ecological information is forthcoming from the studies mentioned above, as well as others just getting underway. Correlative study of cultural changes and changes in other aspects of the local ecosystem will soon be feasible for much of the Archaic period in the CDRB.

Biotic Resources of the Cave Spring Site Locale, 7300-6500 B.P.

A sample of paleobotanical remains has been identified from the Cave Spring site, which is located in Cheek Bend about 1.6 km upstream from Cheek Bend Cave. The component from which these materials were collected is dated between 7300 and 6500 radiocarbon years before present (Hofman 1982a). Table 2.3 lists the species represented in this sample. Additional paleobotanical remains have been identified from Middle and Late Archaic components at the Clay Mine site, 40MU347, which

Table 2.3. List of paleobotanical remains from the Cave Spring site, 40MU141, recovered during the 1980 test excavation.

Scientific Name:	Common Name:	Type of Remains:
Fraxinus pennsylvanica	green ash	charcoal
Fraxinus spp.	ash	charcoal
Carya spp.	hickory	charcoal & nutshell
Celtis occidentalis	hackberry	charcoal
Diospyros virginiana	persimmon	charcoal
Gleditsia triancanthos	honey locust	charcoal
Sassafras albidum	sassafras	charcoal
Prunus serotina	black cherry	charcoal
Juniperus virginiana	red cedar	charcoal
Juglandaceae	walnut family	nutshell
*Arundinaria spp.	cane	charcoal

* Cane fragments were noted during excavation.

is located in Cheek Bend about 1.6 km upstream from Cave Spring (Table 2.4). The Middle Archaic sample is from a component dated to 6240 ± 500 radiocarbon years before present (hereafter abbreviated RCYBP), and the Late Archaic, post-Hypsithermal, sample is dated to 3215 ± 125 RCYBP (Amick and Hofman 1981; Amick 1983).

Botanical remains from mid-Holocene levels in Cheek Bend Cave were also identified by Crites (1982). Stratum V of Cheek Bend Cave is dated to 7500 years ago (Klippel and Parmalee 1982a, 1982b) and is dominated by remains of red cedar. The remains from these sites cannot be assumed representative of the overall mid-Holocene environment of the locale because they have been selected through prehistoric cultural activities and only a few samples have been studied. Nevertheless, a minimum range of species which were utilized by Middle Archaic people in the CDRB is represented.

Many of these species were potentially of considerable economic importance for reasons other than use as fuel. Species which produce edible nuts or fruit are well represented. Various hardwoods, cedar and cane would also have had utility for the manufacture of wooden artifacts. One point of interest is that three primary taxa (oak, hickory and ash), which are reported to have increased significantly in the Middle South during the Hypsithermal interval (Delcourt 1979), are well represented in the paleobotanical record from these mid-Holocene sites along the Duck River (Tables 2.3 and 2.4). Also, the presence of red cedar in samples dating to 7500 RCYBP indicates that the cedar glades of the inner Central Basin are probably not a recent phenomenon

Table 2.4. List of paleobotanical remains from the Clay Mine site, 40MU347, recovered during 1979-1980 excavation.

Scientific Name:	Common Name:	Type of Remains:
MIDDLE ARCHAIC COMPONENT (6249 RCYBP)		
*_Carya_ spp.	hickory	charcoal and nutshell
*_Fraxinus_ spp.	ash	charcoal
Acer spp.	maple, boxelder	charcoal
*_Juniperus virginia_	red cedar	charcoal
Vitis spp.	wild grape	charcoal
*_Arundinaria_ spp.	cane	charcoal
*_Gleditsia triancanthos_	honey locust	charcoal
Quercus spp.	oak	charcoal
Quercus alba	white oak	charcoal
Quercus rubra	red oak	charcoal
Gymnocladus dioicus	Kentucky Coffeetree	charcoal
Ulmus spp.	elm	charcoal
*_Juglandanceae_	walnut family	charcoal and nutshell
Juglans nigra	black walnut	nutshell
*ring porous		charcoal
LATE ARCHAIC COMPONENT (3215 RCYBP)		
*_Fraxinus_ spp.	ash	charcoal
*_Gleditsia triancanthos_	honey locust	charcoal
*_Carya_ spp.	hickory	charcoal and nutshell
Quercus spp.	oak	charcoal
*_Celtis occidentalis_	hackberry	charcoal
*_Juniperus_ virginiana	red cedar	charcoal
*_Prunus serotina_	black cherry	charcoal
*_Juglandaceae_	walnut family	charcoal and nutshell
Juglans nigra	black walnut	nutshell
*ring porous		charcoal

* Species also present at Cave Spring, 40MU141.

(Crites 1982). If the patchy environment of the inner basin with its cedar glades does in fact have a long history, this has significance for comparing past human activities between the inner and outer basins throughout the Holocene (Klippel and Turner 1981).

Animals known to occur prehistorically in the Duck River Basin are represented by faunal remains from a number of archaeological and paleontological sites in or near the region (Bogan 1978; Faulkner, Corkran and Parmalee 1976; Klippel and Parmalee 1982a; Lewis and Lewis 1961; Morey 1981; Parmalee 1978; Robison 1977). Table 2.5 provides a composite list of native species, represented at the Eva and Ervin sites, which inhabited the region during the mid-Holocene. Poor bone preservation, due largely to acidic soils and extreme variations in soil moisture content and shrink-swell action, is typical of the open terrace sites along the central Duck River. Only in special situations, such as rockshelters and caves (Entorf 1980; Hall 1981; Klippel and Parmalee 1982a) or in shell midden sites, do faunal remains generally preserve. Therefore, the available evidence of Hypsithermal archaeological faunas in the CDRB is very limited at open sites like Cave Spring.

At Cave Spring, white-tailed deer was the only animal species positively identified. This species was evidenced by an astragulas and molar fragments in the buried Middle Archaic component. These elements represent very dense bone which often survives when more fragile pieces have deteriorated (e.g. Binford 1977a). Ongoing investigations at rockshelters with mid-Holocene components and at the Ervin site (40MU174) which is located about 7 air km upstream from Cave Spring are

Table 2.5. Composite list of prehistoric animal prey species documented from the Eva and Ervin sites.

Species or Taxon	Present at Eva *	Present at Ervin **
bear, Ursus americanus	x	
deer, Odocoileus virginianus	x	x
wildcat, Felidae family	x	
fox, Canidae family	x	
woodchuck, Marmota monax	x	x
beaver, Castor canadensis	x	x
raccoon, Procyon lotor	x	x
opossum, Didelphis marsupialis	x	
rabbit, Sylvilagus spp.	x	x
eastern cottontail, Sylvilagus Floridanus		x
squirrel, Sciurus spp.	x	x
gray squirrel, Sciurus cf. carolinensis		x
muskrat, Ondatra zibethica	x	
otter, Lutra canadensis	x	
striped skunk, Mephitis mephitis		x
mink, Mustela vison	x	x
rat, Neotoma spp.	x	
turkey, Meleagris gallopavo	x	x
goose, Anserinae family		x
unidentified birds, Aves	x	
mud or musk turtle, Kinosternidae spp.		x
slider/cooter/mop turtle, Chrysemys spp.		x
eastern box turtle, Terrepene carolina		x
unidentified turtle	x	x
hellbender, Cryptobranchus alleganiensis		x
drum, Aplodinotus grunniens	x	
gar, Lepisosteus spp.	x	
catfish, Ictaluridae family	x	
unidentified fish	x	x

* Eva data based on Lewis and Lewis 1961.

** Ervin data based on 1978 surface collection, identified by Darcy F. Morey, 1981.

producing assemblages of fauna which will help fill out the list of economically important species used by the Middle Archaic foragers (Hofman 1983). Seasonal variation in the use of these various species is also being investigated (Manzano 1981; Morey 1983). The shell midden at the Ervin site is dominated by several species of gastropods, but bivalves, aquatic vertebrates, small mammals, and birds also are represented. Deer appears to be the primary terrestrial game species. Although Early Archaic components are present at Ervin, the shell midden there began to accumulate during the Eva Horizon (ca. 7500-6500 B.P.) and continued to accrue until circa 4500 B.P.

For present purposes a minimum range of mid-Holocene fauna is derived primarily from outside the study area. The Eva site, located between Cypress Creek and the Tennessee River in Benton County about 112 km west of Cave Spring and about 13 km below (north of) the mouth of the Duck River had good faunal preservation and is dated to the mid-Holocene (Lewis and Lewis 1961). Taxa represented in the Eva site fauna are listed in Table 2.5. It should be noted that Eva was multicomponent, with Eva through Benton occupations represented, and that the excavation there was not geared to the recovery of small scale faunal remains.

This brief survey provides an initial perspective on the ecological setting of the CDRB for the Hypsithermal interval or mid-Holocene. The climate was probably somewhat drier and warmer on the average than at present. A minimum range of species which were available to and utilized by the Middle Archaic groups in the region has been presented

(Tables 2.3-2.5). It is probable that many additional species were actually utilized, but perhaps those of major importance have been identified.

CHAPTER III

THE CAVE SPRING SITE

The Site Locale

The Duck River, in the central reaches of its course, is a deeply entrenched, meandering stream (Figure 3.1). Each of the river's bends in this area exhibit similar geological configurations. Typically, on the outside curve of each bend the Duck butts against limestone bluffs which vary from 10 to more than 30 m in height. In these situations the karst topography, cedar glades, and thin rocky soils common in the inner Central Basin occur adjacent to the river. The lateral erosion of the Duck against the limestone may be on the order of .5 to 1.5 m per century in some locales (Brakenridge 1982).

The inside of each bend is characterized by deep alluvial sediments composed primarily of silts and clays. Generally at least three distinct terraces are present marking the outward or lateral migration of the river (Brakenridge 1982, 1984). In contrast to the outsides of bends, these deep bottomland sediments supported lush mesophytic forests and associated fauna in early historic times. On downstream curves the inside of each bend usually has a buried point bar formation. In these locations the lateral migration of the river is most rapid and the terrace surfaces are usually broad.

The Cave Spring site is located within Cheek Bend on the downstream curve (Figure 3.1). Surface indications of the site consist of chipped stone artifacts and debris which extend for several hundred meters parallel to the river and extend up to 200 m away from the river on

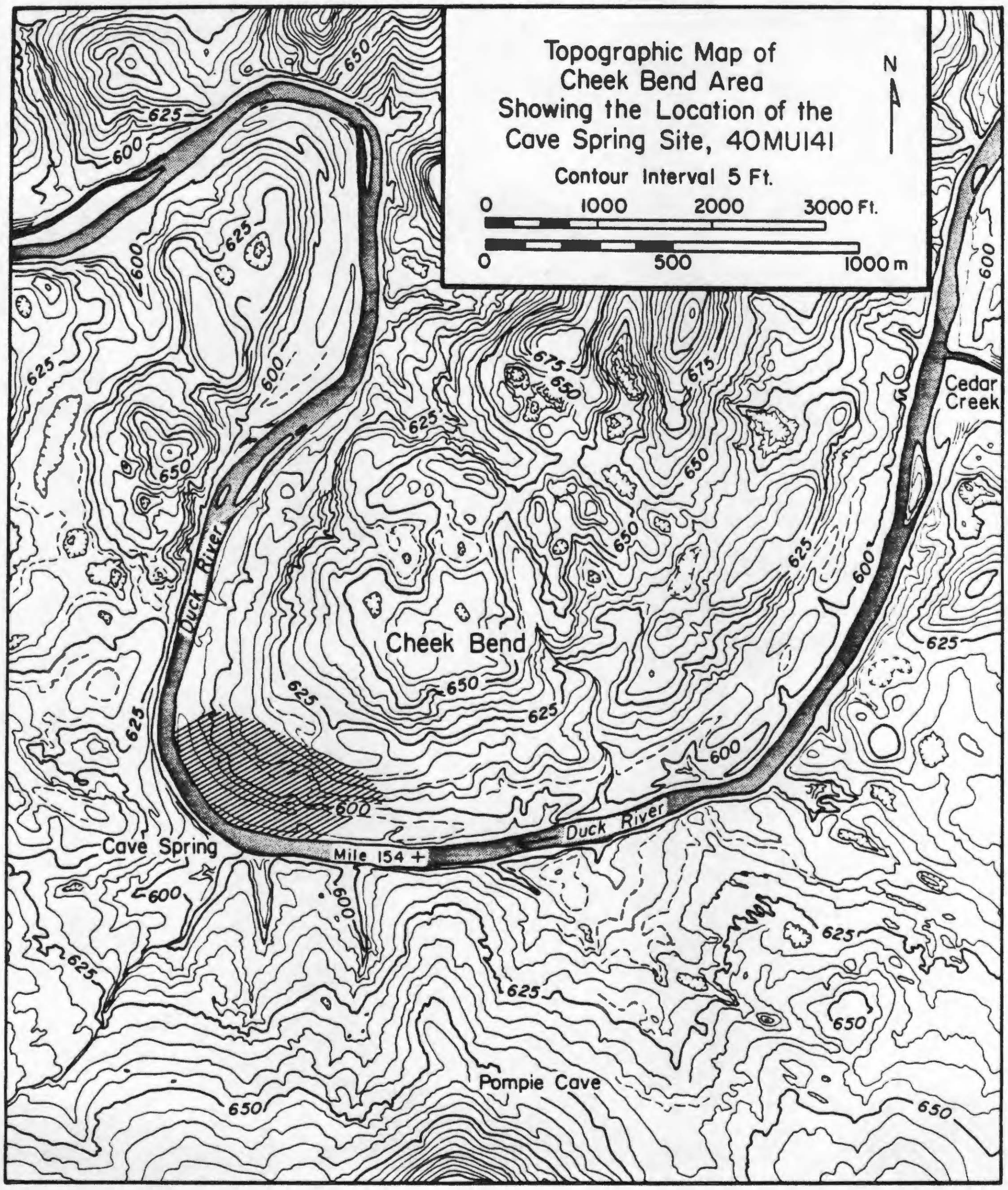


Figure 3.1 Location of the Cave Spring site, 40MU141, on the Duck River in Cheek Bend

ancient terraces. Occupation debris occurs in the plowzone on the T1, T2, and T3 terraces. The assemblage of primary concern in this study, however, is restricted to the buried T1a terrace surface. Subsequent late-Holocene alluviation covered this old land surface and sealed it below the plowzone. During the occupation this surface was the equivalent of the modern T1 levee of the Duck. The buried surface was situated on the crest of a terrace directly adjacent to the river during the mid-Holocene occupations.

Across the river from the site is a cold water spring which eminates from a small cave in the limestone bank (Figure 3.2). Access to this spring water can also be gained through sinkholes in the cedar glades about 100 m south of the river. Except during certain times of the winter, the river level is generally low enough to expose the mouth of the cave. The configuration of the mouth of this spring has probably changed during the past 7000 years since the Middle Archaic occupations, but the spring is assumed to have been present and accessible to Middle Archaic people essentially as it is today. Many meters of the cave spring's passageway can be waded through by stooping to avoid the low ceiling, and nodules of Ridley Chert are common in the walls and ceiling of the cavern. It is possible that the chert as well as the clean water would have made the cave of interest prehistorically.

Within a half kilometer of the Cave Spring site, a variety of diverse ecological niches occur. River resources are close at hand and include gravel bar, island, spring, and limestone or claybank situations. The river bottom is also diverse, varying from a smooth flat limestone floor or rocky, gravelly substrate to a clay bottom.

Figure 3.2 The mouth of Cave Spring across the Duck River from the Cave Spring site, summer 1980.

Calm waters occur behind and at the toe of islands. Rapid currents are common on the outside of the bend sometimes running under overhanging limestone ledges. Varied plant and animal life occurs within these diverse niches of the river. Bottomland mesophytic forest was present along the river on the deep terrace sediments. Many nut and fruit-bearing trees and other useful plants such as cane, greenbrier, catttails, and grapes were present. Riverine and water-edge mammals and forest dwellers would have been common in the site area. Directly south of the site across the river and within a kilometer to the north in the upland portion of Cheek Bend, cedar glade situations are available, which provide considerable edge area for browsing animals, diverse plant life including xeric species not found in the river bottoms, and broken limestone rocky terrain provides a superb habitat for small game such as rabbits and ground hogs.

The T1b terrace at the Cave Spring Site is covered with flood water at least once every 2 or 3 years. These high floods occur in the winter and early spring, from December through April, and the clayey terrace surface is typically saturated with water and often holds water during that period. The fact that this site location is susceptible to winter and spring flooding would have made it seasonally undesirable for long-term habitation. There are periods, however, during the winter when the terrace is dry and habitable. Also, there is good evidence that this terrace was more stable (flooded only infrequently) during the mid-Holocene (Brakenridge 1982). The perennial cold water spring, on the other hand, may have made the site desirable at least as a temporary

camp or stop-over during hot months when the Duck is low and its water relatively less potable.

History of Investigations and Methodology

The Cave Spring Site was first recorded in 1972 (Dickson 1976:296-301) during an initial survey of the proposed Columbia reservoir area. The site had been known to locale artifact collectors for many years. A total of 396 lithic pieces were collected in 1972 from three areas of the site on the T2 terrace. A small collection, including one Eva projectile point, was also made from a restricted area of the T1 terrace and was designated as site 40MU140 (Figure 3.3).

In 1978 a revisit to the area was made when the current Columbia archaeological survey was initiated under Walter E. Klippel's direction. In 1978 several small lithic scatters were discovered in disturbed areas where trees had been cleared. Sites 40MU280, 331, 332, 333, and 334 were recorded at that time (Figure 3.3). In this study, all of these lithic scatters are considered part of the 40MU141 site complex and are referred to collectively as 40MU141 or the Cave Spring site.

During 1980 a comprehensive controlled surface survey of tillable lands in Cheek Bend including the entire 40MU141 site area was conducted (Figure 3.3). The collection of surface artifacts was horizontally controlled by establishing an extensive grid of 20 meter squares. These units were then sub-divided into 10 m square quads by using a mobile rope grid (Hofman 1981a).

Each 20 meter square was designated by the grid coordinates of its southwest corner. The four 10 m quads of each 20 meter square were

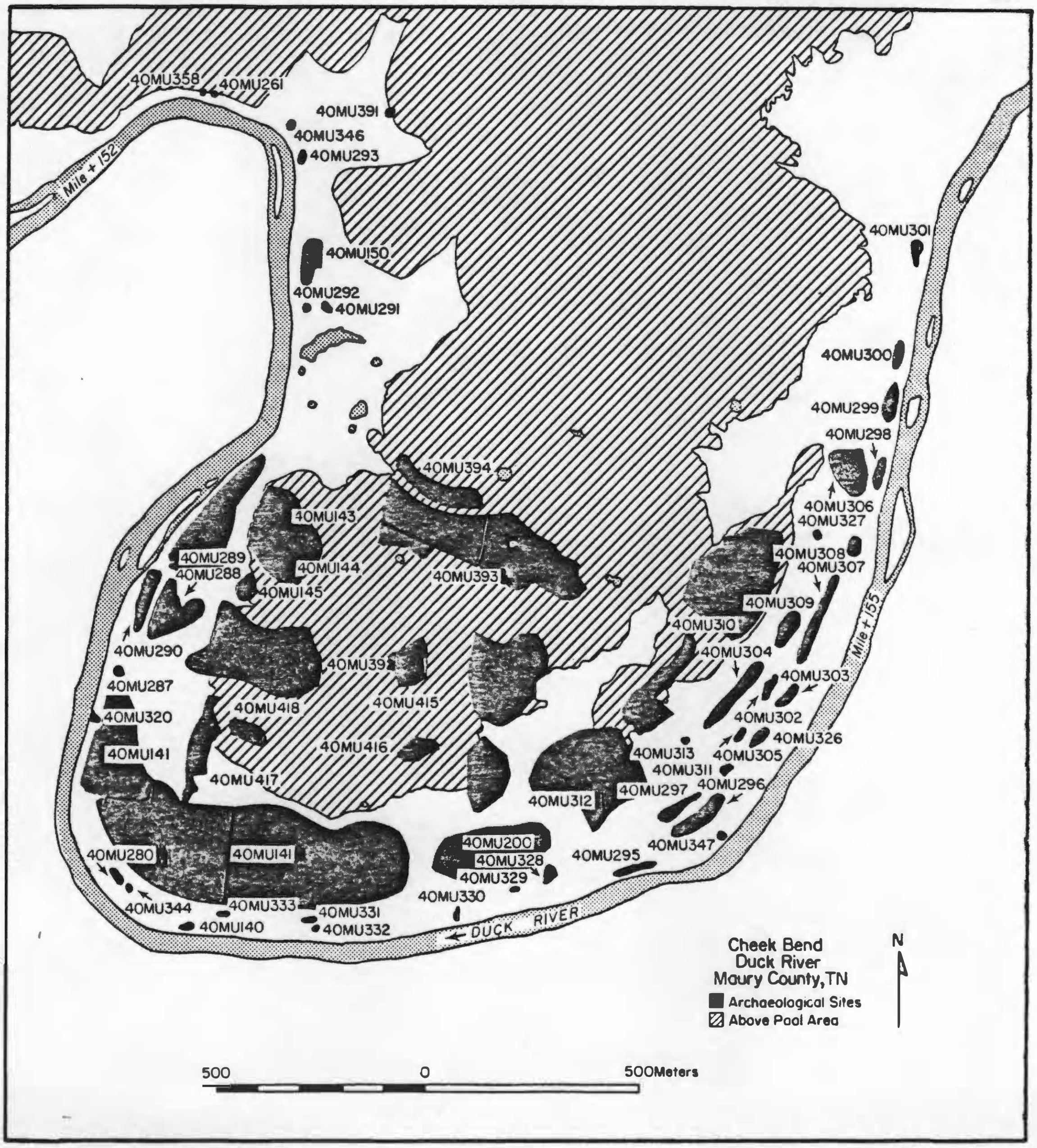


Figure 3.3 Archaeological sites recorded in Cheek Bend 1972-1981.

labeled A through D beginning in the southwest corner and proceeding in a clockwise fashion (e.g. quad D was always the southeastern quad). Materials collected from each quad were bagged and labeled separately. Each 10 meter quad was collected by walking between planted rows of corn or at intervals not exceeding 1 meter. The field's surface was clean except for the rows of small corn plants (generally 8 to 15 cm high) and bunches of grass in some spots. Surface visibility was between 80 and 100 percent, usually nearer the latter, for the field had received several inches of rain which settled the dust, disolved clods, and exposed artifacts to view.

The controlled surface collection yielded specific information about the horizontal distribution of material. Figure 3.4 shows the 10 meter square quads at the site which produced 100 or more chipped stone artifact or debris pieces (this is a density equal to or greater than 1 piece per square meter). The entire area shown in the Figure 3.4 map, to the limits of the field, was collected using 10 m square units. The most dense concentration of materials occurs on the top or crest and front slope of the Pleistocene T2 terrace. Here the plowzone extends well into the ancient terrace sediment, and remains from human occupations dating from Paleoindian to Woodland times occur within this shallow zone.

Toward the river, the Holocene T1 terrace contains considerably fewer artifacts in its plowzone and these were primarily of Late Archaic and Woodland age. This lower terrace had apparently not yet formed or was just beginning to be deposited during Paleoindian times. During the Early Archaic period, circa 10,000 to 7,500 years ago, the lower

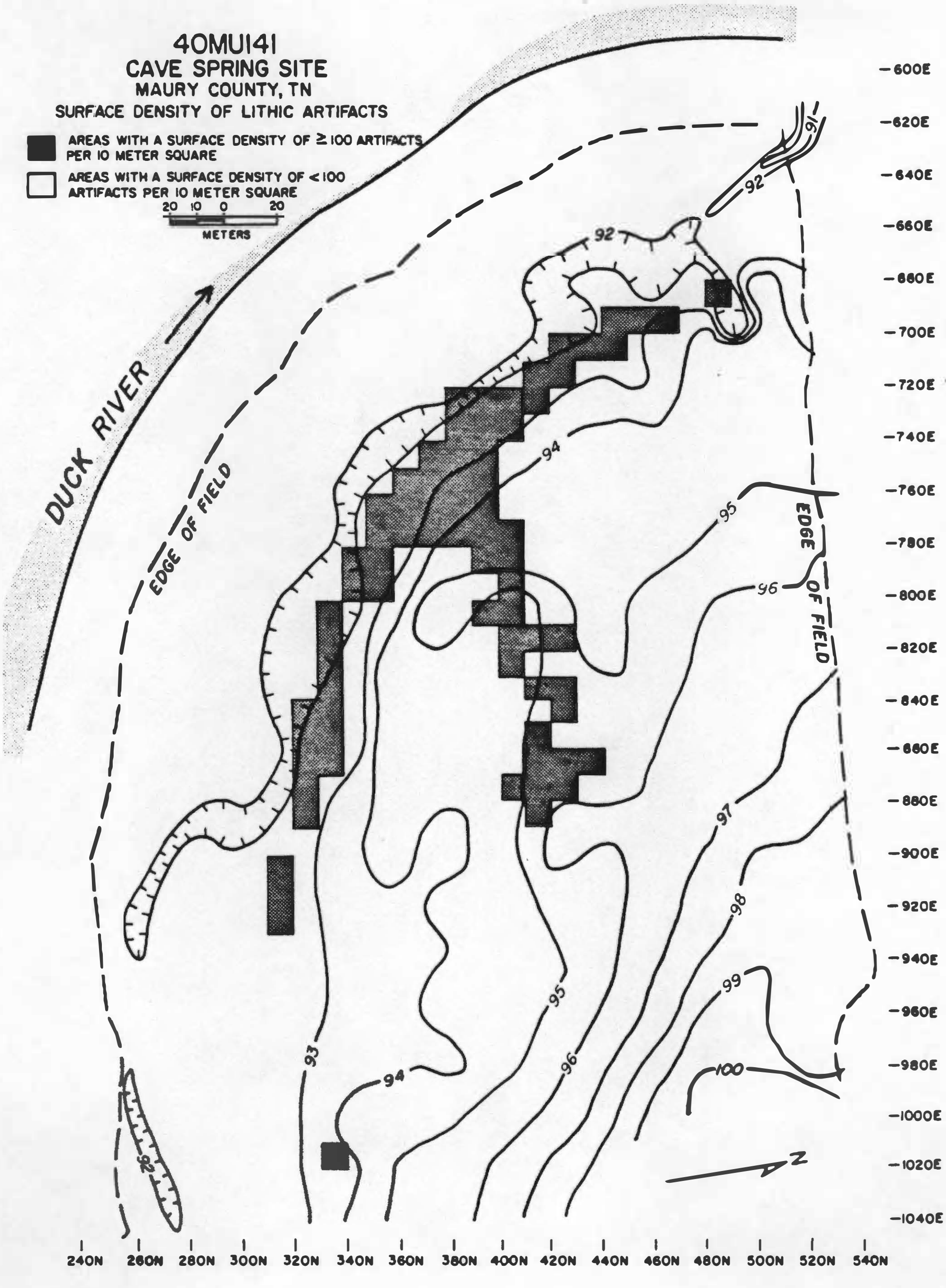


Figure 3.4 Distribution of 10 meter square units which produced 100 or more artifacts during the 1980 surface collection.

formation or T1a was being laid down. The later aggregation of the T1b or upper member of the Holocene terrace buried these older sediments and most early artifacts below the plowzone on the T1 terrace except in a few situations.

The widespread occurrence of buried archaeological deposits in terrace sediments has become increasingly well documented in recent years (Broyles 1971; Chapman 1975, 1976, 1977a, 1977b, 1978, 1979; Coe 1964; Collins 1979; Wyckoff 1964). The possibility that there may be deeply buried sites in the Duck River terraces prompted deep site testing in the Cave Spring site area. Late during the 1979 field season, backhoe trenches were excavated about 1.6 km upstream from Cave Spring at the Clay Mine site which has a similar surface distribution pattern to that of Cave Spring. Evidence of two Archaic components below the plowzone in the T1 terrace at the Clay Mine Site confirmed a suspicion that buried terrace sites occurred in the area and indicated that more buried sites may occur in similar settings (Amick and Hofman 1981).

Geomorphological investigations of the river terrace system in the Duck River Valley was initiated in 1980. Brakenridge (1982) directed early trenching and stratigraphic study efforts towards locations which might contain charcoal to aid in dating the strata. The Cave Spring site was one such location, selected because of its position on the river and distinct terrace surfaces and because it might contain datable archaeological strata, such as were found at the Clay Mine site.

A backhoe with a 3 foot wide bucket was used to excavate a stratigraphic trench (designated 80D) from the crest of the T2

Pleistocene terrace, down its slope and extending to the T1b and T0 levee overlooking the river. This 108 meter long trench (Figure 3.5) revealed a stratigraphic sequence and a buried paleosol which contained considerable charcoal, gravel, and chipped stone artifacts (Hofman 1981a:45). The procedure for study and recording the trench walls was essentially as discussed by Turner, Hofman, and Brakenridge (1982). Colored flags were used to mark the location of items exposed in the trench walls; white flags for chipped stone artifacts, blue flags for charcoal, and orange flags for river gravel (Figure 3.6).

Figures 3.7 and 3.8 illustrate the distribution of artifacts, charcoal, and gravel in Trench 80D (the Pleistocene section of the trench is not illustrated). These trench profiles indicated that cultural material was scattered throughout and adjacent to the buried paleosol which marked the top boundary of the early Holocene T1a terrace.

Interpretation of the origin of these buried cultural materials proved problematical because stream gravel suggested the possibility that the cultural remains were redeposited (Hofman 1981a; Hofman and Brakenridge 1982a, 1982b). Therefore, further investigation was required in order to evaluate the origins of the buried artifacts, to evaluate how much of the vertical distribution of artifacts could be accounted for by post-depositional disturbance, and to determine the number of artifact complexes or cultural assemblages represented. Controlled hand excavations were made adjacent to Trench 80D in order to address these problems.

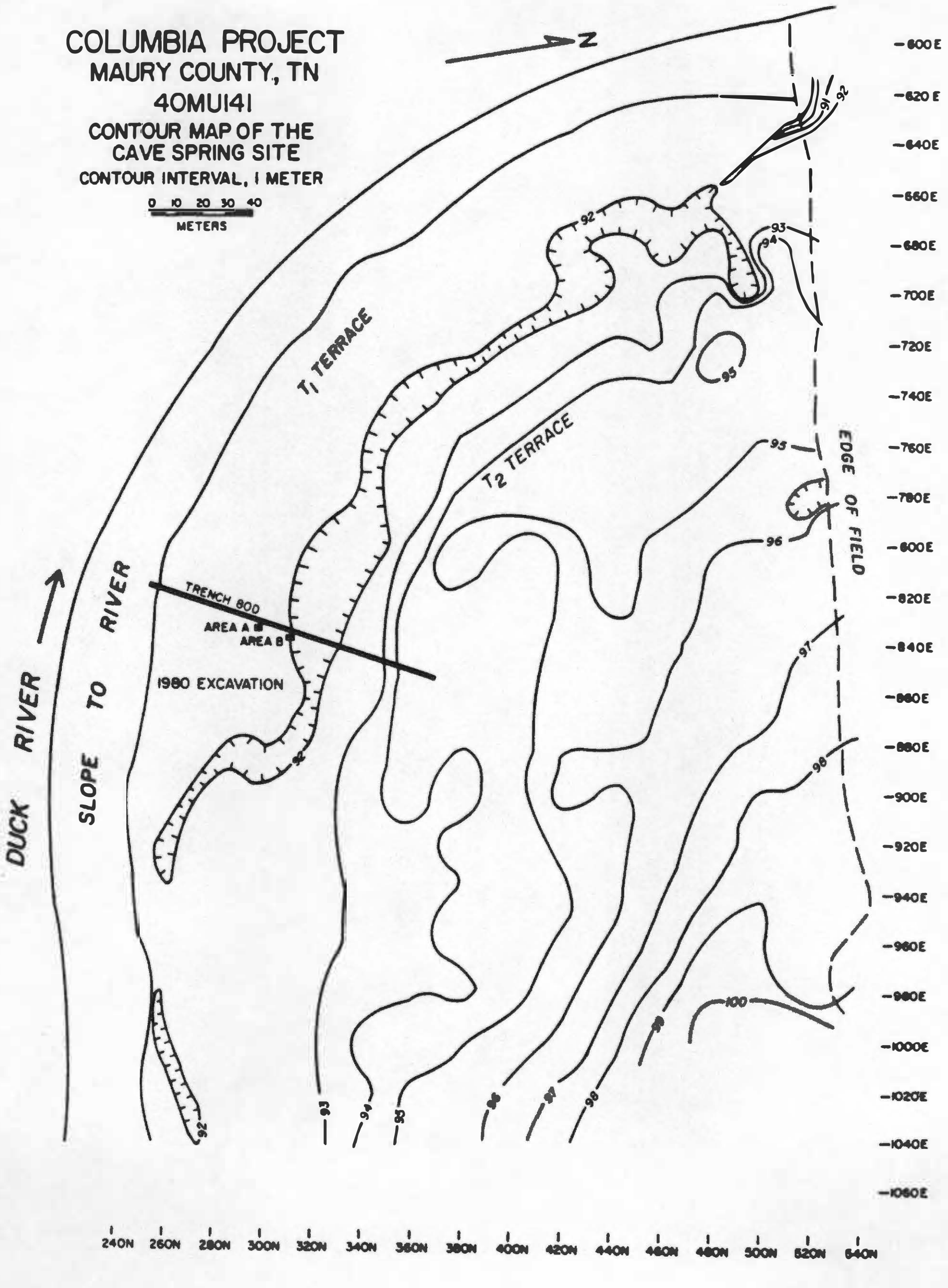


Figure 3.5 Location of backhoe Trench 80D and excavation areas A and B at Cave Spring, 40MU141.

Figure 3.6 Flagging and mapping of Trench 80D, Cave Spring site.

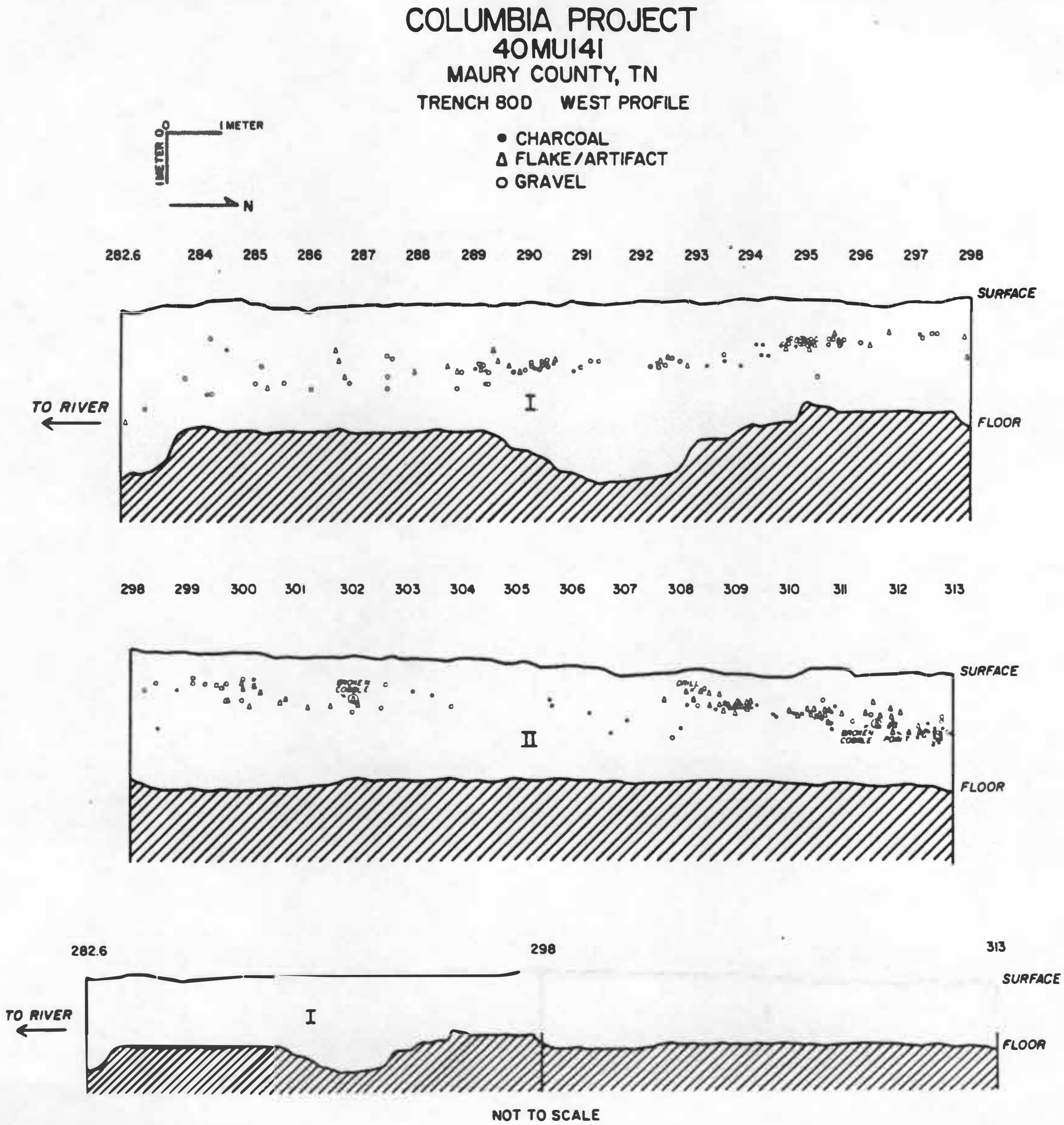


Figure 3.7 Distribution of charcoal, chipped stone and gravel in the west profile of Trench 80D.

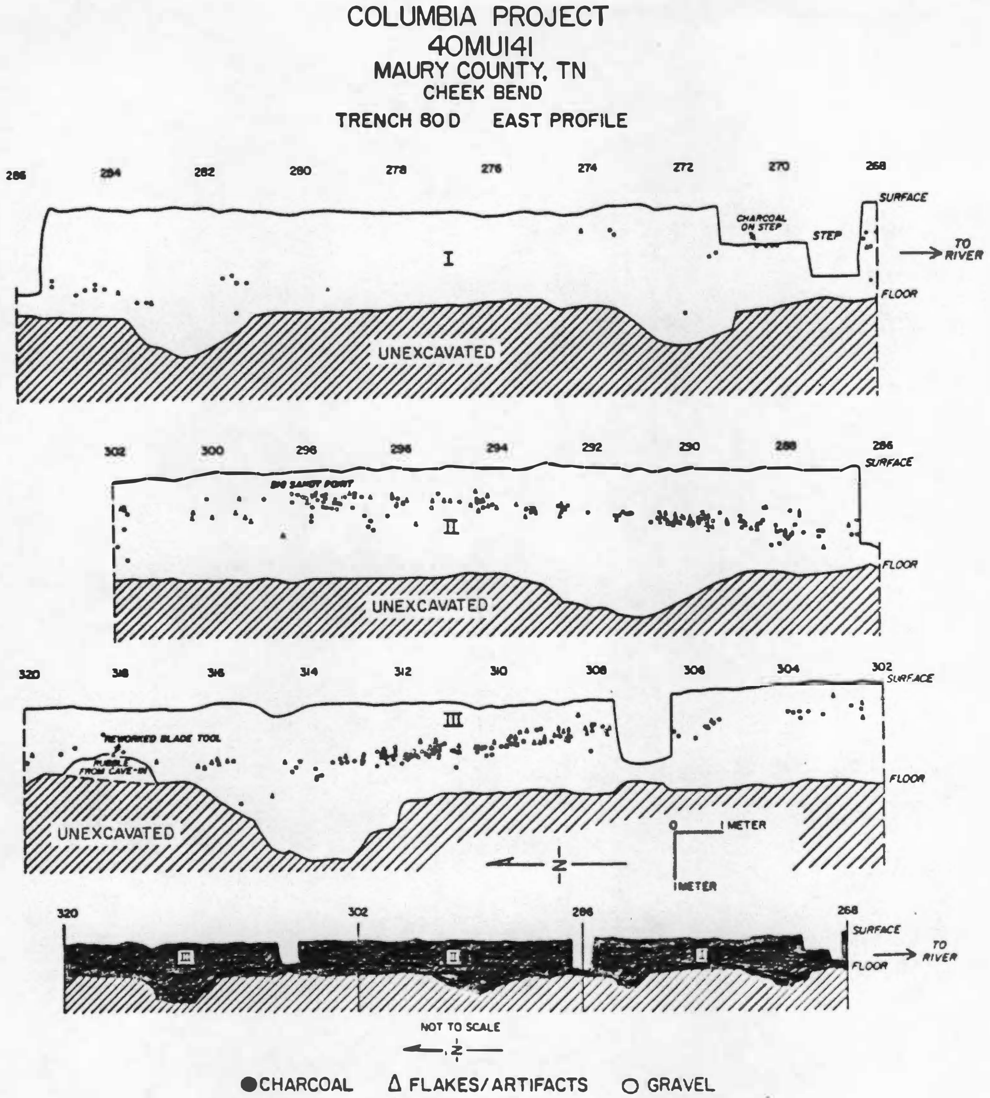


Figure 3.8 Distribution of charcoal, chipped stone and gravel in the east profile of Trench 80D.

Two areas were manually excavated on the east side of Trench 80D (Figure 3.9). Area A was situated on the crest of the old T1a levee where the buried soil containing cultural material was closest to the surface and relatively level. Area A consisted of a 2x3 meter excavation divided into 6 contiguous 1 meter squares. Level 1 consisted of the historic plowzone which extended 14 to 17 cm below the surface. The stratigraphic profile of the east wall of Trench 80D directly west of Area A indicated that the dark gray paleosol containing charcoal and cultural material was about 30 cm below the base of the plowzone or about 45 cm below the surface. Therefore, level 2 was excavated with the intention of removing the majority of the "sterile" stratum between the plowzone and the buried cultural level. Level 2, about 20 cm thick, extended from the base of the plowzone (ca. 15 cm below the surface) to 35 cm deep. Matrix from levels 1 and 2 was processed by waterscreening through ½ and ¼ inch wire mesh. Levels 3 (35-45 cm) through 8 (85-95 cm) were excavated as 10 cm units, following the contour of the modern surface. The northern and southern squares in Area A were excavated to Level 9 (95-105 cm). All matrix, except flotation and soil samples, from each square below Level 2 was waterscreened through ½, ¼, and 1/16 inch wire mesh screen.

The base of Level 8 was well below the buried paleosol which contained abundant cultural material. However, a few flakes and one Early Archaic projectile point had been recovered several centimeters deeper below the soil stratum in the east wall of Trench 80D near Area A. Therefore, the two central units in Area A, 296N-834E and 295N-835E, were excavated through Level 11 (115-125 cm) to evaluate the possibility

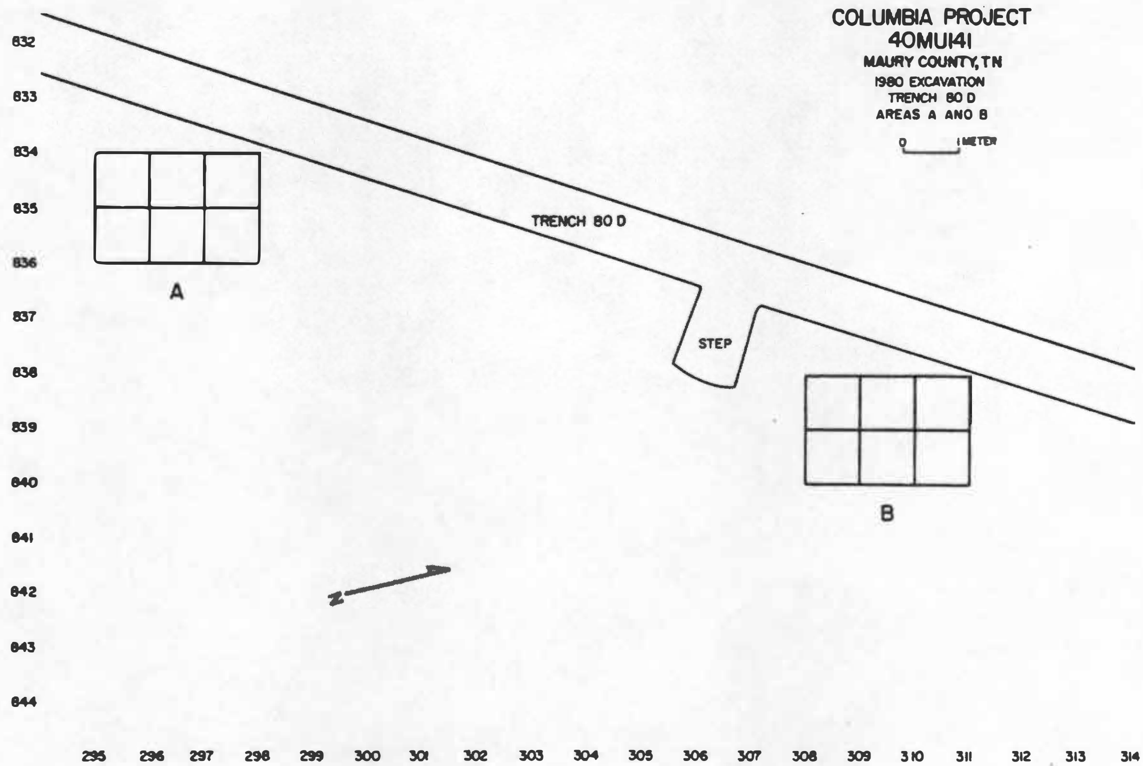


Figure 3.9 Location of test excavation areas A and B at Cave Spring, 40MU141.

of an occupation below the paleosol, but no evidence was found. During the excavation, all materials encountered in place in levels 3 through 8 were mapped in place, with the exception of pieces of gravel less than 1 cm in size. A profile of Area A is shown in Figure 3.10.

The Area B excavation, also 2x3 meters, was located 10 meters north and 2 meters east of Area A (Figure 3.9). Excavation procedure in this area was essentially the same as for Area A. The plowzone, Level 1, in Area B was slightly deeper (16.5-21 cm), which probably was due to slope wash resulting from erosion of the higher T1a terrace crest directly south of Area B. Area B was situated on the back slope or swale behind a slight rise in the T1 terrace, which marks the old location of the levee during T1a times. At the time of occupation and when the buried paleosol was forming, this slope was slightly steeper than the modern slope at Area B. Therefore, the excavated levels, which followed the modern surface contour, crosscut the natural stratigraphy slightly. The buried paleosol was several centimeters deeper in the north end of Area B than in the south end.

Level 2 extended from the base of the plowzone to 35 cm below the surface. Matrix from Levels 1 and 2 was processed by waterscreening through ½ and ¼ inch wire mesh. Levels 3 (35-45 cm) through 10 (105-115 cm) were all 10 cm units waterscreened, except for flotation and soil samples, through ½, ¼, and 1/16 inch wire mesh hardware cloth. Almost all items larger than 1 cm which were found in place in levels 3 through 6 (35-75 cm) were mapped in place. In contrast to Area A, the lower three levels in Area B were removed in 50 cm quads, by quartering each 1 meter square. A profile of Area B is shown in Figure 3.11.

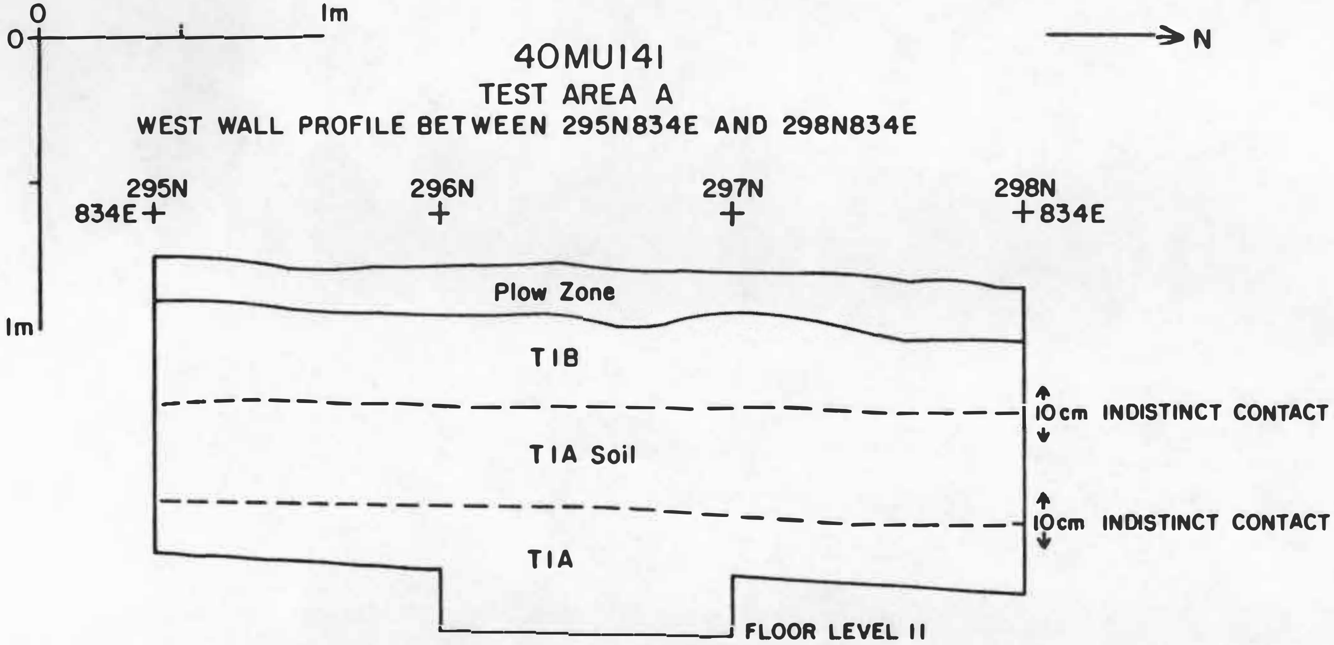


Figure 3.10 West wall profile of Area A test excavation, 40MU141.

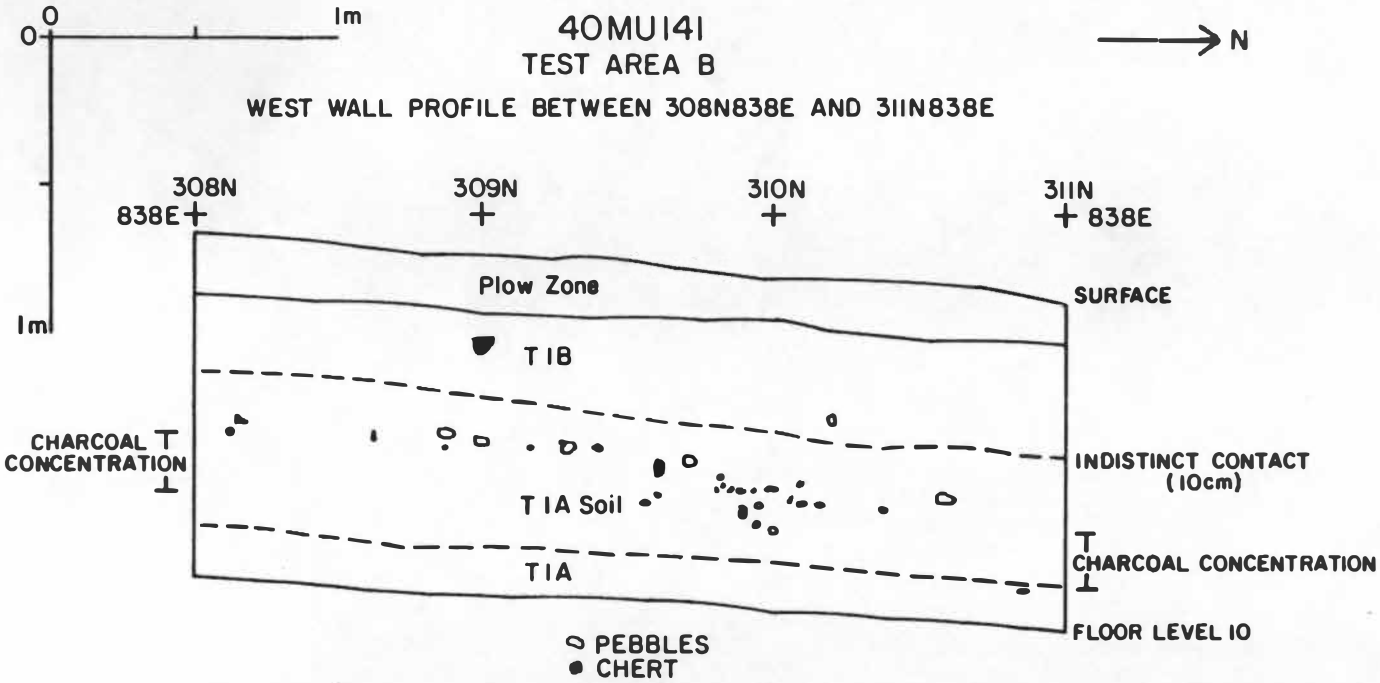


Figure 3.11 West wall profile of Area B test excavation, 40MU141.

Two samples were processed by flotation in order to achieve near-total recovery of a sample of charred botanical remains and for radiocarbon dating. The Area A flotation sample consisted of an entire 10 cm level, Level 5 (55-65 cm), from Square 296N-384E. From Area B, Level 6 (65-75 cm) of Square 309N-838E was processed by flotation. The flotation was accomplished using a mechanical system comparable to the SMAP machine described by Watson (1976), but smaller and adapted to indoor plumbing.

A column of soil samples was collected from each of the excavation areas. Both columns were 20 cm square and collected as each level was excavated. Except for the plowzone and Level 2 which varied in depth, each sample consisted of a cube 20x20x10 cm in size. These samples were collected for opal phytolith, particle size and chemical studies, and are housed at the Department of Anthropology, University of Tennessee, along with the other materials recovered from the site. The Area A soil samples were collected from the southwestern corner of unit 296N-835E. In Area B the samples were from the southwestern corner of unit 308N-838E.

In conjunction with the excavation of Areas A and B, which was done primarily to evaluate the integrity and resolution of the buried assemblage, testing was also done in an attempt to determine the areal extent of the buried stratum. Manually operated post hole diggers were used to determine how far the buried cultural material extended to the east and west of Trench 80D and the Area A and B excavations (cf. Fry 1972).

The north and south limits of the deposit were already known to be confined to the T1 terrace. The profile in Trench 80D indicated that the cultural stratum terminated before reaching the Pleistocene T2 terrace at about 25 meters north of Area B. To the south the deposit bearing cultural material ended on the front slope of the old T1a levee, now buried by the T1b sediments, about 20 meters south of Area A. This confined the north-south dimension of the buried stratum to about a 50 meter wide strip parallel to and in front of the T2 terrace.

The excavation and surface collection grid was used for locating post hole digger tests, and these extended at intervals east and west from Trench 80D (Figure 3.12). Chopping-style diggers were used rather than auger type diggers simply because the former were available at the time. This type of digger is not well suited to digging much deeper than 1 meter (e.g. Bobalik 1977). Holes were dug until cultural material was recovered, or until the hole had been excavated to at least 1 meter in depth. The plowzone was discarded and all subplowzone matrix was dry screened through ¼ inch mesh. The recovered material from each post hole digger test is listed in Table 3.1. Cultural material, charred nuts, and flakes were recovered up to 30-40 meters east of the main 1980 excavation and up to 20 meters west. This testing, then, documented that the buried occupational surface extended for a minimum of 50 or 60 meters east to west. Based on the post hole digger tests alone, however, it was impossible to know whether the buried stratum actually ended or if it was simply deeper than 1 meter beyond this area, and therefore, was not detected with the post hole diggers.

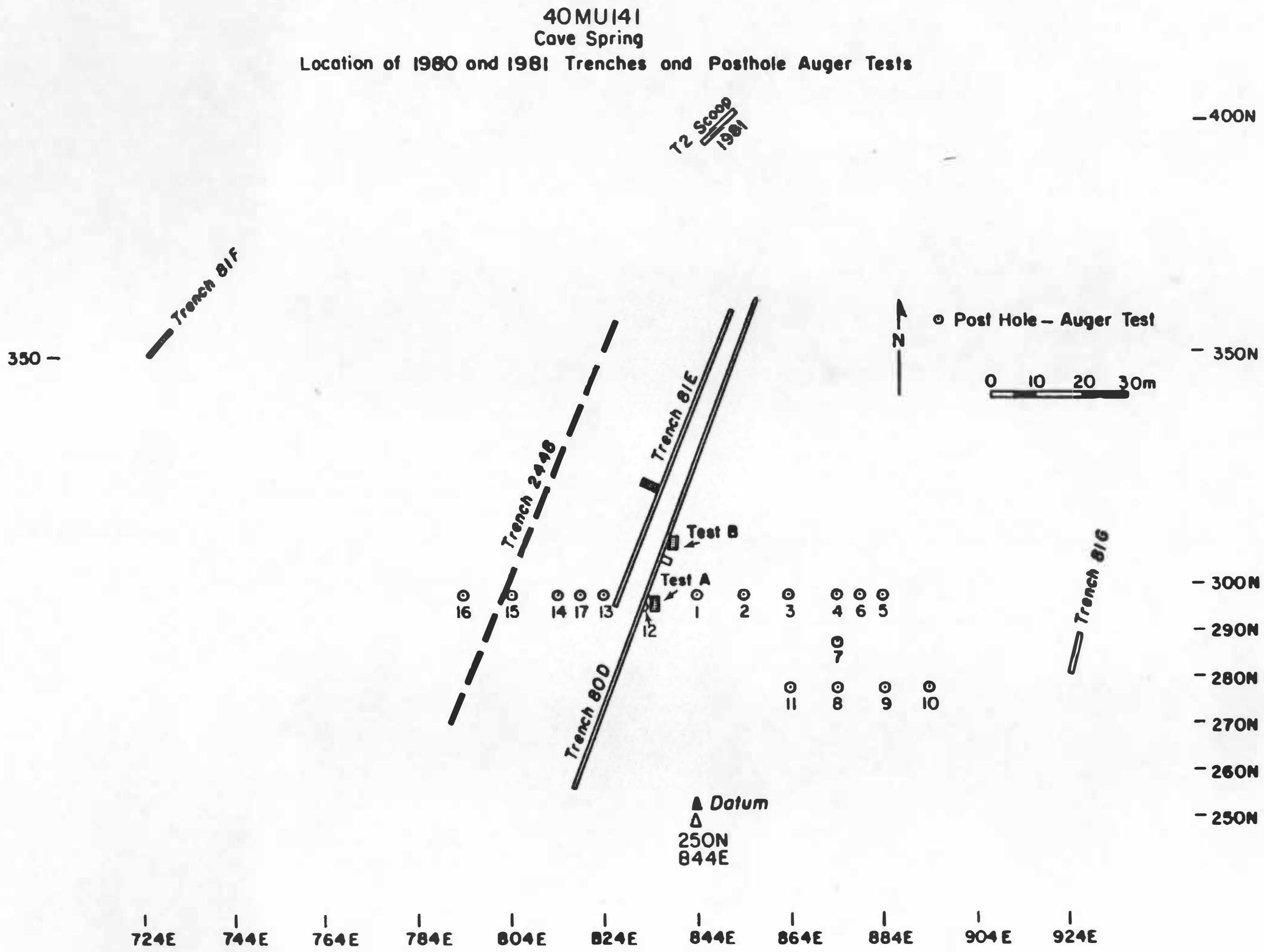


Figure 3.12 Location of post hole test pits and all backhoe trenches excavated at Cave Spring, 40MU141.

Table 3.1. Results of post hole auger testing at 40MU141.

Auger Hole Number	Location	Total Depth	Material Encountered*
1	298N-844E	72 cm	charcoal, gravel, flake
2	298N-854E	73 cm	charcoal, gravel, flake
3	298N-864E	70 cm	charcoal, gravel
4	298N-874E	73 cm	charcoal, 2 flakes
5	298N-884E	100 cm	few charcoal flecks
6	298N-879E	79 cm	charcoal, gravel (1 piece)
7	288N-874E	81 cm	charcoal (includes charred nutshell)
8	278N-874E	73 cm	gravel (1 piece)
9	278N-884E	100 cm	no material
10	278N-894E	100 cm	gravel (1 small piece)
11	278N-864E	70 cm	charcoal
12	296N-833E	70 cm	charcoal, gravel, flakes
13	298N-824E	70 cm	charcoal, gravel, 35 flakes, 1 ppk
14	298N-814E	100 cm	charcoal, 4 flakes, flaked cobble**
15	298N-804E	100 cm	no material
16	298N-794E	100 cm	no material
17	298N-819E	100 cm	charcoal, gravel 25 flakes

* The top 45 cm of each probe, including the plow zone and T1b sediment was discarded. All fill below 45 cm was screened through ¼ inch wire mesh.

** Material from probe 14 was all recovered between 90 and 100 cm.

As part of a systematic deep site testing program in selected parts of the Columbia Reservoir study area, a series of backhoe trenches were excavated in 1980 and 1981 at 200 meter intervals perpendicular to the River around all of Cheek Bend (Mahaffy 1980). These trenches were not continuous as Trench 80D had been, but instead consisted of a series of scoop trenches each about 10 meters long. These trenches extended from the modern levee overlooking the Duck River to the Pleistocene T2 terrace. The location of one of these trenches, number 2448, was 30 meters west of Trench 80D. The sections of Trench 2448 showed a stratigraphic sequence directly comparable to that found in Trench 80D and excavation Areas A and B (Figure 3.13). The only significant difference was that the upper unit, T1b, above the buried paleosol was thicker in this more western part of the site. The buried paleosol containing mid-Holocene cultural material occurred from 80 to 140 cm below the surface, rather than 40-50 cm below as was the case in the area of Trench 80D.

After study of the stratigraphic information from the 1980 trenches and excavation, some questions still remained unanswered concerning the stratigraphy in the T1 terrace at Cave Spring. Therefore, additional backhoe trenches (designated 81E, 81F, 81G, and 81H) were excavated in 1981 (Figure 3.12).

Trench 81E, about 50 meters long, extended from the crest of the T2 terrace to the center of the T1, and was four m west of, and parallel to, Trench 80D. A profile of Trench 81E is shown in Figure 3.14. This trench was dug to gain additional information for the geomorphological study of the T2-T1 contact in this location. Also, the strata in Trench

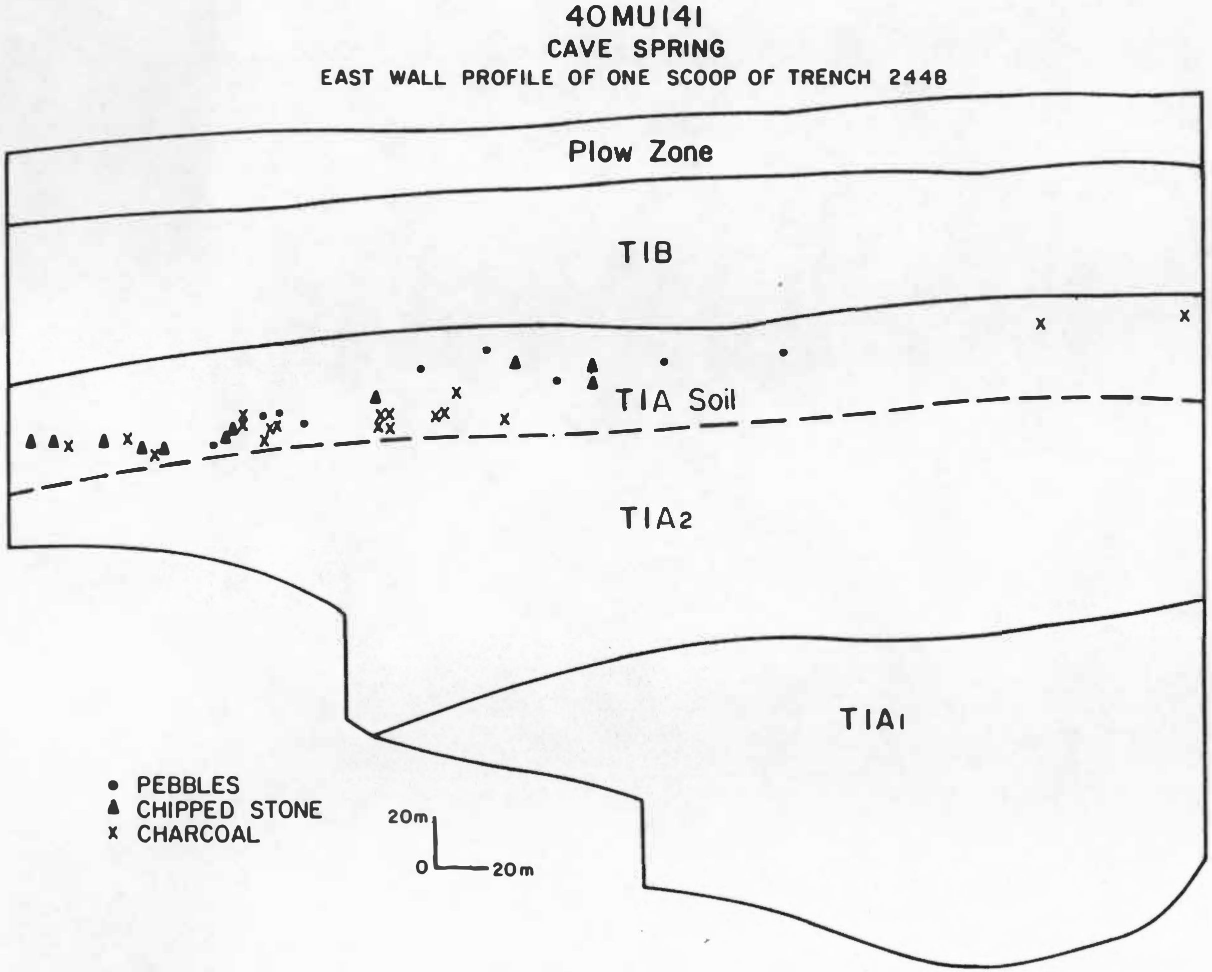


Figure 3.13 Stratigraphic profile of one section of backhoe Trench 2448, 30 meters west of excavation areas A and B at Cave Spring.

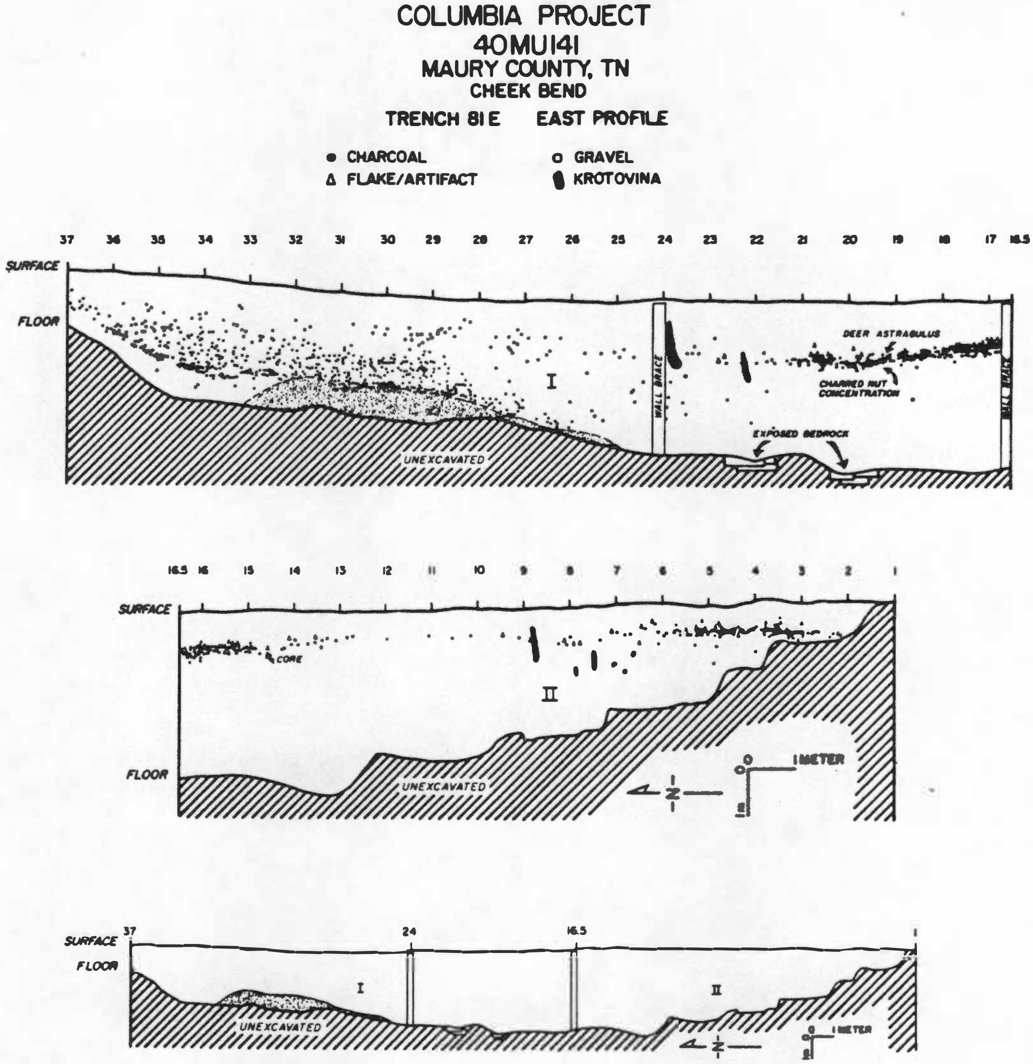


Figure 3.14 East wall profile of Trench 81E showing location of charcoal, chipped stone and gravel.

80D had indicated that a point bar formation was probably located under the terrace, and Trench 81E would allow evaluation of this interpretation. Thirdly, the total depth of T1a sediments was unknown. Determining the depth to bedrock in this location and checking the immediately overlying strata was needed in order to evaluate the possibility of a very deeply buried cultural level at the site. Trench 81E information would also be used to corroborate or correct the stratigraphic interpretation of the 1980 trench. Finally, samples of gravel from the face of the T2 terrace were needed for comparison to those from the excavations, and the possibility that erosion of the T2 terrace face could have deposited gravel in the cultural stratum needed investigation. As it turned out, bedrock was found to be fairly shallow, the presence of a point bar formation was confirmed, no deeply buried cultural strata were revealed, and it was determined stratigraphically impossible for gravels eroding out of the T2 terrace to have been washed downslope directly onto the occupation area because of an intervening slough.

Trench 81F and 81G, both about 7 meters long and nearly 3 meters deep, were excavated to help determine the eastern and western limits of the buried cultural stratum. Trench 81F was located 113 meters west of Trench 81E. The stratum correlated to the dark gray soil containing cultural material was recognized but was indistinct. Only 2 charcoal flecks and 1 pebble were noted in the trench profile in this level. An edge fragment of a serrated biface, possibly representing a Kirk cluster point fragment, was found well below the buried soil in the T1a

sediment. This trench is considered to mark the extreme western limit of the buried site area.

Trench 81G was dug about 100 meters east of Trench 81E. The buried soil was again poorly defined, and only a few charcoal flecks and two pieces of gravel were found within it. Trench 81G, therefore, is considered to mark the eastern extent of the buried mid-Holocene component at Cave Spring. The buried occupational surface which was tested extends for 200 meters east-west and about 40-50 meters north-south and parallel to the old T2 terrace. This gives an estimated total site area of about 8000 m^2, which means that Areas A and B (12 m^2) represent 0.15 percent of the estimated site area.

A final short backhoe scoop, Trench 81H, about three meters deep was made on the T2 terrace about 40 meters north of the T2 crest. It revealed only Pleistocene sediments and increasing gravel content toward the bottom.

In summary, the Cave Spring site is located adjacent to the Duck River and directly across the river from a perennial spring. Prehistorically the site would have been located in a river bottom forest setting with a diversity of ecological niches in the adjacent uplands. These included western mesophytic forest, cedar glades, and patches of open grassland.

Investigation of the Cave Spring site proceeded through a series of stages. These include a systematic controlled surface collection, stratigraphic trenching using a backhoe, manual excavation, and, finally, additional backhoe trenching. The manual excavation was

limited to two tests both 2x3 m in size, the fill from which was waterscreened through graduated screens down to 1/16 inch in size. A buried stratum in the T1 terrace was the focus of the manual excavation, and the recovered materials are the subject of this study.

CHAPTER IV

CONTEXTUAL ANALYSIS I: DEPOSITIONAL ENVIRONMENT OF CULTURAL MATERIALS

> If we fail to record the context, or if we misread or misinterpret that context, proper archaeological interpretation is impossible. (Wood and Johnson 1978:315)

Introduction

Consideration is given in this chapter to the depositional environment in which buried artifacts were found at the Cave Spring site. A summary of the alluvial sequence within which the artifacts were contained is provided, and an analysis is made of river gravel from different facies of the terrace system. This is done in order to learn more about the origin of the gravel in the cultural stratum and what the gravel indicates about the integrity of the deposit. The discussion of geomorphology which follows is derived primarily from Brakenridge (1982, 1984).

Geomorphological History

In Cheek Bend, the bedrock of the Duck River is composed of Ordovician age limestone of the Ridley Formation. The river has become increasingly entrenched in this limestone formation during the Holocene (Brakenridge 1982, 1984). Ridley Limestone stratigraphically overlies the Pierce Murfreesboro Formation and is overlain by the Lebanon and Carters formations respectively (Amick 1981; Bassler 1932). The latter two are exposed in the river bed within a few miles downstream from Cave Spring. In the higher elevations of Cheek Bend ancient strath terraces

are common and are usually recognizable by a veneer of river gravel. This gravel generally has a somewhat different composition, in terms of size and relative abundance of chert types, than the gravel in the modern streambed (Amick 1981). In some parts of Cheek Bend, including the southwestern portion, a series of pre-Pleistocene terraces are definable between the strath terraces and the Pleistocene age T2. These older terraces are not of immediate concern for this discussion.

At the Cave Spring site, the oldest alluvial sediments investigated which stratigraphically underlie the buried culture level are of Pleistocene age. Figure 4.1 depicts the natural stratigraphy at Cave Spring as mapped in Trenches 80D and 81E. Brakenridge (1982, 1984) has defined the Cheek Bend Formation, which is the formal name for the Pleistocene T2 terrace in the Central Duck River Basin. The Cheek Bend Formation is composed of at least two members interpreted to have formed between 30,000 and 13,000 radiocarbon years ago (Brakenridge 1982, 1984). The Cheek Bend, T2, Formation is usually yellowish-brown and brown mottled with mangenese coatings and locally abundant, small manganese nodules. It has a medium prismatic structure and silty clay texture with variable pebble content and increased sand in the lower member. The T2 samples from Trench 81E contained about 28 percent sand, 40 percent clay and 31 percent silt. Underlying the toe of the T2 terrace is a point bar gravel deposit overlying the limestone.

The next stratigraphic unit is the Holocene T1 terrace which has been divided into early Holocene, T1a, and late Holocene, T1b, members designated as the Cannon Bend Formation and Leftwich Formation,

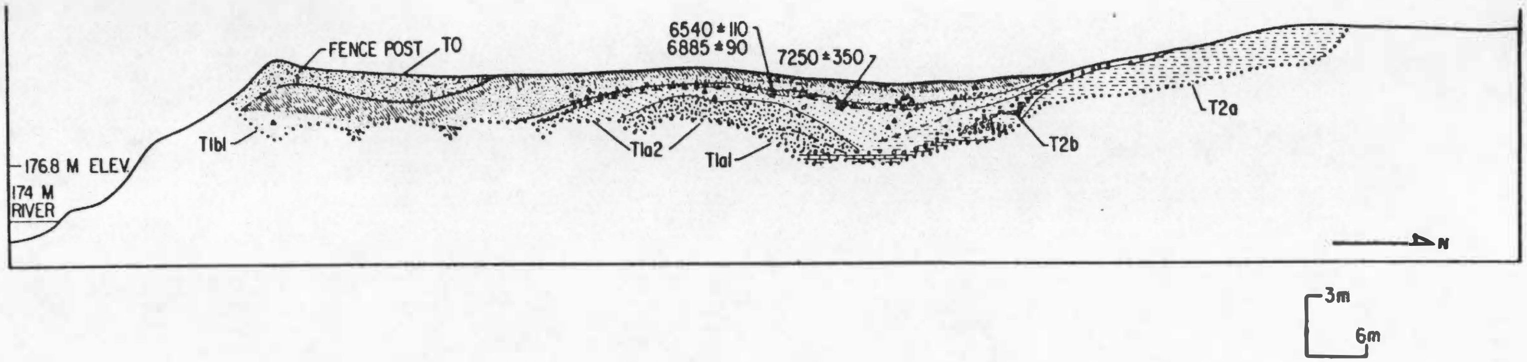


Figure 4.1 Stratigraphic profile of terraces at Cave Spring, 40MU141, based on Trenches 80D and 81E (from Brakenridge 1982).

respectively. The lower T1a deposit overlies the edge of the T2 and as one moves riverward it lies directly on the limestone bedrock. The lower T1a units are dark brown to reddish brown and form an arched deposit high in sand content (40-60 percent), representing a point bar formation. However, point bars do not necessarily consist of sediments which are coarser than those found in overbank terrace veneer deposits (Wolman and Leopold 1970:175). The arched cross sectional shape of the T1a deposits strongly influenced the ultimate shape and general configuration of the Holocene terrace sequence at Cave Spring. As the T1a point bar deposits grew vertically and laterally, there was a concomitant lateral movement and downcutting of the river on the outside of the channel (Brakenridge 1982; Wolman and Leopold 1970). The upper T1a is very silty clay and brown in color. This upper unit of the T1a had somewhat of a leveling affect on the terrace surface so that it became considerably less arched than the lower T1a. Nevertheless, after the final T1a terrace surface had formed over the point bar sediments, there was a swale behind the T1a levee, in front of the T2 slope. This swale would have held water as much as 60-80 cm deep during floods while leaving the crest of the T1a terrace exposed as a linear island. Active sedimentation on the T1a ended or slowed considerably sometime prior to 7200 years ago. This sedimentary change reflects a general change in the river regime and is correlated with the Hypsithermal interval (Brakenridge 1982, 1984).

The T1a surface became stabilized, as evidenced by the formation of a dark soil typical of rich marsh grasses or, perhaps, cane breaks. This stable period in the development of the terrace system at Cave

Spring correlates with the time of mid-Holocene human occupation at the site. The T1a soil or cultural stratum varies in thickness between about 35 and 50 cm. A schematic view of the terrace surface as it appeared about 7,000 years ago is shown in Figure 4.2.

During the early Holocene (ca. 12,000-8,000 B.P.) more than 3.5 meters of sediment were deposited in forming the T1a terrace at Cave Spring. This is a little less than one mm per year on the average, although the actual buildup of the terrace would have been more erratic and complex with considerable erosion episodes as well as deposition involved. At the surface of the T1a terrace, the dark gray soil composed of silty clay represents a period of relative stabilization with considerably slower alluviation. This paleosol contains abundant scattered charcoal and charred nut fragments. Such material is absent in the T2 terrace and very scarce in the lower T1a. Overbank flooding and deposition would not necessarily have stopped completely during the formation of this soil, but would have been considerably less frequent than previously. This period of terrace stability and soil development occurred between 8,000 and 6,000 B.P.

Between 7,200 and 6,500 radiocarbon years ago, the interval within which the site was occupied, the crest of the T1a terrace would have been a levee directly overlooking the river. Today, cane breaks often occur on such natural levees which have not been cleared. Such vegetation would have contributed significantly to the organic enrichment and development of soil on the T1a terrace. Deciduous river bottom forest is also likely to have occupied this setting, as was the case in early historic times. The swale behind the T1a levee and in

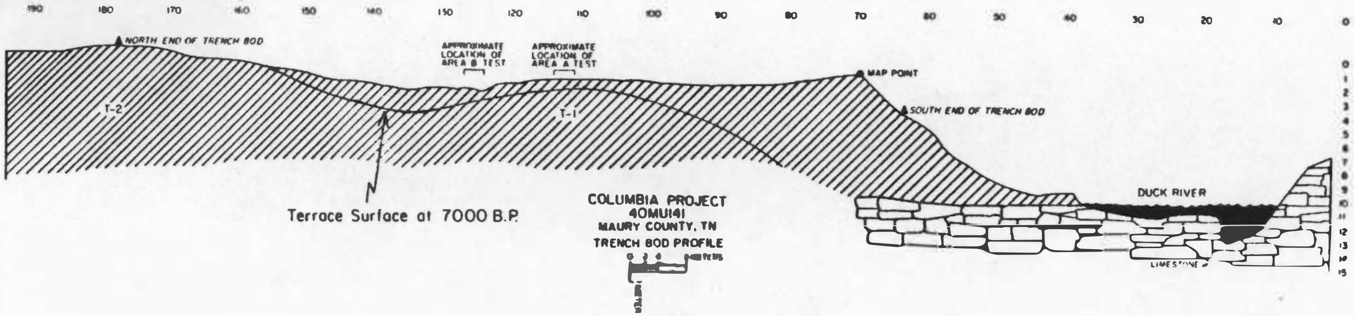


Figure 4.2 Terrace surface at Cave Spring, 40MU141, about 7,000 years ago as compared to the present terrace configuration.

front of the T2 may have been more marshy, and perhaps formed a backwater swamp during parts of the year. Overbank flooding of the T1a surface on which cultural material was deposited would have been primarily by calm, slow moving water, as evidenced by the fine size of the clay and silt particles which constitute no less than 85-95 percent of the soil. The presence of scattered river gravel within this soil, however, indicated that an episode of very swift current overbank flooding might have occurred as well.

By 6,000 B.P. the T1a surface was being buried by the gradual buildup of the T1b or Leftwich Formation (Brakenridge 1982). This formation capped the T1a and extended the crest or levee of the Holocene terrace laterally or riverward for 35-40 meters by 2,000 years ago. The surface of the T1b terrace exhibits a remnant of the arched deposit which was originally a point bar and later the T1a levee. The crest of this rise in the center of the modern T1 terrace has, however, been partially leveled by cultivation and erosion. Erosion of this agricultural field covering the Cave Spring site is in the process of filling in the swale behind the old T1a levee and washing away the rise which marks the location of the old levee.

The last deposits in the terrace system are of historic age, dating since about 1820, and represent the Sowell Mill Formation or T0 (Brakenridge 1982). These silty sediments form the modern flood plain and cap the modern levee which conforms to the position of the T1b levee. Historic sedimentation has also largely filled in the swale behind the T1b levee. Sowell Mill Formation sediments do not, however, constitute a recognizable unit overlying the T1 terrace in the area of

the buried mid-Holocene cultural deposit and are, therefore, of little direct interest to this study.

Archaeological Lessons from River Gravel

River gravel is commonly encountered during archaeological investigations in alluvial terrace settings. When such gravel exhibits no intentional modification it is often unrecorded, unstudied and even unreported by archaeologists unless the gravel occurs as part of a concentration or "feature" (e.g. Chapman 1977a:101, 1979:63, 166, Fig. 37; Collins 1979:744; Lewis and Lewis 1961; Schroedl 1975:Tables 1 and 12, 1978:Fig. 27; Webb 1974). No systematic studies of river gravel samples from archaeological deposits have been reported from the Southeast. The apparent lack of such studies indicates that archaeologists have generally regarded these materials as insignificant to contextual or behavioral inquiries.

At Cave Spring this was not the case, and an attempt was made to analyze and interpret the origin and significance of the recovered gravel (Hofman and Brakenridge 1982a, 1982b). As a result, the potential of gravel analyses for resolving specific archaeological problems or highlighting particular interpretations has been documented. River gravel should be seriously considered during archaeological research if problems of geological context, activity analysis, and inter- or intra-component variability are being considered.

When gravel occurs in association with archaeological materials, there are several questions which archaeologists excavating and analyzing the materials should attempt to resolve.

1. Was the gravel introduced into the stratum naturally or by human activity?
2. What was the source or sources of the gravel?
3. How is the gravel distributed within the stratum vertically and horizontally, and how can the observed distribution be accounted for?

River gravel results from water rolling and tumbling pieces of stone along the substrate of rivers and streams (Adams 1979). Gravel can arrive on terrace sites through down slope colluviation (erosion of higher terrace material), fluvial action (high energy flooding or deposition of gravel veneer over terrace deposits), and human transport. The size of gravels used by human groups can vary significantly and this variability generally reflects local availability and functional requirements. Even small gravel may be useful in some activities, so we should not assume a priori that only large gravel and cobbles were used in capacities such as heat retainers or cores.

Furthermore, the presence of small gravel can potentially reflect activities other than those directly involving gravel use. For example, collection of aquatic resources, such as bivalves and gastropods, may result in the introduction of small gravel to an occupation area. At some shell midden sites, such as the Middle Archaic Ervin site (40MU174) about seven air km northeast of Cave Spring, aquatic gastropods are present by the hundreds of thousands. Collection of these animals was apparently done en masse as there was no apparent size selection and many very small shellfish were gathered (individuals less than one cm

are common). Gastropod collecting may have consisted of dislodging groups of snails from rocks and/or the substrate and catching them in fine nets or baskets. This process would probably result in the unintentional "collection" of small amounts of gravel which would not adversely affect the processing (perhaps cooking by stone boiling) of the shell fish. Such gravel could be incorporated into the midden prior to or after cooking and might be deposited with the shell waste. It is, therefore, possible that the collection and processing of aquatic resources such as gastropods may be recognizable through the study of gravel, even when shell or other organic remains are not preserved.

For this analysis, however, the primary concerns are (a) investigating the possible sources of river gravel in the mid-Holocene deposit at Cave Spring, (b) documenting how this gravel does or does not differ from that at the potential sources, and (c) determining what possible functions, if any, the gravel may have served at the site. The gravel's vertical distribution is also investigated in an attempt to gain insight into the number of depositional surfaces present during development of the T1a paleosol at the Cave Spring site locale.

River Gravel Investigations at 40MU141. In 1980, during backhoe excavation of Trench 80D, river gravel was exposed and recorded in the trench walls (see Chapter III) and backdirt. The gravel was concentrated in two parts of the trench. The Pleistocene age T2 sediments in the trench's northern end contained numerous pieces of dispersed gravel (Figure 3.14). Except for the plow zone, no cultural

materials are present in the T2 sediments, and there is no evidence of artifacts or features in the intact T2 terrace fill.

The second concentration of gravel was within the dark soil overlying the T1a. From a geological perspective, the first and most economical explanation for the T1a soil gravel's origin was through high-energy overbank flooding and fluvial deposition (Hofman and Brakenridge 1982a, 1982b). Artifacts in the trench profiles were also concentrated in the T1a soil. These artifacts, including many pieces of chipped stone debris, exhibited pristine edges and indicated the possibility that at least some of the materials in the T1a soil stratum had not been redeposited. The generally fine texture of the clayey-silt forming the majority of the stratum, the presence of charred nut and wood fragments generally lacking rounded or eroded edges, and the wide range in size of chipped-stone pieces also suggested that the materials had not been deposited by stream action.

There remained the possibility that a gravel veneer had been deposited on the old T1a surface and that one or more occupations subsequently occurred on this surface. This would account for the gravel through stream transport and the cultural materials through local human activity. The presence of a few Early Archaic artifacts in addition to Middle Archaic Eva-Morrow Mountain materials from the back dirt and trench walls initially supported the possibility of a fairly stable surface which could have been subjected to severe flooding and repeated occupation over several thousand years.

However, inspection of the Early Archaic artifacts revealed severe patination and in most cases reworked edges exposing unpatinated

interiors. The Middle Archaic pieces are unpatinated. Therefore, the Early Archaic pieces were apparently reused by Middle Archaic people and incorporated into the Middle Archaic assemblage. The lack of an assemblage of patinated chipped stone artifacts and debris supports the interpretation that Middle Archaic people picked up selected older artifacts and reused them. A likely source for such artifacts is the surface of the higher T2 terrace where patinated Early Archaic artifacts and debris are quite common.

It is argued then, that the T1a soil at Cave Spring was occupied during Middle Archaic times, but not during the Early Archaic. The gravel, however, could still have been deposited prior to the Middle Archaic occupation, though probably not after it. If the gravel was deposited by high-energy flooding on a surface already covered by the Middle Archaic debris, then we should expect to see removal of the light fraction (such as charred nuts and wood charcoal) and size sorting of the lithic pieces such that small retouch flakes would be displaced downstream from larger blockier pieces. This was not the case. Apparently, flooding which occurred after the Middle Archaic occupation(s) was by low-energy backwater which deposited fine silts and clays and caused no serious disturbance to the horizontal provenience of chipped stone pieces and other cultural remains. If the gravel had been stream deposited, then its sedimentary matrix should have included sands instead of just silty clay. Gravel deposition may have been coterminous with that of the cultural material, and, therefore, the possibility that the gravel was carried to the site area needed further investigation. Because gravel and cultural material were dispersed vertically

throughout the T1a soil we were not certain whether this represented materials originating from one or more than one surface. Study of the vertical distribution of the gravel would potentially help resolve this problem.

Gravel Samples and Analytical Categories. Three samples of gravel are considered in this study. The first was recovered during excavation and waterscreening of the matrix from Areas A and B and includes 6518 pieces. The remaining two samples are controls from definite non-cultural contexts. The second sample was collected from a modern gravel bar located on the inside of the river channel at Cave Spring directly south of the excavation. The sample was collected using a modified version of the technique devised by Amick (1981) and included a total of three one meter radius circular areas. One located at the head, center, and toe of the gravel bar. Collections from the head and center of the bar were studied, and collectively these form the gravel bar sample of 4687 pieces discussed herein.

The third sample, 584 pieces, was collected by stratigraphic levels from the east wall at the north end of Trench 81E. The sample from the T2 terrace slope (as exposed in Trench 81E) is considered the most appropriate for comparison. Gravel from this stratum should reflect the nature of gravel which might have been exposed and susceptable to collection in eroded patches on the T2 slope and which could have been secondarily deposited if and when high water eroded the T2 face. Based on the stratigraphic information derived from the profile of Trench 81E, however, it would not have been possible, because of the intervening

slough, for gravel on the T2 surface to wash downslope directly onto the old T1a surface. Gravel from the buried point bar at the edge of the T2 terrace is excluded from consideration in this study because it was already deeply buried and inaccessible in mid-Holocene times.

The modern gravel in this portion of the Duck River is composed predominantly (75-98 percent) of Fort Payne Chert (Amick 1981:Figure 3). This is apparently also true of the gravel from the 1980 excavation and from Trench 81E. One important factor which may influence the gravel comparison, however, is that larger pieces of gravel and cobbles (those greater than five cm in length) from the excavation were commonly fire cracked or flaked. Those pieces so modified were coded as fire cracked rock, flaked cobbles, or cores and so are not included in this analysis. Therefore, the large size category is probably underrepresented in the excavation sample.

A second factor which may have adversely affected comparability of the samples is that each was collected by different techniques. These differences may have resulted in uneven recovery, especially of the small pieces, 0-1 cm category. Gravel from the Area A and B excavation was recovered by screening through fine mesh screens. The modern gravel bar samples were collected by scraping all loose gravel off the surface within one meter radius circles, and the T2 slope gravel was collected by digging exposed pieces out of the trench wall. Because of these potential problems, the size comparison between the samples is unfortunately of unknown reliability, especially for the less than 1 cm size fraction. Therefore, the less than one cm category is deleted from some intercollection comparisons made below.

Comparisons made between the gravel samples are based on three variables: size, color, and breakage. Four categories of size are used: 0-1 cm, 1-3 cm, 3-5 cm and greater than 5 cm. These same categories were also used in coding all of the chipped stone pieces from Cave Spring as well as the gravel. Because levels 1 and 2 of the excavation were only screened through ¼ inch mesh and not 1/16 inch, the recovery of 0-1 cm size gravel from these levels is not comparable to that from lower levels. Therefore level 1 and 2 gravel is excluded from the size comparison.

Actual measurement of gravel was not done by mass analysis but by measuring each piece individually. A sheet of metric graph paper was used with one, three, and five cm squares outlined. Pieces were measured with their long axes parallel to the edge of the paper. Therefore, no pieces longer than three cm, for example, are included in the 1-3 cm category as would happen in mass processing through graduated sieves.

Gravel color was divided into two groups. The majority of the gravel has a tan-yellow-brown patina which is a weathered rind on the chert produced by years of tumbling in the stream. The second color category consists of gravel with a reddened or oxydized cortex. Pieces which were only partially reddened were also classed as "red" even if their cortex was partially or primarily tan.

Breakage classification also consisted of two categories. Broken pieces of gravel are those exhibiting at least one distinct fractured surface around the margins of which are sharp apparently unabraded

edges. That is, no evidence of abrasion on these edges was obvious with the unaided eye. All other pieces were classified as complete.

Origin of the Gravel in the T1a Soil. There are two potential sources and two primary transport mechanisms which could account for the presence of stream gravel in the cultural stratum. The sources are active gravel from the bed of the Duck River and redeposited gravel from erosion of older terraces, specifically the T2 Pleistocene terrace face at Cave Spring. The transport mechanisms are water and humans. Water could have deposited the gravel on the T1a terrace surface during high-energy overbank flooding or by erosion and redeposition of T2 terrace gravel. Human groups may have been interested in chert river gravel for heat retention in hearths, roasting pits or ovens as well as for manufacture of chipped stone artifacts from the larger pieces.

Because the size of gravel in the immediate area of the site is quite small (most commonly 1-3 cm in greatest dimension), collection of gravel for heat retention in hearths or for stone boiling may have been done en masse. Mass collection would be most economical in situations where hearth stones or heat retainers were needed but stone or gravel size was small and pieces concentrated. Larger pieces would likely be selected out and treated as potential sources of stone artifacts. The most likely source for mass gravel collections would have been active gravel bars. Gravel could also have been picked up as it eroded out of the T2 terrace slope, but concentrations such as found on gravel bars would likely not have occurred on the T2 slope.

Size of gravel from the excavation could be very similar whether it was deposited by stream action or mass collection by people. For the reasons noted above, the most likely source for the majority of the gravel would have been gravel bars where pieces were concentrated and easily accessible or from which they could have been transported by the river. Vertical distribution of the gravel, discussed below, corresponds to the distribution of artifacts, and we can, therefore, conclude that whether or not the gravel was collected and intentionally brought to the site, it was at least deposited on the same surface as that occupied by Middle Archaic people.

A comparison of the gravel samples by size is provided in Table 4.1. The relative frequency of pieces by size varies but is roughly comparable for each sample. The chi square value (X^2=62, df=6, p<.001) for Table 4.1, however, indicates that significant differences are present. Pursuing the meaning of this difference, chi square tests comparing the excavated sample first with the T2 slope gravel (Table 4.2), and then with the modern gravel bar sample (Table 4.3), indicate that significant differences do not exist, at the .05 level, when the less than one cm size category is deleted. This deletion is justified because of the potential bias due to different collection techniques as noted above. The basic similarity of these gravel samples may simply indicate that gravel size along this portion of the Duck, the preponderance of one to three cm sized pieces, has been essentially stable throughout the Holocene. Gravel size, at any rate, does not provide a reliable discriminator for distinguishing the three gravel samples.

Table 4.1. Relative frequency of gravel by size and collection station, 40MU141.

Collection Station	Gravel Size: 0-1 cm	1-3 cm	3-5 cm	>5 cm	Totals
Modern Gravel Bar (percent of sample)	740 (15.8%)	3471 (74.1%)	428 (9.1%)	48 (1%)	4687
Test Areas A and B*	1305 (20%)	4635 (71.1%)	497 (7.6%)	81 (1.2%)	6518
Slope of T2 Terrace**	118 (20.2%)	365 (63%)	84 (14.4%)	14 (2.4%)	584
Totals	2163	8474	1009	143	11,789

* Gravel from test areas A and B does not include plow zone specimens, and was collected by water screening through 1/16 inch wire mesh.

** Gravel from the T2 terrace face was collected by hand from the east wall of Trench 81E between meters 28 and 36, above the point bar formation.

Table 4.2. Crosstabulation of gravel size (larger than 1 cm), by selected collection stations, 40MU141.

Collection Station		Gravel Size: 1-3 cm	3-5 cm	>5 cm	Totals
Test Areas A and B	o	4635	497	81	5213
	(e)	(4592.5)	(533.3)	(87.2)	
Slope of T2 Terrace	o	368	84	14	466
	(e)	(410.5)	(47.7)	(7.8)	
Totals		5003	581	95	5679

df=2 $\chi^2=0$ $p<.99$

o = observed frequency
e = expected frequency

Table 4.3. Crosstabulation of gravel size (larger than 1 cm) by selected collection stations, 40MU141.

Collection Station		Gravel Size: 1-3 cm	3-5 cm	>5 cm	Totals
Modern Gravel Bar	o	3471	428	48	2947
	(e)	(3390.7)	(386.9)	(53.9)	
Test Areas A and B	o	4635	497	81	5213
	(e)	(4715.3)	(538.1)	(75)	
Totals		8106	925	129	9160
		df=2	X^2=5.87	$p<.10$	

o = observed frequency
e = expected frequency

Vertical Distribution of Gravel--Number of Depositional Surfaces. The number of surfaces on which gravel was deposited could not be determined by examining the trench or excavation profiles, but it was obvious that gravel was most abundant within and adjacent to the T1a soil. The possible existence of relatively discrete levels of gravel concentration needed to be investigated. After determining where the gravel was concentrated vertically, comparison was then made with where the chipped stone artifacts occurred to determine if they were deposited on the same surface(s). The vertical co-occurrence of gravel and artifacts left open the possibility that the gravel was deposited, in part, through cultural activity. The vertical distribution of chipped stone debris is shown in Figures 4.3 and 4.4.

Histograms showing the vertical distribution of gravel by level were prepared for each excavation unit in both Area A and B. Without exception, these figures show a unimodal vertical distribution of gravel within the deposit. In Area A the buried T1a soil sloped slightly upward toward the north and the peak density of gravel follows this slope. Figure 4.5 illustrates the vertical distribution of gravel in Area A. In the southern part of Area A gravel peaked in Level 5 but in the middle and north parts of Area A gravel occurred primarily in Level 4. There were so few pieces of gravel larger than three cm that evaluation of the possibility that the vertical distribution of larger pieces might be significantly different from that of the small gravel (due to depositional or post depositional factors) was not feasible.

Area B gravel also exhibits a vertical distribution with one prominent peak (Figure 4.6). The slope of the T1a soil in Area B is to

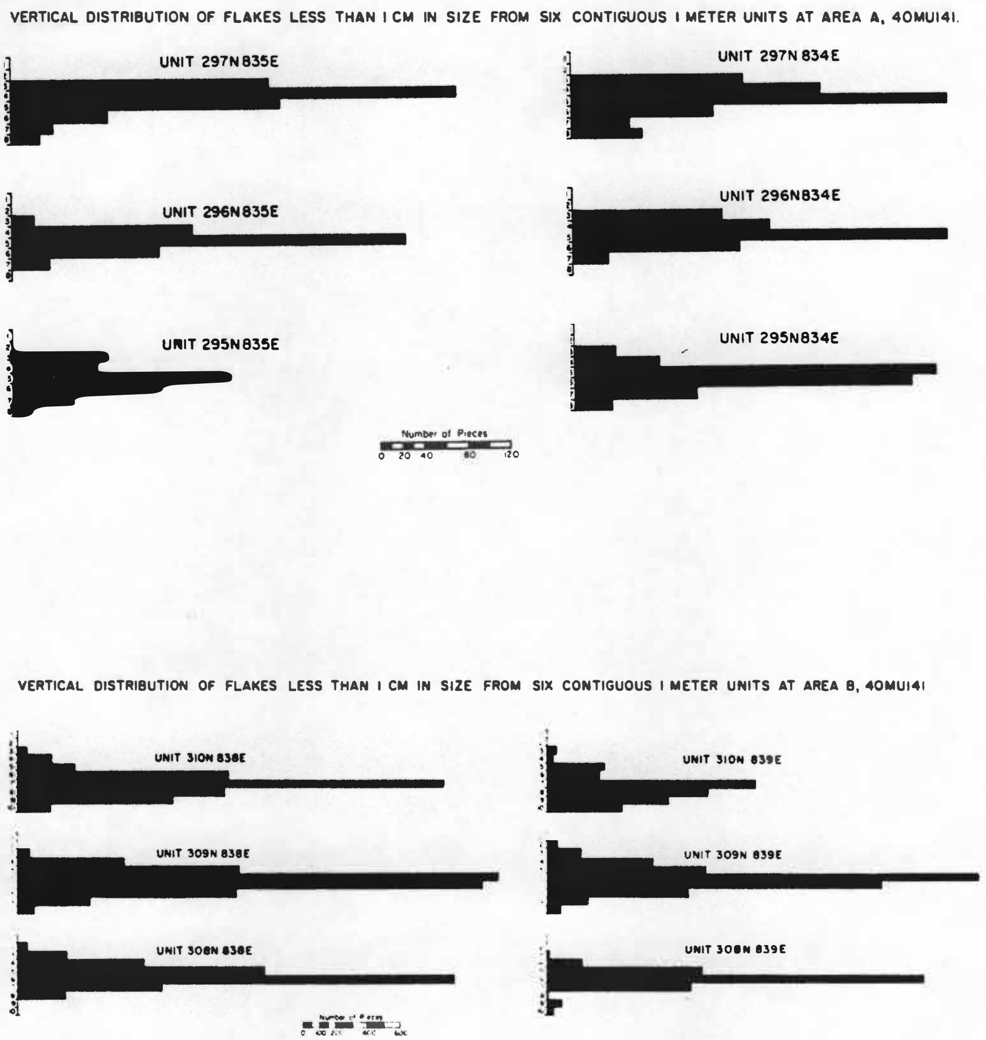
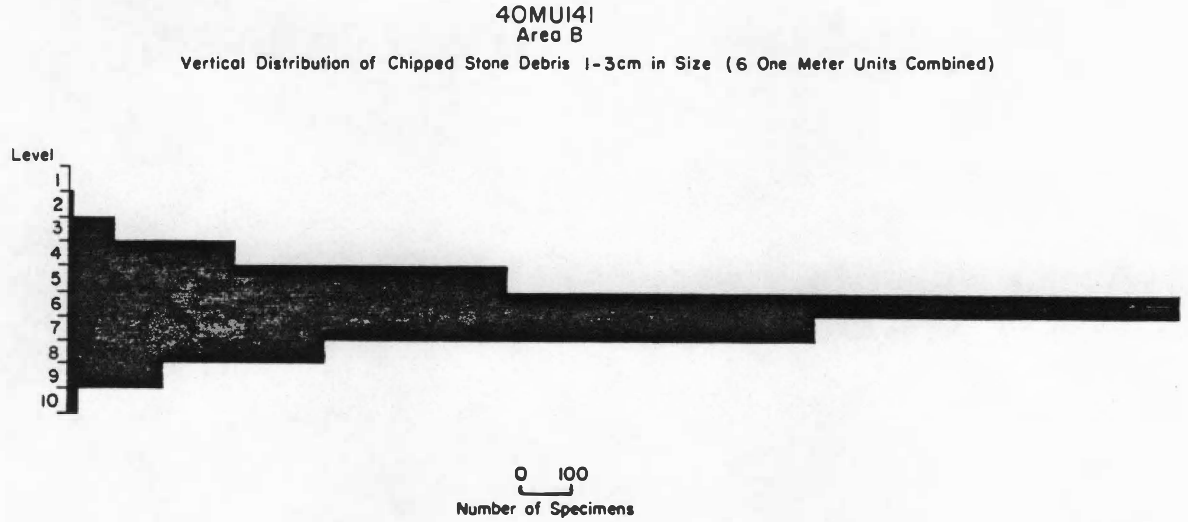


Figure 4.3 Vertical distribution of chipped stone debris less than one cm in size from areas A and B, 40MU141.



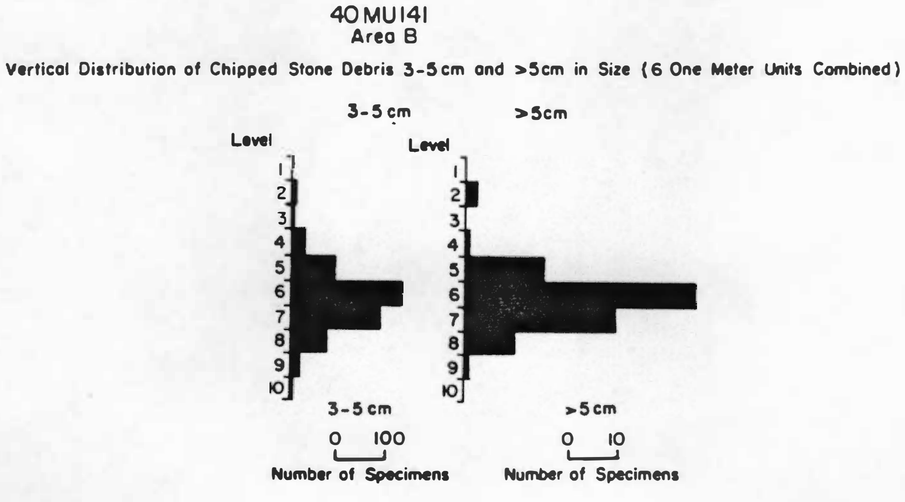


Figure 4.4 Vertical distribution of chipped stone debris greater than one cm in size from Area B, 40MU141.

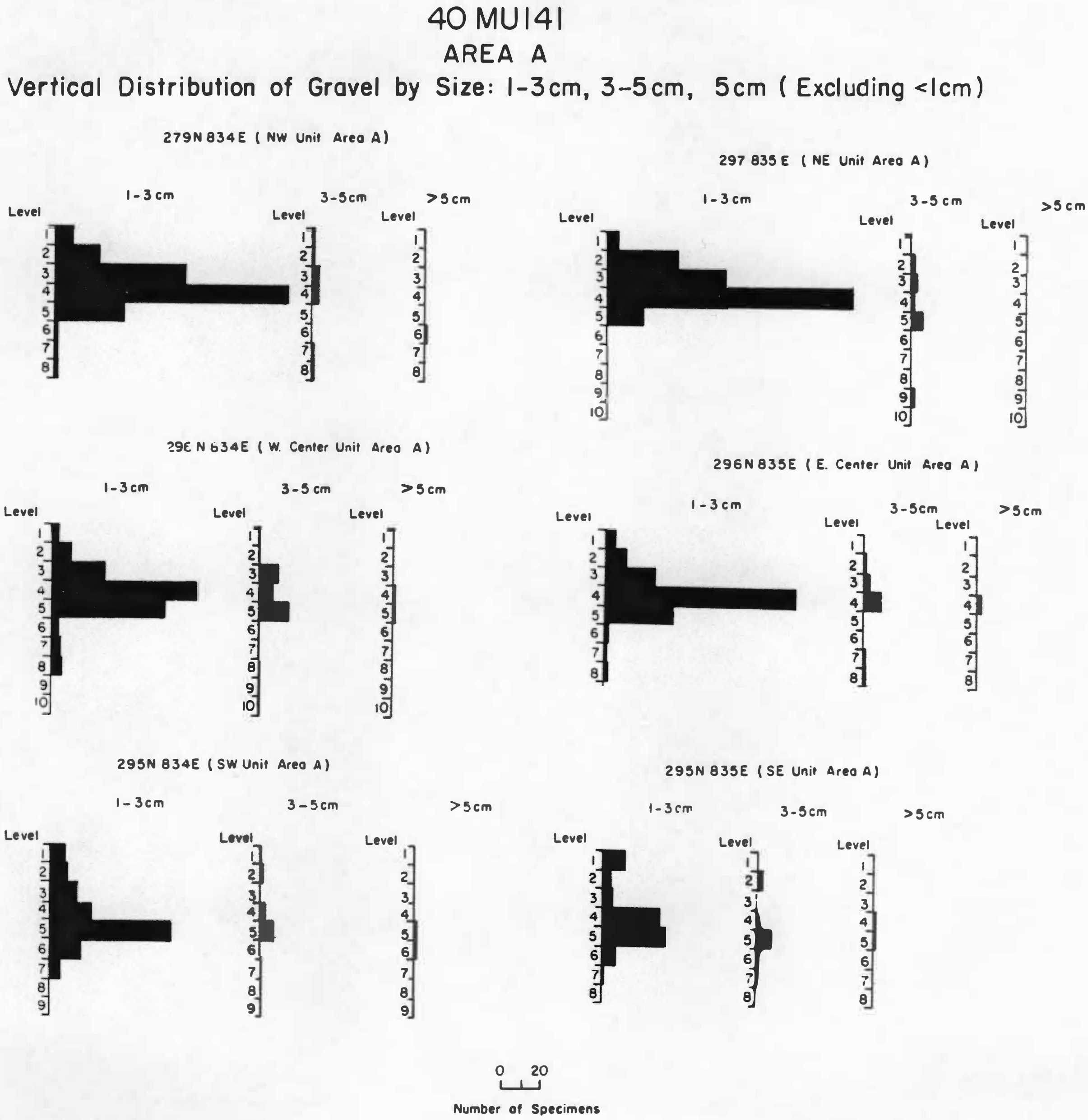


Figure 4.5 Vertical distribution of gravel by size, Area A, 40MU141.

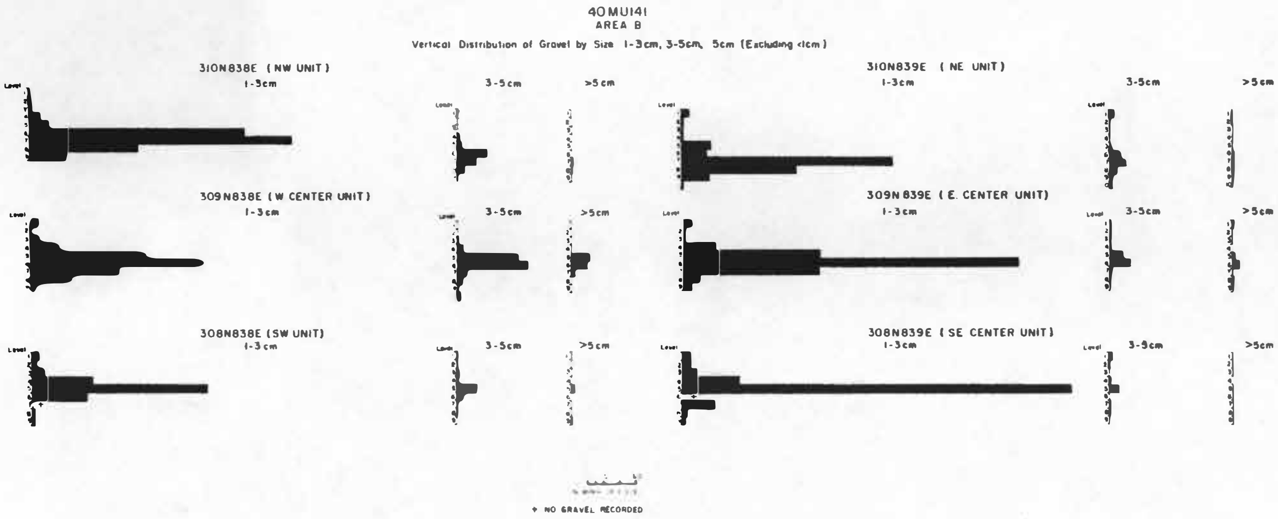


Figure 4.6 Vertical distribution of gravel by size, Area B, 40MU141.

the north and the gravel distribution reflects this with the peak occurring in Level 5 in the south end of Area B, Level 6 in the middle and Level 7 in the north end. Excluding Level 1, the historic plow zone, there is evidence in Area A and B of only one primary surface on which gravel was deposited. Subsequently, post-depositional factors have operated causing some vertical dispersal of gravel throughout the T1a soil.

River Gravel and Cultural Activity. If gravel was carried onto the surface of the T1a terrace by mid-Holocene people, the most likely purpose would have been for use in heat retention during cooking, heating, baking or stone-boiling. Small stones are as effective as cobbles for such activities but slightly different techniques would be used for transferring the heated stones to the water. Stone-boiling was a common water heating and cooking technique widely used by groups prior to the introduction of pottery or in situations where pottery vessels were unavailable or small (Driver 1961:66-67; Frison 1967:13; Harrington 1942:27).

If the gravel recovered from the T1a soil at Cave Spring was so used, there should be evidence of thermal alteration on a portion of the gravel. Building a surface fire on gravel will, if kept burning for several hours, redden (oxydize) and fracture a large proportion of the underlying gravel. However, the rocks will become hot enough to boil water before the majority of them have turned red and cracked. Therefore, if the purpose of a fire was to heat rocks for stone-boiling, many would not necessarily be heated to the point of turning red or

breaking. We can expect, though, to see a significantly higher frequency of reddened and broken rocks in an area where hearths and stone boiling were frequent as opposed to areas where they were not, such as the modern gravel bar.

Table 4.4 shows that the frequency of red and broken gravel is proportionally and significantly much higher in the T1a soil than on the gravel bar or T2 slope. Tables 4.5 and 4.6 confirm the correlation between red and broken gravel from excavation areas A and B. The distribution of broken red gravel in areas A and B conforms to the general slope of the T1a soil and compares favorably with the distribution of chipped stone artifacts (Figure 4.7).

The available evidence suggests that regardless of how the gravel arrived on the T1a surface, it had undergone modification apparently due to thermal alteration which was much greater than observed in the natural settings of the modern gravel bar and T2 slope.

The repeated introduction of gravel onto an occupation surface would be expected in situations where the rocks were being used for stone-boiling. This is because stones discarded after use would rapidly become dirty and scattered and probably would not be reused. Subsequent stone-boiling operations would have been facilitated by collection of clean gravel from the gravel bar or streambed.

Some comments should be made concerning the horizontal distribution of gravel. Considerably more gravel and chipped stone pieces were recovered from Area B than from Area A. It is possible that this horizontal distribution is due in part to sheet erosion. Area A is situated near the crest of the T1a levee while Area B is on the slope

Table 4.4. Relative frequency of red and broken gravel categories by collection station.

Collection Station	Total Gravel from Collection	No. Pieces of Red Gravel	No. Pieces of Broken Gravel
Modern Gravel Bar	4687	74	12
percent of total		(1.58%)	(.26%)
Test Areas A and B*	5237	1060	600
		(20.24%)	(11.46%)
Slope of T2 Terrace	584	10	102**
		(1.7%)	(17.47%)

* Only gravel below the plow zone is included in this tabulation.

** Some gravel breakage resulted from the operation of the backhoe during excavation of the trench.

Table 4.5. Crosstabulation of gravel color by completeness, Area A, 40MU141.*

Color		Number Broken	Number Complete	Totals
Red	o	123	192	315 (25.5%)
	(e)	(80.5)	(234.5)	
Tan/	o	193	729	922 (74.5%)
Yellow	(e)	(235.5)	(686.5)	
Totals		316	921	1237
		(25.5%)	(74.5%)	
		df=1	X^2=40.4	p<.001

* This tabulation does not include gravel from the plow zone or gravel less than 1 cm in size.

o=observed frequency
e=expected frequency

Table 4.6. Crosstabulation of gravel color by completeness, Area B, 40MU141.*

Color		Number Broken	Number Complete	Totals
Red	o	153	592	745 (18.6%)
	(e)	(52.9)*	(692)	
Tan/	o	131	3124	3255 (81.4%)
Yellow	(e)	(231)	(3023)	
Totals		284 (7.1%)	3716 (92.9%)	4000
		df=1	X^2=250.5	p<.0001

* This tabulation does not include gravel from the plow zone or gravel less than 1 cm in size.

o=observed frequency
e=expected frequency

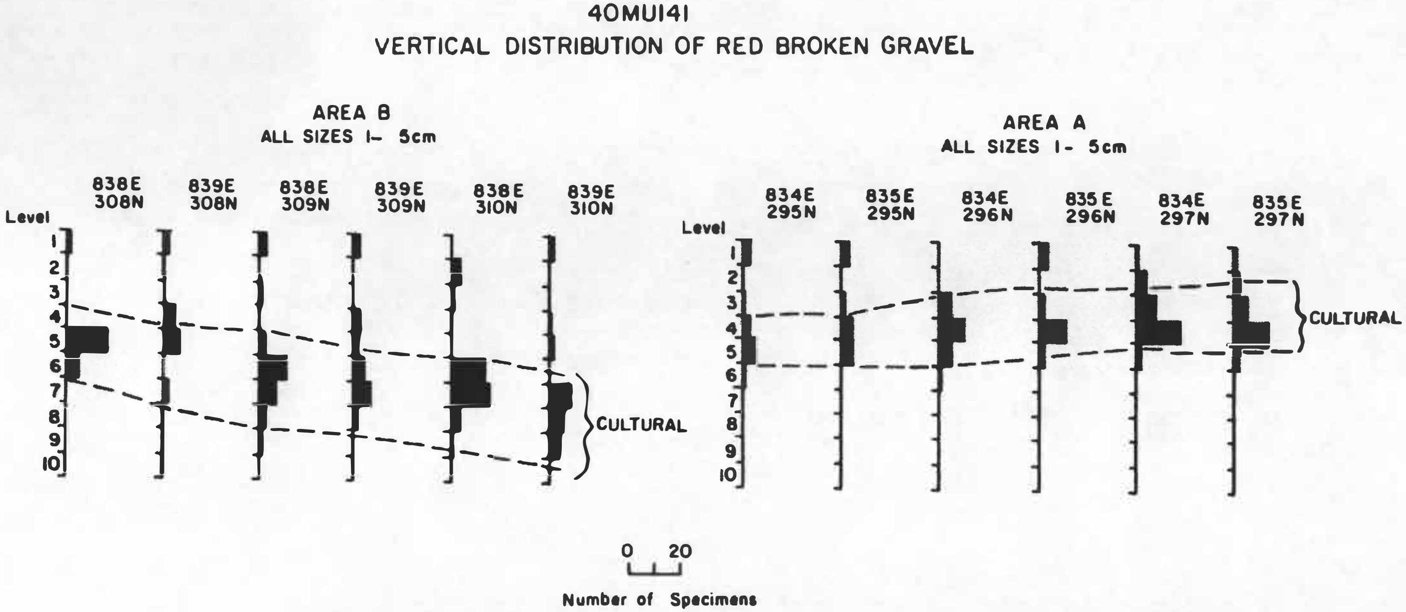


Figure 4.7 Vertical distribution of red broken gravel from areas A and B, 40MU141.

behind this crest. It is possible, especially if ground cover vegetation was limited after occupational activity, that some materials from that part of the terrace near Area A washed down the gentle slope to Area B and/or down the front slope toward the river. Movement of gravel and artifacts down a gentle slope due to water action should move small pieces more readily and farther than larger pieces (Isaac 1967, 1977).

If sheet erosion occurred we can expect a greater abundance of small pieces, such as gravel less than 3 cm and small flakes, in Area B than in Area A, even if similar quantities of such materials were originally deposited on both areas. This is in fact the situation for both gravel and chipped stone. It is unclear whether the greater density of small gravel and chipped stone pieces in Area B is due to more intensive prehistoric activity in that area, different kinds of activity, or to downslope movement of debris due to sheet wash.

There is, however, a concentration of gravel in Area B which was recognized during the excavation as Feature 1 (Figures 4.8, 4.9). This concentration consisted of a mass of gravel much of which was oxydized and within which were occasional pieces of burned clay and numerous flakes, artifacts, and charred botanical remains. The problem is whether this gravel concentration resulted from cultural activity, such as dumping of gravel after stone-boiling, or from an erosional irregularity, such as a small gulley or natural check dam. No evidence of a gulley was revealed during the excavation, nor was there evidence that the soil around or underlying the concentration had been burned.

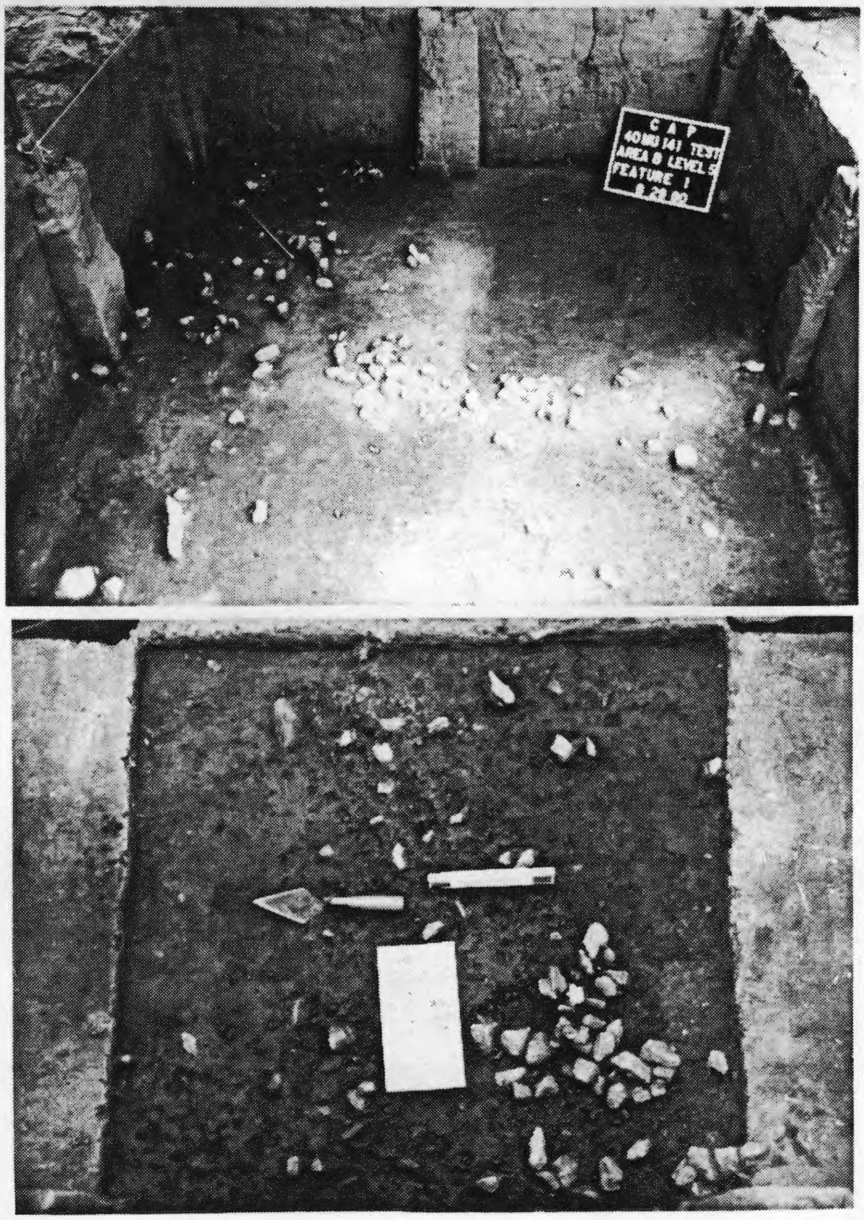


Figure 4.8 Gravel concentration in Area B, 40MU141. Top: Photograph of level 5 floor, 65 cm below surface, in the southern part of Area B showing portion of gravel concentration (Feature 1). Bottom: Floor of level 6 in unit 309N-838E showing portion of gravel concentration 75 cm below surface.

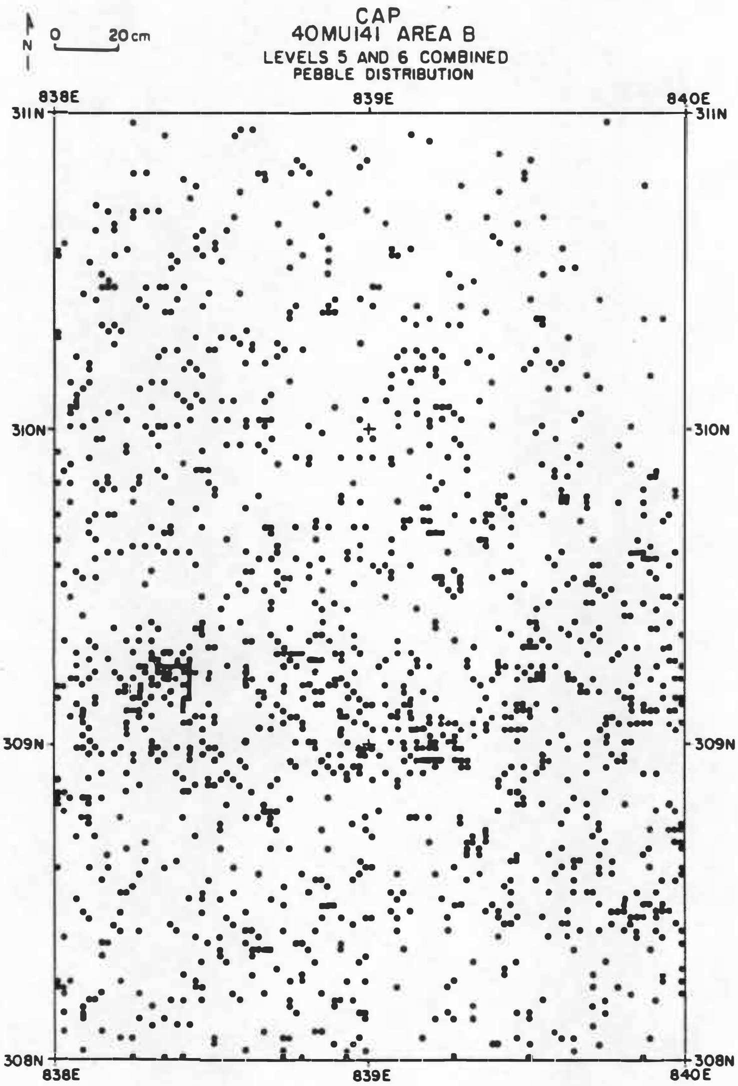


Figure 4.9 Distribution of mapped gravel larger than one cm in levels 5 and 6, Area B, 40MU141.

Therefore, the gravel concentration is believed to represent a trash dump from a hearth or boiling area, or the naturally dispersed remains of such a feature.

CHAPTER V

CONTEXTUAL ANALYSIS II: EVALUATION OF POST DEPOSITIONAL DISTURBANCES

> . . . the structure of archaeological remains is a distorted reflection of the structure of material objects in a past cultural system. (Schiffer 1976:42)

Introduction

The argument has been made that river gravel on the T1a surface at Cave Spring was culturally introduced and originally deposited on a single surface. In this chapter the argument for a single depositional surface is evaluated using the chipped stone data. Evidence is introduced indicating that post depositional vertical movements of chipped stone pieces from a single surface has occurred.

Processes or mechanisms which have probably stimulated vertical dispersal of stone pieces at Cave Spring are noted first, and then a practical evaluation of such movements is made using the technique of refitting. Finally, it is emphasized that while the refitting analysis provides an indication of the minimum number of surfaces which were occupied, it cannot inform us of the actual number of occupations which occurred. The problem of how many groups occupied the T1a surface is addressed in the typological analysis of the next chapter.

Disturbance Processes and the Cave Spring Site

Despite many cautionary papers, and several specific disturbance studies, it is still common to read archaeological reports which provide analyses of material remains but which lack investigation or even

discussion of various possible transformations which can affect the content, integrity, and resolution of recovered collections. Archaeologists sometimes assume, often erroneously, that excavated "assemblages" are in situ unless there is obvious evidence of disturbance (e.g. krotovinas), and that there is no need to evaluate the nature or extent of potential disturbances which do not leave distinct traces (Ascher 1961; Binford 1981a, 1981b).

Many factors act to distort the archaeological record after cultural materials have been lost or discarded. Most items are exposed on the surface for some period prior to burial. Therefore, processes which influence the dispersal and destruction of archaeological surface remains must be accounted for even when studying buried archaeological deposits (Todd and Hofman 1980:17). Disruptive factors which actively influence the position or survival of surface artifacts have been discussed in numerous studies (see Behrensmeyer 1978; Binford 1981a; Binford and Bertram 1977; Courtin and Villa 1982; Foley 1981; Haynes 1980; Hughes and Lampert 1977; Isaac 1967; Kent 1981; Matthews 1965; Moeyersons 1978:27; Rick 1976; Rolfsen 1980; Stockton 1973; Villa 1981, 1982).

The process of burial can also be damaging. Separation of particles as to weight, size, or shape is common where wind and water transport or downslope movement are involved (Hanson 1980; Isaac 1967; Leet and Judson 1971:324-337; Rick 1976). Natural factors which contribute to vertical and horizontal movement of pieces after their burial can be divided into two major groups of processes, physiogenic and biogenic (Butzer 1982:77, 104).

Primary mechanical or physiogenic processes which affect deposits such as at Cave Spring include shrink-swell action of clays (Figure 5.1 illustrates a vertical drying crack 1.5 m deep in the T1a silty clay at 40MU141), freeze-thaw action in soil, tree falls, and perculation of water through cracks and holes. Numerous studies provide details of the affects of these various processes (Butzer 1982; Denney and Godlett 1956; Duffield 1970; Johnson and Hanson 1974; Lutz 1960; Otinger and Lafferty 1980; Rolfsen 1980; Wood and Johnson 1978). Ultimately the primary physiogenic factor contributing to downward movement of particles is of course gravity. The collapse of materials into cavities created by animals, decayed roots, or clay shrinkage will contribute substantially, given time, to the displacement of sediments and materials inclusions. Downward movement is often counteracted, however, by tree throws, swelling of clays, activities of animals and so forth.

Biogenic processes known to have been operative within the Holocene terrace sediments and T1a soil at Cave Spring include root, rodent, and insect action all evidenced by krotovinas, and worm activity evidenced by castings and burrows (Figure 5.2 illustrates a worm and cast-filled burrows .5 m deep in the T1 sediments). A large biomass dominated by hardwood forest occupied the Duck River terraces, including the Cave Spring area, until modern land clearing. Over the 7000 years since occupation of Cave Spring, the perpetual action of extensive and deep root networks of trees has probably been one of the more important factors contributing to disturbances and movement of artifacts within the sediments.

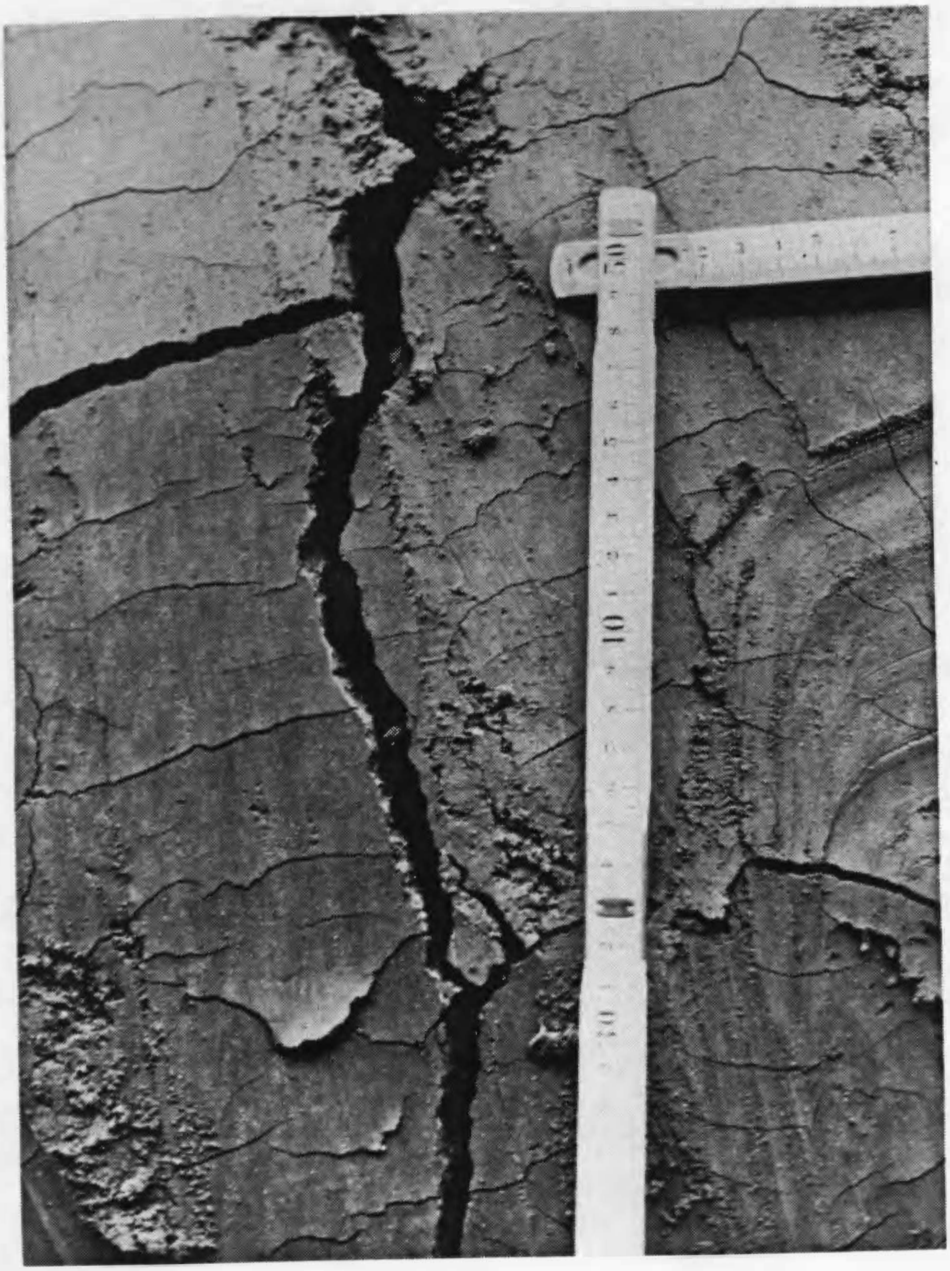


Figure 5.1 Shrinkage crack in Tla silty clay at Cave Spring.

Figure 5.2 Worm, worm casts and burrows in T1 sediments .5 meters deep.

Groundhogs, moles, chipmunks, mice, and voles contribute to displacement through digging holes and burrows. In the 2x3 m excavation of Area A at Cave Spring, for example, 81 krotovinas between 2 and 10 cm in size attributable to roots and rodents were recorded on the floor of Level 7, 85 cm below the surface. Considerably more disturbances less than two cm in diameter were also documented at this depth. Most of the krotovinas were discernible because they had become filled with a mixture of the darker T1a soil material from about 10 cm above. Because a high proportion (86 percent) of the chipped-stone items recovered from Cave Spring are less than one cm in greatest dimension, these small burrows may also represent a significant disturbance factor.

Insects are responsible for a portion of these small krotovinas. The May Beetle, Phyllophaga spp. (Milne, Milne, and Rayfield 1980), was commonly encountered in both larval and adult form as much as a meter below the surface in silty clay T1a sediments. The larva of May Beetles ("grub worms") live in the ground burrowing and eating for two years and finally pupat during the third year. The adult beetles live in burrows, when not feeding, and spend winters deep in the soil. Large populations of such long-lived burrowing insects can create, during thousands of years, an immense number of disturbances at a site. Furthermore, May Beetles are only one of dozens of burrowing insect and ant species.

Mention should also be made of the powers of earthworms as mixing and sorting agents. In recent years the importance of earthworms as bio-turbational disturbance factors in archaeological deposits has been widely acknowledged, and a variety of studies documenting their behaviors and impacts are available (Atkinson 1957; Butzer 1982;

Cornwall 1958; Darwin 1881; Evans 1948; Evans and Guild 1947; Stein 1980, 1982, 1983; Thurp 1949; Wood and Johnson 1978).

Refitting Analysis and Archaeological Interpretation

Within the past decade, research involving refitting of conjoinable artifacts has become important to the study and interpretation of stratified deposits in alluvial and eolian settings (Cahen 1976, 1978a; 1978b, 1981; Cahen and Moeyersons 1977; Cahen *et al*. 1980; Villa 1978, 1982). Primary among Cahen's findings has been documenting beyond question the vertical displacement of artifacts, in stratified river sediments, for as much as a meter in less than 10,000 years. Such displacement is attributable to natural physiogenic and biogenic processes. Refitting of conjoinable pieces provides one means of evaluating the impact such disturbance processes have had on buried assemblages.

One aspect of the contextual analysis of the Cave Spring materials is, therefore, the refitting of chipped-stone pieces (Hofman 1981a, 1981b; Hofman and Brakenridge 1982a, 1982b). Through this technique it is possible to evaluate the integrity of buried assemblages from several perspectives. Horizontal artifact displacement resulting from stream action, sheet erosion, or cultural activity can be monitored. After severe flooding, lithics should be sorted by size and shape with pieces of widely different size, geometry, or density expected to become segregated. Vertical movements can be documented when matching pieces are found in different vertical units and the intensity and extent of such movements can be generally evaluated. Vertical linkages between

conjoinable pieces provides evidence of the number of surfaces which were occupied or on which materials were deposited. If there is more than one depositional surface, then the possibility of a single phase of occupation at a site can be discounted.

Results of Refitting with the Cave Spring Collection

A total of 405 chipped stone pieces from Cave Spring larger than one cm were matched in sets of two to 16 pieces each. There are 154 refitted sets. This represents 5.34 percent of the chipped stone sample greater than one cm in size. Information on the refitted sets is presented in the following tables and figures which are intended to provide a basic descriptive summary of the refitting analysis. The major lithic raw material groups are tabulated and figured separately for Area B, while the small number of refits from Area A are treated as a group. A narrative discussion of the tables and figures is followed by a synopsis of the primary analytical results.

Table 5.1 summarizes the refitted projectile point-knives which include one patinated and stream abraded Kirk cluster point which had apparently been collected from a gravel bar and introduced to the site. Most of the projectile point-knife fractures resulted from severe thermal alteration, and fire spall and crenated fractures are evident in Figure 5.3. The horizontal and vertical distributions of refitted projectile point-knives are shown in Figure 5.4. The dashed lines in the vertical distribution figure represent the approximate limits of the T1a soil. Most of the refits, except Refit 8, follow the general slope of the soil. Refit 5 is of special interest because it links Area A and

Table 5.1. Projectile point-knife refits, Areas A and B, 40MU141.

Refit Number	Proveniences* 1x1m unit	Description of items	Lithic Material	Projectile point Type
1	308n839e L5#90	base@	Fort Payne	Eva
	308n839e L5#284	tip@		
2	309n838e L6 d	blade frag.	Fort Payne	?
	310n838e L6	tip		
3	308n839e L4 b	base	Fort Payne	Eva
	310n839e L5#7	lower blade		
4	308n839e L6#303	base	Fort Payne	Kirk
	309n838e L6 c	pot lid@		(patinated)
5	309n839e L6#38	base frag.@	Ridley	Eva
	297n835e L4#67	blade & tip		
6	308n838e L6#10	tip@	Ridley	?
	308n838e L6#184	blade frag.@		
7	308n839e L6#27	base@	Ridley	Eva
	309n838e L6#50	blade frag.@		
8	308n838e L4	base	Fort Payne	Eva
	308n839e L6#283	base/blade frag.		
	308n838e L6#177	blade frag.@		

*The second part of the provenience entry indicates level and quad or level and specimen number for piece plotted pieces.

@ The specimens marked with an @ have been fire-spalled, potlidded, heat crazed or show other evidence of being burned or severely heated.

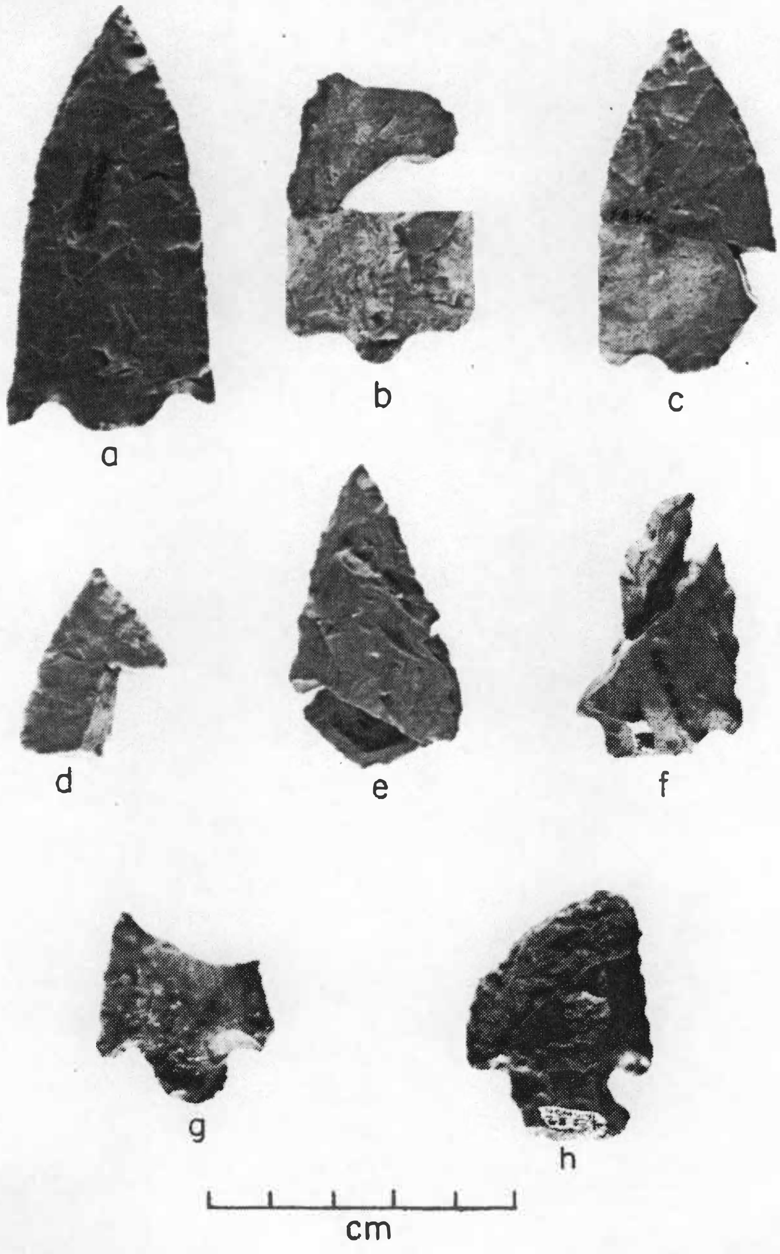


Figure 5.3 Refitted projectile point-knives from Area B, 40MU141.

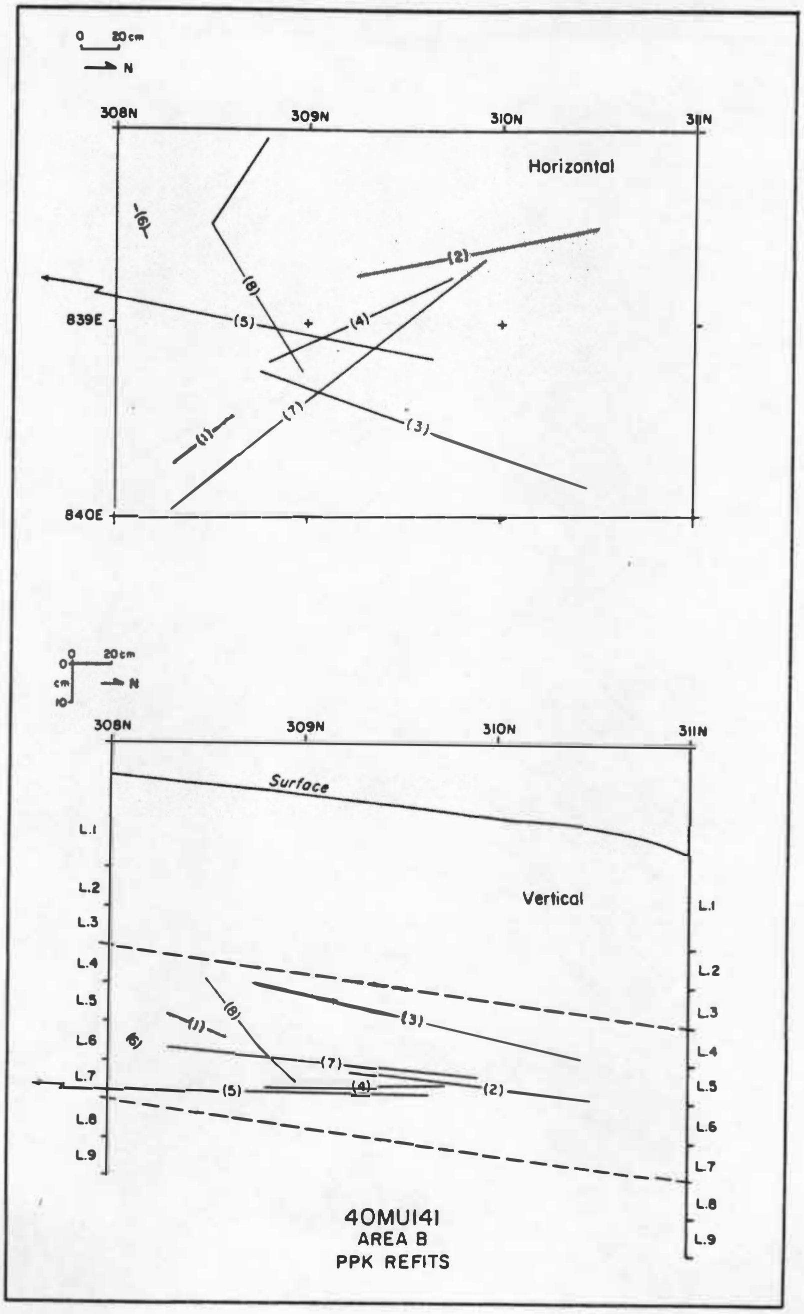


Figure 5.4 Horizontal and vertical distribution of refitted projectile point-knives from Area B, 40MU141. Refit numbers, as in Table 5.1, are indicated in parentheses.

B by matching pieces of the same projectile point which were recovered over 12 m apart. Refitting was not attempted between Areas A and B with material other than projectile point-knives.

Considerably less material was recovered from Area A than from Area B and this difference is reflected in the frequencies of refits from the two excavations. Table 5.2 lists the 20 refitted sets from Area A, and the horizontal and vertical positions of these sets are shown in Figure 5.5. The vertical refits in Area A serve sufficiently to link the materials between levels 2 and 7. The original surface is believed to have centered on Level 5, based on vertical densities of all chipped stone and gravel.

Because of the large number of refits, the tables and illustrations for Area B are divided by lithic material type. Table 5.3 describes the 33 Fort Payne chert refitted sets from this area. The horizontal distribution of these refitted pieces is shown in Figure 5.6 while their vertical positions are illustrated in Figure 5.7. Again the general tendency of vertical refits is to follow the T1a soil, but in a number of cases (specifically, refits 1, 12, 16, 17, 20, 23, and 26) the refits cross-cut the orientation of this stratum. Levels 4 through 9 are well interconnected by this series of refitted sets.

Several core reduction sequences are represented by the Fort Payne refits, and selected examples are shown in Figures 5.8 through 5.10. Figure 5.8a and Figure 5.9 represent a core and secondary decortication flakes, Refit 12. This was the most completely reconstructed Fort Payne core reduction sequence and apparently reflects the percussion manufacture of flake blanks for flake tools. The refitted flakes are

Table 5.2. Refits from Area A, all material types, 40MU141.

Refit Number	Proveniences* 1x1m unit	Description of items	Lithic Material
1	296n834e L3	blocky debris	Ridley
	296n834e L3	blocky debris	
2	296n835e L3	secondary flk	Ridley
	296n835e L3	broken flake	
3	296n835e L3	secondary flk	Ridley
	296n835e L3	broken flake	
4	296n834e L5	secondary flk	Ridley
	296n834e L5	secondary flk	
5	296n834e L3	blocky debris	Ridley
	296n834e L4	blocky debris	
6	297n835e L4	blocky debris	Ridley
	297n835e L5	blocky debris	
7	297n834e L4	secondary flk	Ridley
	297n834e L4	broken flake	
8	296n835e L2	primary flake	Fort Payne
	296n835e L2	broken flake	
9	295n835e L5	tertiary flk	Fort Payne
	295n835e L6	tertiary flk	
	295n835e L7	tertiary flk	
	296n835e L5	tertiary flk	
10	295n834e L6#14	core	Fort Payne
	297n834e L6	primary flake	
11	297n835e L2	secondary flk	Fort Payne
	295n835e L5	primary flake	
12	297n834e L8	bif. thin.flk	Fort Payne
	297n834e L8	broken flake	
13	297n834e L4	secondary flk	Bigby-Cannon
	296n835e L4	secondary flk	

Table 5.2 (continued)

Refit Number	Proveniences* 1x1m unit	Description of items	Lithic Material
14	296n835e L6 295n835e L7	tertiary flk@ broken flake	St. Louis
15	297n834e L3 296n834e L5	broken flake broken flake	Ridley
16	296n834e L4 296n834e L4	broken flake tertiary flk	Ridley
17	295n834e L3 295n834e L3	secondary flk secondary flk	Ridley
18	296n835e L4 296n835e L5	secondary flk secondary flk	Fort Payne
19	297n834e L4 297n834e L4	bif.thin. flk broken	Bigby-Cannon
20	297n834e L8 297n834e L8	broken flake broken flake	Ridley

*The second part of the provenience entry indicates level and quad or level and specimen number for piece plotted pieces.

@This specimen is a retouched flake tool.

flk=flake

bif. thin. flk=biface thinning flake

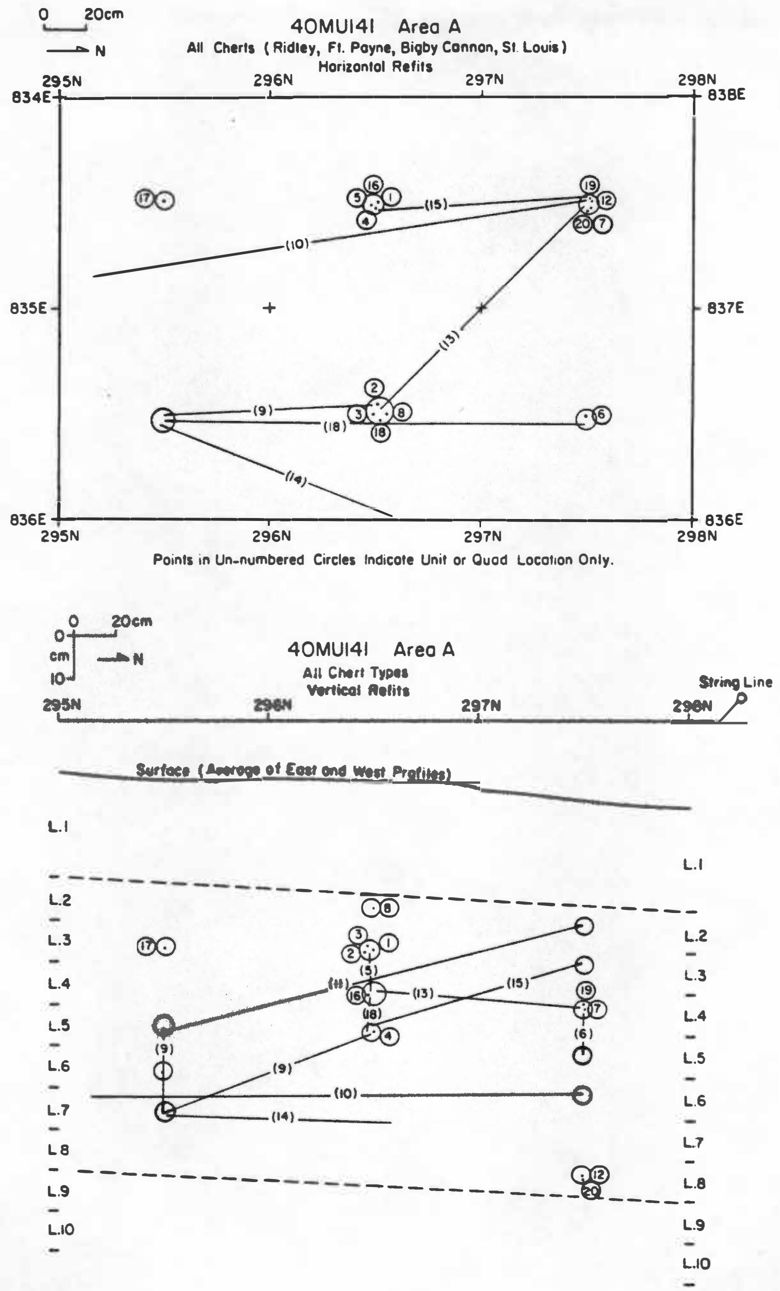


Figure 5.5 Horizontal and vertical distribution of refitted pieces, Area A, 40MU141. Refit numbers (Table 5.2) are indicated in parentheses for separated pieces and in circles for pieces with the same provenience.

Table 5.3. Refits of Fort Payne Chert, Area B, 40MU141.

Refit Number	Provenience* 1x1m unit	Description of items
1	310n838e L6	secondary flake
	308n838e L6#281	secondary flake
	309n838e L9	broken flake
2	309n838e L7	biface thinning flake
	308n839e L6#112	preform
	308n838e L6#254	biface thinning flake
3	309n839e L7b	blocky debris
	309n839e L7a	secondary flake
4	310n838e L7a	secondary flake
	310n838e L7b	tertiary flake
5	310n839e L7b	tertiary flake
	309n839e L7c	tertiary flake
6	310n838e L8a	secondary flake
	310n838e L6	broken secondary flake
7	309n839e L5	primary flake
	309n839e L5	secondary flake
8	309n838e L6	blocky debris
	308n838e L4	secondary flake
	308n839e L5	tertiary flake
	308n839e L5	broken flake
9	309n839e L6	broken flake
	309n839e L6	broken flake
10	309n838e L5	tertiary flake
	309n838e L6	tertiary flake
	310n839e L8c	secondary flake
	309n839e L6#339	tertiary flake
11	310n839e L8d	primary flake
	310n839e L8d	tested cobble

Table 5.3 (continued)

Refit Number	Provenience* 1x1m unit	Description of items
12	310n839e L8c	core
	310n838e L8a	secondary flake
	310n838e L8a	secondary flake
	310n838e L8c	secondary flake
	310n838e L6	secondary flake
	309n838e L7	tertiary flake
	309n838e L6#250	secondary flake
	309n838e L6#346	secondary flake
	309n838e L6#414	secondary flake
13	308n838e L5	secondary flake
	308n838e L5	broken secondary flake
	308n838e L5	broken secondary flake
	308n838e L5c	preform
14	308n838e L5	tertiary flake
	309n838e L5	tertiary flake
15	309n838e L5	blocky debris
	309n839e L5	flaked cobble
16	310n839e L9c	tertiary flake
	309n838e L6	tertiary flake
	309n838e L6	broken flake
	309n839e L5	broken flake
17	309n839e L7b	fire cracked rock
	309n839e L7c	fire cracked rock
	309n839e L5	core
18	309n839e L7#6	biface fragment
	308n839e L5#48	biface fragment
	309n838e L7#2	broken preform
	309n839e L6	potlid from biface
19	310n839e L8c	blocky debris
	310n839e L8c	blocky debris
20	309n838e L5	secondary flake
	309n838e L8b	core
21	310n838e L5	tertiary flake
	310n838e L5	broken secondary flake
	310n838e L5	broken secondary flake
	310n838e L5	broken flake

Table 5.3 (continued)

Refit Number	Provenience* 1x1m unit	Description of items
22	308n839e L6#249	broken flake
	310n839e L9c	broken flake
23	309n838e L4	secondary flake
	309n838e L6#231	core
24	309n839e L6#316	broken secondary flake
	308n839e L5	broken flake
25	310n838e L7a	secondary flake
	309n838e L6#315	broken secondary flake
26	310n838e L7a	broken flake
	310n839e L8c	broken flake
	310n839e L8c	broken flake
	310n839e L9c	broken flake
27	310n839e L9c	biface fragment
	310n839e L9c	tertiary flake
28	310n839e L8c	broken flake
	309n839e L6	broken flake
29	309n839e L6	biface fragment
	309n839e L6	tertiary flake
30	309n839e L6	tertiary flake
	310n838e L7b	tertiary flake
31	310n838e L7a	tested cobble
	310n838e L9b	secondary flake
32	310n838e L8c	blocky debris
	310n838e L8c	blocky debris
33	310n839e L8c	broken flake
	310n839e L8c	broken flake

*The second part of the provenience entry indicates level and quad or level and specimen number for piece plotted pieces.

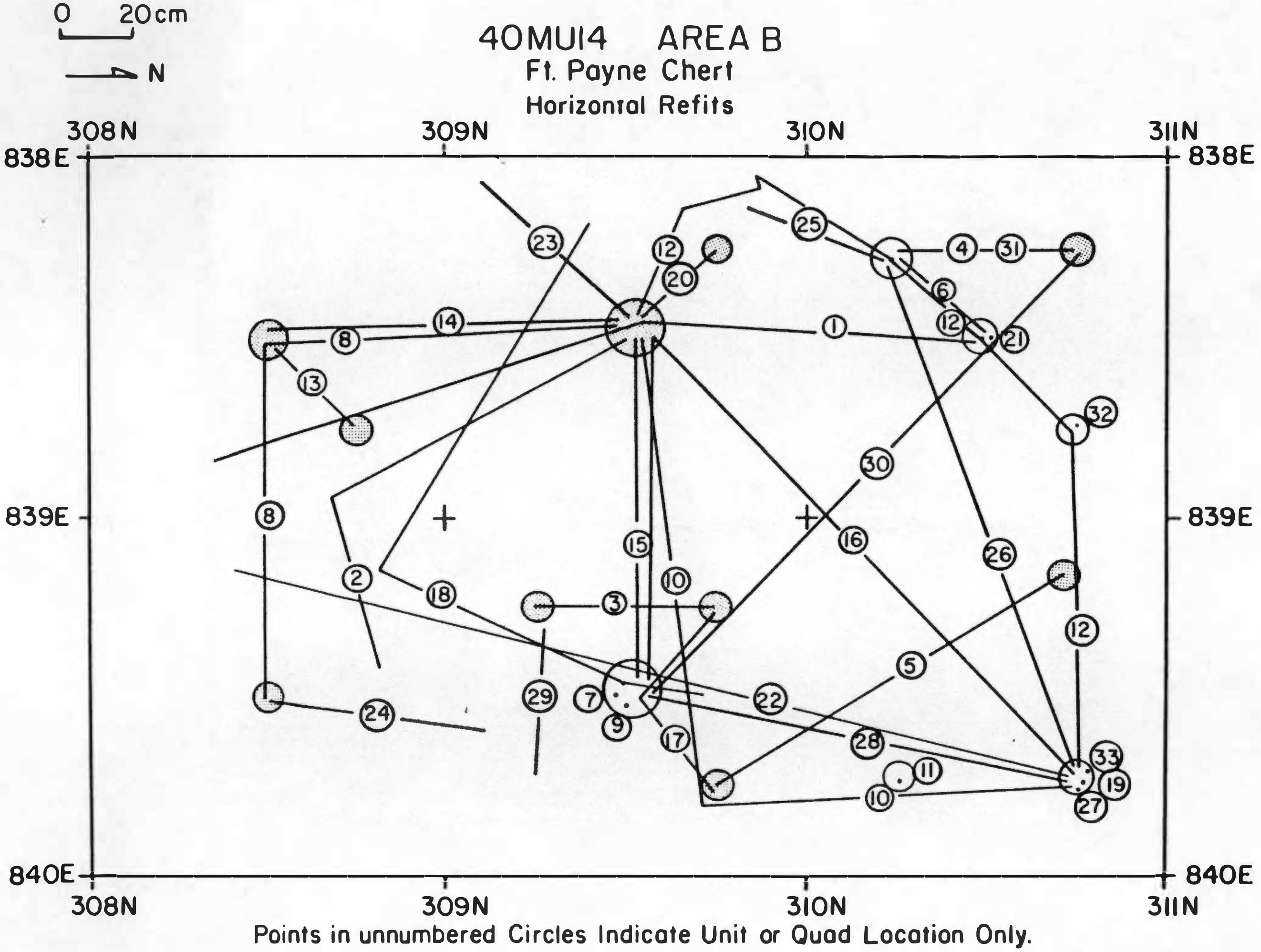


Figure 5.6 Horizontal distribution of refitted pieces of Fort Payne Chert, Area B, 40MU141. Refit numbers, as in Table 5.3, are indicated in circles.

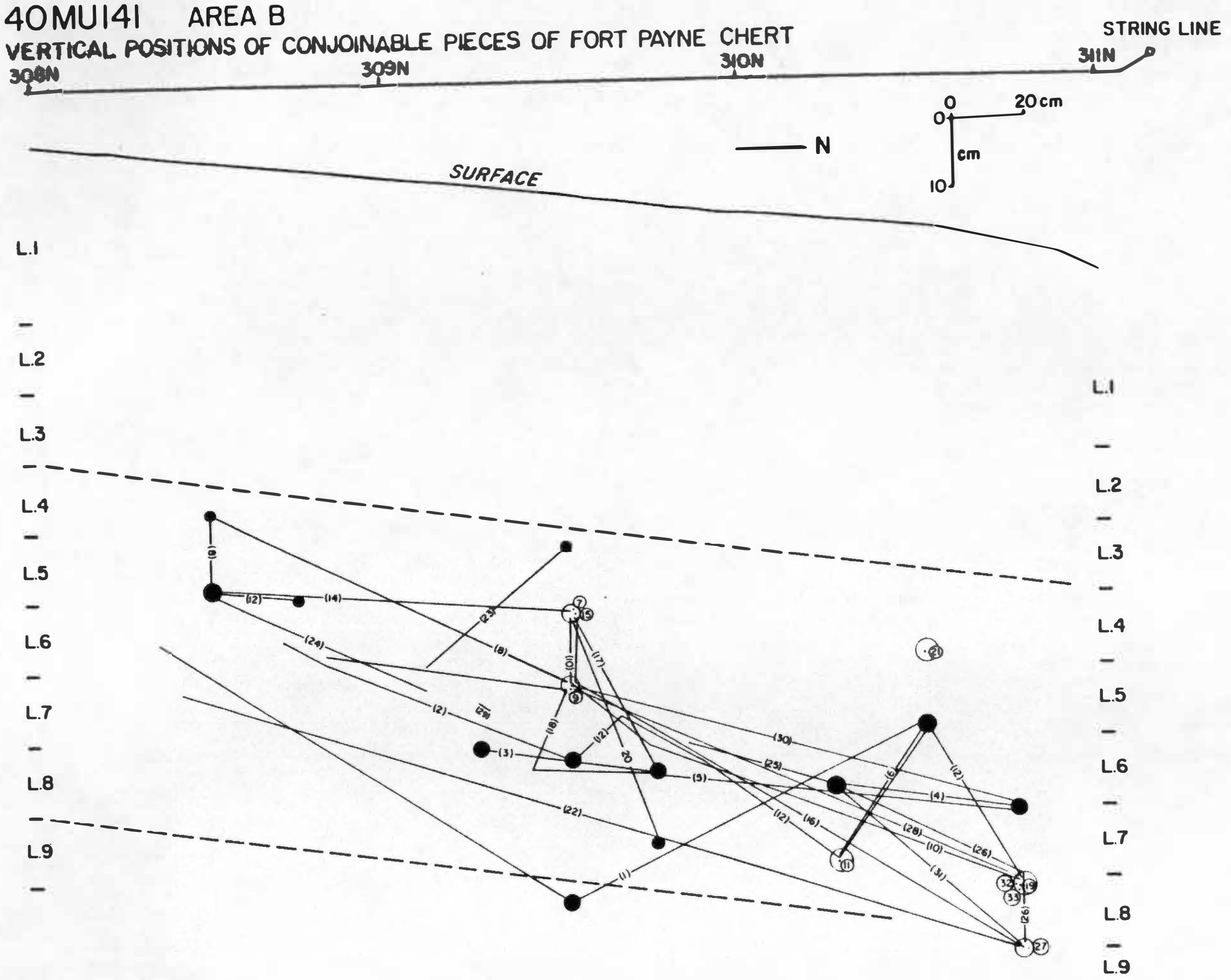


Figure 5.7 Vertical distribution of refitted pieces of Fort Payne Chert, Area B, 40MU141. Refit numbers are indicated in parentheses for separated pieces, and in circles for pieces with the same provenience.

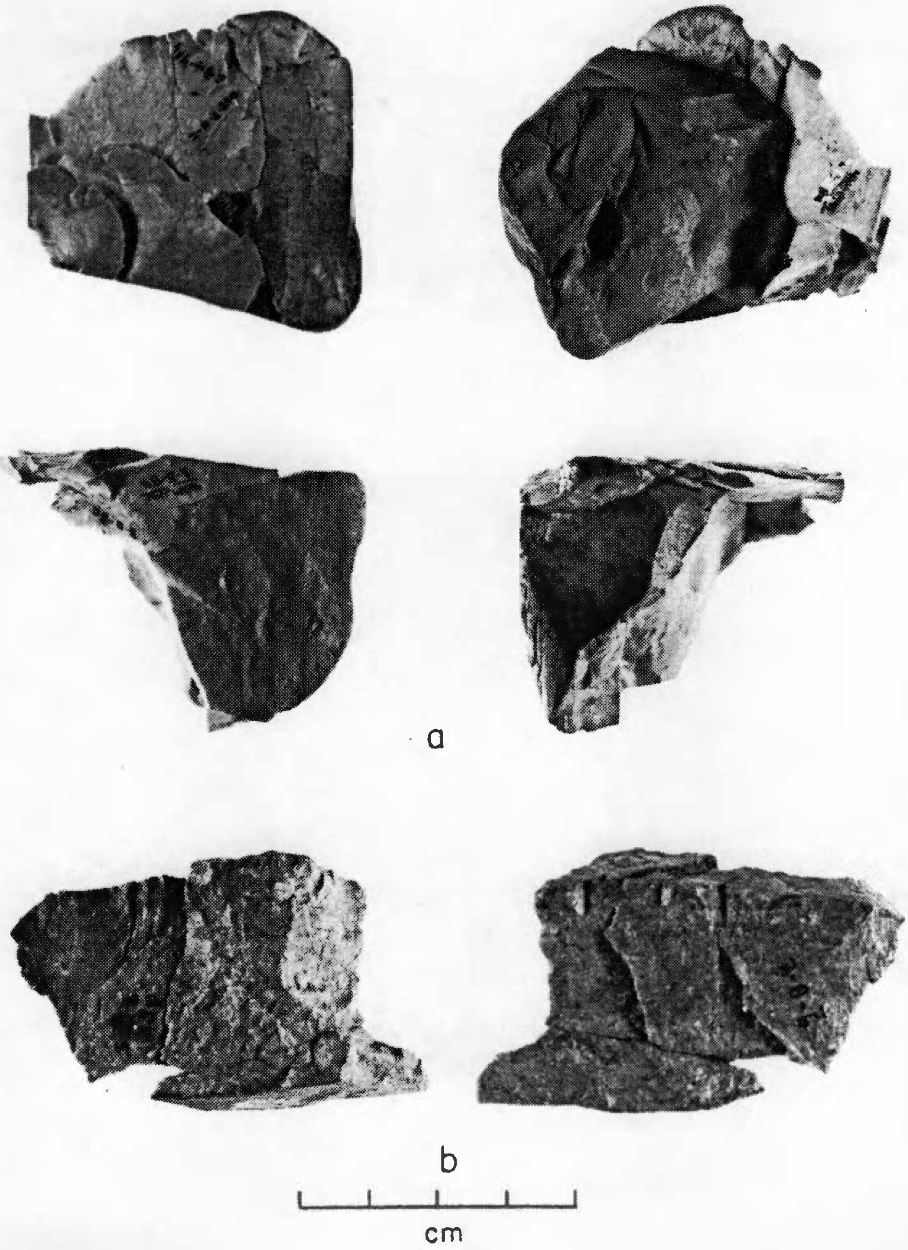


Figure 5.8 Fort Payne core reduction sequences, Area B, 40MU141. a: Thermally altered core and seven unheated flakes, refit number 12 (4 views). b: Two tertiary and one secondary decortication flake, refit number 10, dorsal and ventral views.

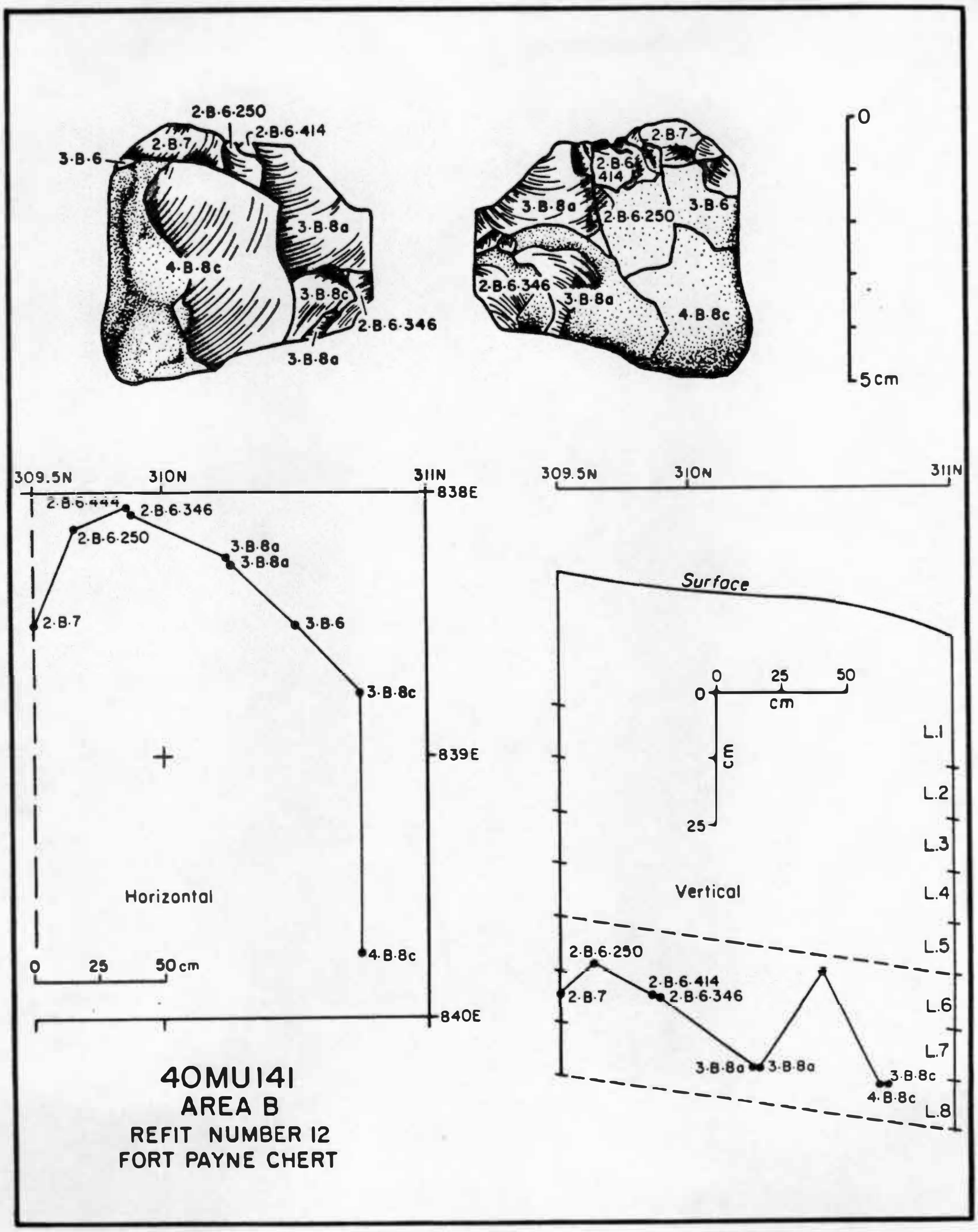


Figure 5.9 Horizontal and vertical distribution of Fort Payne refit number 12, Area B, 40MU141, representing a thermally altered core with unheated secondary decortication flakes (n=6) and tertiary flake.

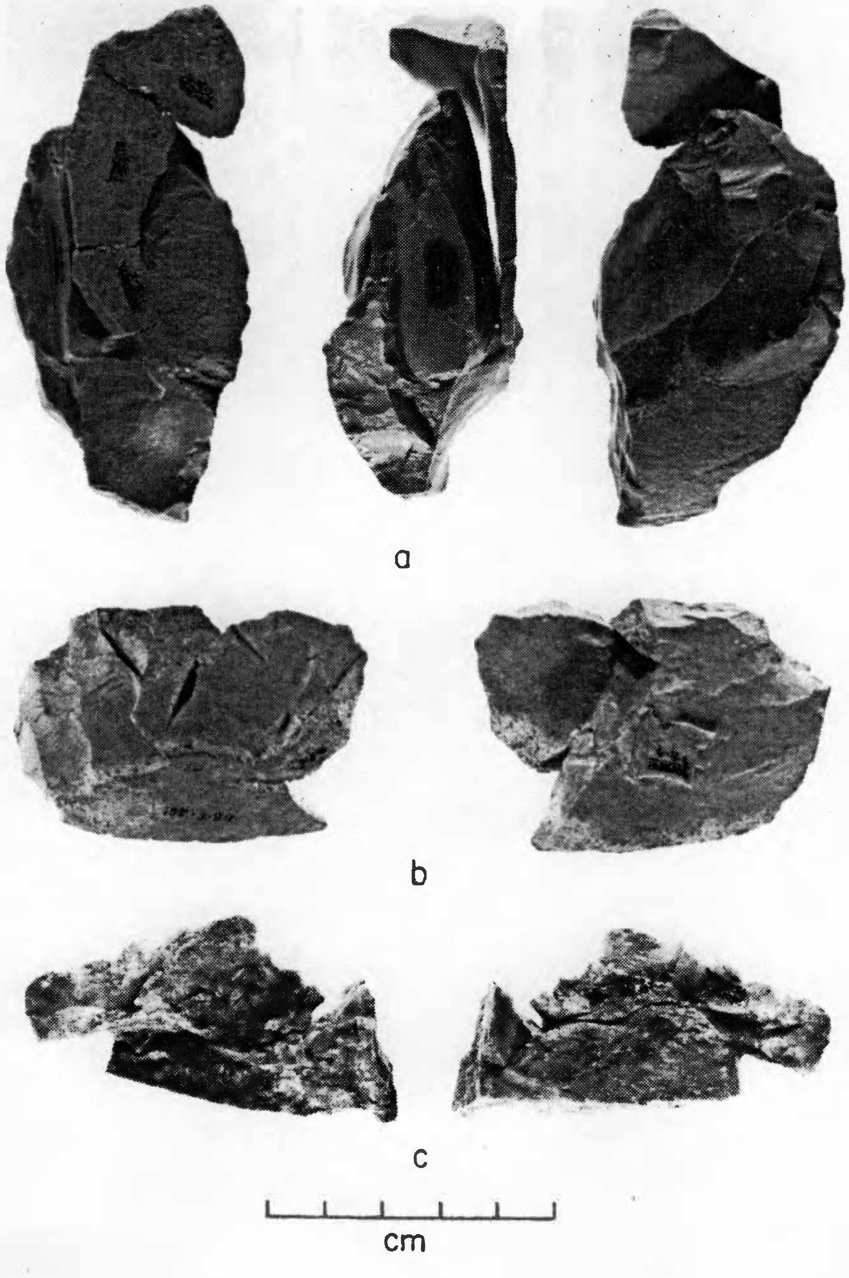


Figure 5.10 Initial biface reduction and core reduction sequences of Fort Payne Chert, Area B, 40MU141. a: Refit number 13 showing decortication flake struck from an early stage aborted preform. b: Refit number 1 is two secondary decortication flakes and one broken flake. c: Refit number 8, a core reduction sequence with a decortication, tertiary, and broken flake and blocky debris.

discards and perhaps selected flakes from this core were used/discarded elsewhere. The core exhibits opposing platforms. Figure 5.9 shows the element distribution of this refitted set and indicates that the core was approximately one m away from the nearest of the flakes and at the downslope extreme of the distribution. Finally, the core was thermally altered after the flakes were removed. It was apparently exposed to or used in a hearth. The refitted flakes are yellow and unaltered, while the core is reddened. Other core reduction sequences, refits 1, 8, and 10 are shown in Figure 5.8b and Figure 5.10b and c.

Fort Payne biface reduction sequences are represented by three aborted preforms (refits 2, 13, and 18). Refit 13 represents an early stage preform aborted after unsuccessful attempts to thin a thick edge (Figure 5.10a). A broken primary decortication flake was refitted to this preform, but the intervening thinning flakes from this homogeneous and vitreous cobble were not recovered. They may have been selected out as flake tools or tool blanks and used/discarded elsewhere.

Two small biface thinning flakes with broad platforms were apparently removed by percussion and were refitted to the preform shown in Figure 5.11a. This intermediate stage preform was aborted after breaking on an incipient fracture plane. The small flakes were both within about one m of the preform. This is one of several cases of refitted sets containing large and small pieces which suggest that horizontal size sorting due to stream action had not affected the collection. Refit 18 is reconstructed from four fire-fractured pieces and represents a final stage preform which was discarded after too much of one edge was removed by an end shock break (Figure 5.11b).

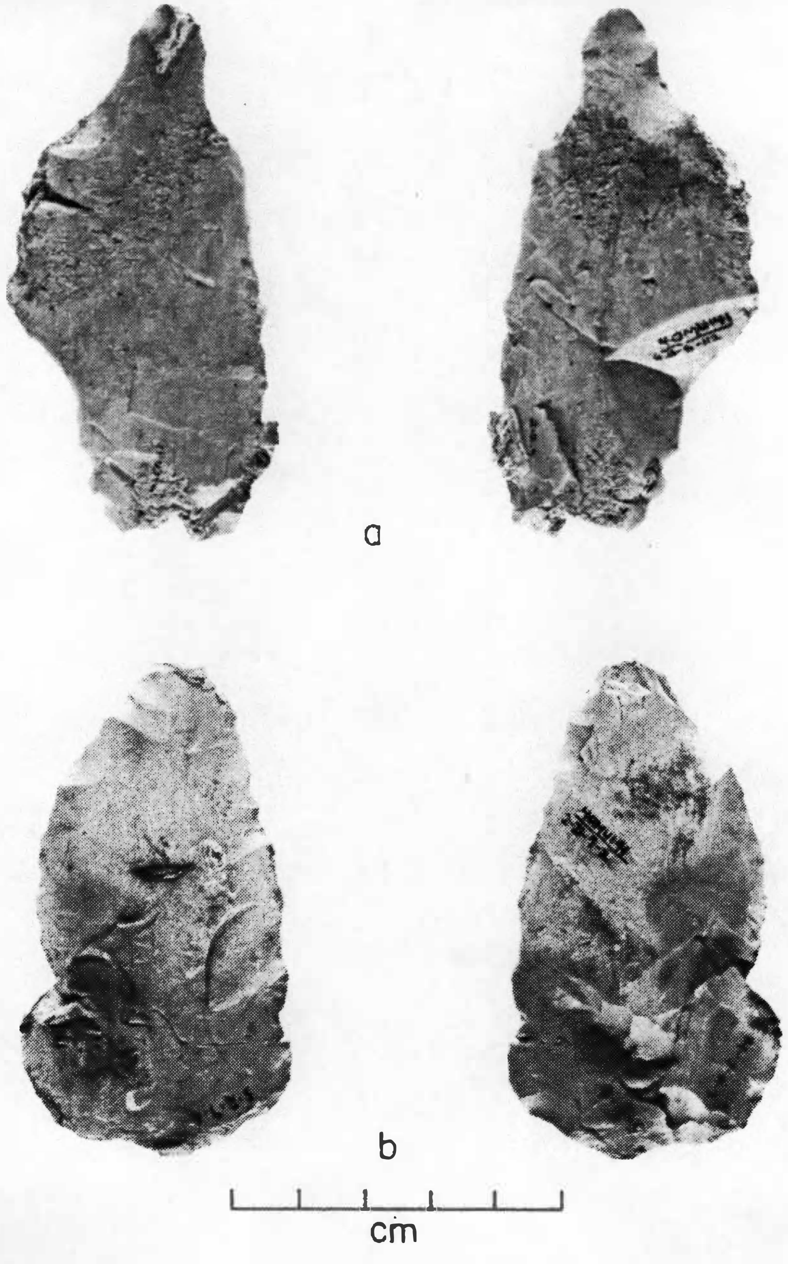


Figure 5.11 Intermediate and late stage aborted preforms of Fort Payne Chert, Area B, 40MU141. a: Refit number 2, a broken preform with biface thinning flakes refitted. b: Refit number 18, a fire fractured preform.

Most refits from Area B are of Ridley chert and are listed in Table 5.4. These 84 refitted sets include a variety of core reduction and biface reduction sequences, reconstructed fire-cracked rocks and blocky debris. The latter reflects the initial reduction of Ridley cobbles along incipient fracture planes. The horizontal distribution of Area B Ridley refits is shown in Figure 5.12 and their vertical distribution is in Figure 5.13. The Ridley refits serve as vertical links for levels 5 through 8 with the majority of refits and recovered materials in levels 6 and 7.

Selected core reduction sequences are illustrated in Figures 5.14 through 5.19. Refit 10 is a series of decortication and tertiary flakes including several blade-like specimens (Figure 5.14a). A partially exploded view of this sequence is shown as Figure 5.15, while the horizontal and vertical scatter of the pieces in Refit 10 are shown in Figure 5.16. An early stage secondary decortication flake sequence is shown in Figure 5.14b.

Figures 5.17 and 5.18 illustrate matched sets of Ridley chert core reduction and biface reduction flakes. Figure 5.19 depicts a refitted set of 16 flakes (a combination of refits 11, 28, and 50) and their horizontal and vertical distributions. This sequence reflects the production of a biface which was about four cm wide. It also documents the transition from late stage core reduction, represented by broken tertiary flakes, to biface reduction.

Several refitted sets which are probably Ridley chert, but which could not unequivocally be segregated from the lithologically similar Carter chert, are listed in Table 5.5 along with several Bigby-Cannon

Table 5.4. Refits of Ridley Chert, Area B, 40MU141.

Refit Number	Provenience* 1x1m unit	Description of items
1	310n839e L7c	fire cracked rock
	309n839e L5	fire cracked rock
2	309n839e L7c	secondary flake
	309n839e L7c	secondary flake
	310n838e L8	core
3	310n838e L7a	broken flake
	310n838e L7a	broken flake
4	308n838e L7	secondary flake
	310n839e L7a	secondary flake
	309n838e L6	secondary flake
5	310n838e L7a	secondary flake
	310n838e L7a	broken secondary flake
6	310n839e L7a	primary flake
	310n839e L7a	broken secondary flake
7	310n838e L7c	primary flake
	310n838e L7c	broken secondary flake
8	309n839e L6#427	broken secondary flake
	309n839e L6#375	secondary flake
9	309n839e L6	blocky debris
	309n839e L6	blocky debris
10	309n839e L6#428	tertiary flake
	308n839e L5	secondary flake
	309n839e L6#256	secondary flake
	310n839e L7a	secondary flake
	309n839e L6#160	tertiary flake
	309n839e L6#192	broken flake
	309n839e L6#224	broken flake
	309n839e L6#205	broken flake
	309n839e L7c	tertiary flake
	309n839e L7d	broken flake

Table 5.4 (continued)

Refit Number	Provenience* 1x1m unit	Description of items
11	309n839e L6#412	broken flake
	309n839e L6#169	biface thinning flake
	309n839e L7b	broken flake
	309n839e L6	broken flake
	309n839e L7c	broken flake
	309n839e L6#258	broken flake
	309n839e L7c	biface thinning flake
	309n839e L6	broken flake
	309n839e L6#357	broken flake
	309n839e L6#121	biface thinning flake
	309n839e L6	broken flake
	310n838e L6	broken flake
	309n839e L6#355	biface thinning flake
	309n839e L6#184	biface thinning flake
	309n839e L6#225	broken flake
	309n839e L6	biface thinning flake
12	309n839e L6#264	tertiary flake
	309n839e L6#434	tertiary flake
13	309n838e L6#76	secondary flake
	310n838e L7a	tertiary flake
	309n838e L8a	tertiary flake
14	309n838e L6#273	primary flake
	309n838e L6#110	flaked cobble
15	310n839e L6	blocky debris
	310n839e L7d	blocky debris
	310n839e L7d	blocky debris
	310n839e L7d	blocky debris
	310n839e L7d	blocky debris
	310n839e L7d	blocky debris
	310n839e L7d	blocky debris
	310n839e L7d	blocky debris
16	309n839e L6	blocky debris
	309n839e L6	blocky debris

Table 5.4 (continued)

Refit Number	Provenience* 1x1m unit	Description of items
17	310n839e L7d	fire cracked rock
	310n839e L7d	fire cracked rock
	310n839e L7d	fire cracked rock
	310n839e L7d	fire cracked rock
	310n839e L7d	fire cracked rock
	310n839e L7d	fire cracked rock
	310n839e L7d	fire cracked rock
	310n839e L7d	fire cracked rock
	310n839e L7d	fire cracked rock
18	310n838e L6#309	secondary flake
	310n838e L7a	broken secondary flake
19	309n838e L6#389	tertiary flake
	309n838e L6#420	tertiary flake
20	309n838e L6#440	broken secondary flake
	309n838e L6	secondary
21	310n838e L7a	secondary flake
	310n838e L7a	secondary flake
22	309n838e L6#251	tertiary flake
	310n838e L7a	core
	308n838e L5	secondary flake
23	309n839e L7c	core
	309n839e L7c	broken flake
	309n839e L7c	tertiary flake
	309n839e L7c	secondary flake
	309n839e L7c	blocky debris
24	309n839e L6#466	flake tool, retouched
	309n839e L7b	secondary flake
	309n839e L7a	secondary flake
	309n839e L7a	broken secondary flake
	309n839e L7b	broken secondary flake
	309n839e L7b	broken secondary flake
	309n839e L5	broken secondary flake
	309n839e L5	broken secondary flake
	309n839e L5	broken secondary flake
	309n839e L6	secondary flake
25	309n839e L7a	secondary flake
	309n839e L6#386	secondary flake

Table 5.4 (continued)

Refit Number	Provenience* 1x1 m unit	Description of items
26	309n839e L7b	blocky debris
	309n839e L7b	blocky debris
27	310n839e L8d	secondary flake
	309n839e L6#72	blocky debris
	309n839e L6#328	secondary flake
28	combined with #11	
29	309n839e L6#396	tertiary flake
	309n839e L7a	secondary flake
30	310n838e L7a	tertiary flake
	309n838e L6#369	broken flake
31	309n839e L7c	biface thinning flake
	309n839e L7c	broken flake
32	309n839e L6#189	biface thinning flake
	309n839e L7c	secondary flake
33	308n839e L5	fire cracked rock
	308n839e L5	fire cracked rock
34	309n839e L6#177	broken flake
	309n839e L6	broken flake
	309n839e L7b	tertiary flake
35	309n838e L7	blocky debris
	309n839e L5	blocky debris
36	308n838e L6	blocky debris
	308n838e L5	blocky debris
37	308n839e L6	secondary flake
	308n839e L6	secondary flake
38	309n838e L5	broken secondary flake
	308n839e L6#51	secondary flake
39	310n838e L7a	secondary flake
	310n838e L7a	broken flake
	310n838e L7a	broken flake

Table 5.4 (continued)

Refit Number	Provenience* 1x1m unit	Description of items
40	309n838e L6#150	broken flake
	309n838e L6#199	tertiary flake
	310n838e L6#294	secondary flake
	310n838e L7b	secondary flake
41	309n839e L6#126	tertiary flake
	309n839e L6#178	tertiary flake
42	309n839e L7c	tertiary flake
	309n839e L6#125	tertiary flake
43	309n839e L7c	secondary flake
	309n838e L6	secondary flake
44	309n839e L7c	blocky debris
	309n839e L7c	blocky debris
	309n839e L6	blocky debris
45	309n839e L6#389	biface thinning flake
	309n839e L7d	biface thinning flake
	309n839e L8	secondary flake
46	309n839e L6#165	secondary flake
	309n839e L7a	tertiary flake
47	308n839e L6#122	secondary flake
	308n839e L6#292	secondary flake
	310n839n L8b	broken flake
48	308n839e L6#68	biface thinning flake
	308n839e L6	broken flake
49	310n838e L6	flaked cobble
	310n839e L5	blocky debris
50	combined with #11	
51	309n839e L7b	broken flake
	309n839e L6	broken flake
	309n839e L6#213	broken flake

Table 5.4 (continued)

Refit Number	Provenience* 1x1m unit	Description of items
52	308n838e L5	biface thinning flake
	309n838e L6	broken flake
53	309n839e L6#415	secondary flake
	308n839e L6#137	tertiary flake
54	combined with #23	
55	310n839e L7d	blocky debris
	310n839e L7d	blocky debris
	310n839e L7d	blocky debris
56	310n838e L7b	broken flake
	310n838e L7b	secondary flake
57	combined with #24	
58	309n839e L7c	tertiary flake
	309n839e L6#190	tertiary flake
59	309n839e L9	secondary flake
	309n839e L9	broken secondary flake
60	309n838e L9	secondary flake
	309n838e L9	broken secondary flake
61	310n839e L8b	primary flake
	309n839e L8	broken flake
	309n839e L6#374	secondary flake
62	310n838e L8c	fire cracked rock
	310n838e L8c	fire cracked rock
63	310n839e L8a	blocky debris
	310n839e L8a	blocky debris
64	310n839e L8a	fire cracked rock
	310n839e L8a	fire cracked rock
65	310n838e L9c	secondary flake
	310n838e L9c	secondary flake
66	309n839e L9	blocky debris
	309n839e L9	blocky debris

Table 5.4 (continued)

Refit Number	Provenience* 1x1m unit	Description of items
67	310n839e L8b	secondary flake
	310n839e L8c	secondary flake
68	310n838e L8c	blocky debris
	310n838e L8c	blocky debris
69	310n839e L8d	blocky debris
	310n839e L8d	blocky debris
70	310n839e L4	blocky debris
	310n839e L4	blocky debris
71	309n839e L7b	broken secondary flake
	309n839e L7b	secondary flake
	309n839e L7b	secondary flake
72	310n839e L6	secondary flake
	310n839e L6	broken secondary flake
73	308n838e L5	blocky debris
	308n838e L5	blocky debris
	308n838e L5	blocky debris
74	310n839e L8a	broken flake
	310n839e L8a	secondary flake
75	309n839e L7a	primary flake
	309n839e L7a	secondary flake
76	309n839e L7d	secondary flake
	309n839e L7d	secondary flake
77	combined with #24	
78	309n838e L7	secondary flake
	309n838e L7	secondary flake
79	310n838e L7a	blocky debris
	310n838e L7a	blocky debris
80	309n838e L7	secondary flake
	309n838e L7	secondary flake
81	308n839e L6	broken flake
	308n839e L6	biface thinning flake

Table 5.4 (continued)

Refit Number	Provenience* 1x1m unit	Description of items
82	310n839e L7d	blocky debris
	310n839e L7d	blocky debris
83	309n838e L3	blocky debris
	309n838e L3	blocky debris
84	309n839e L7c	secondary flake
	309n839e L7c	secondary flake

*The second part of the provenience entry indicates level and quad or level and specimen number for piece plotted specimens.

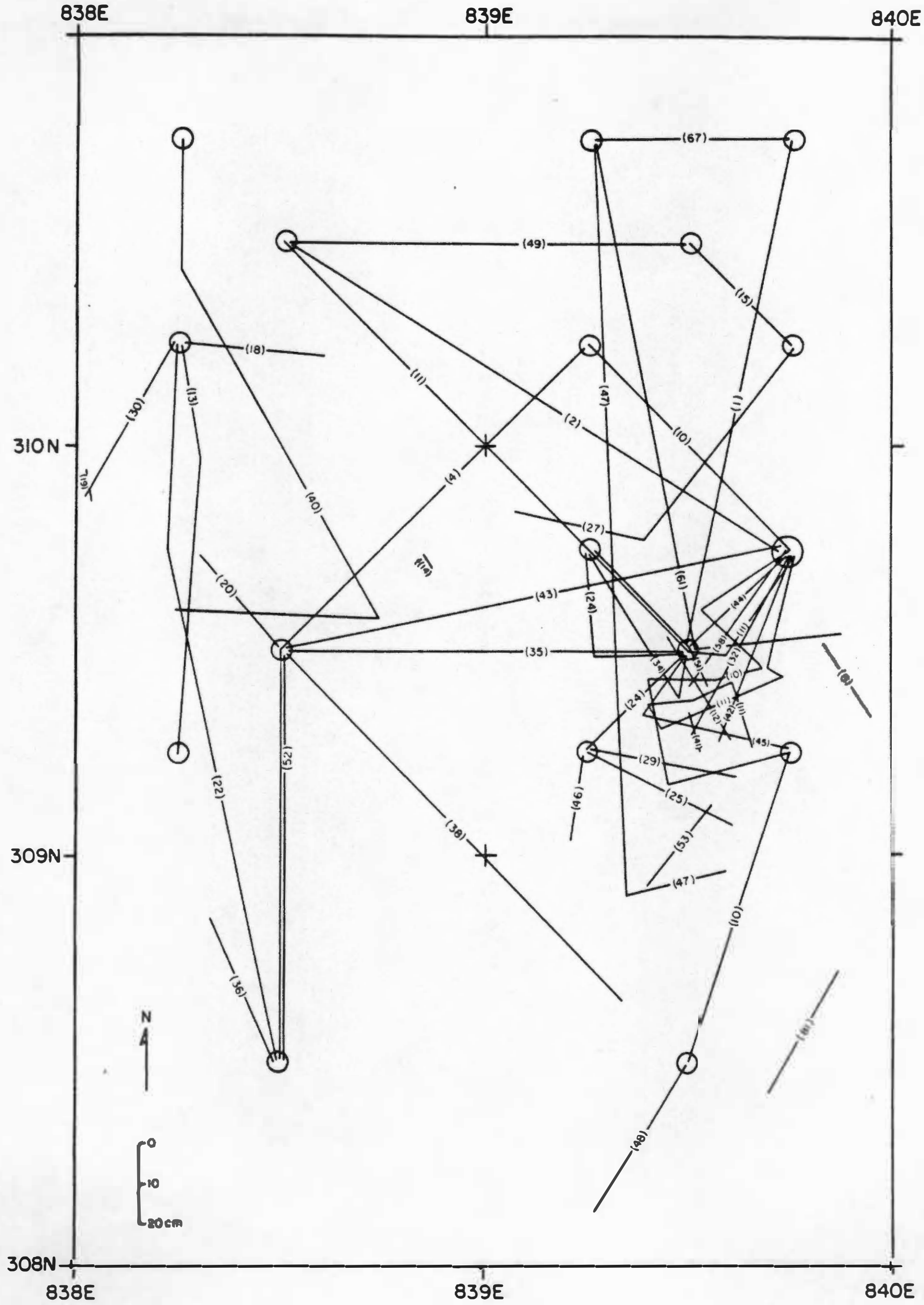


Figure 5.12 Horizontal distribution of Ridley Chert refitted pieces, Area B, 40MU141. Refit numbers (as in Table 5.4) are indicated in parentheses. Refitted pieces from the same provenience unit are not shown.

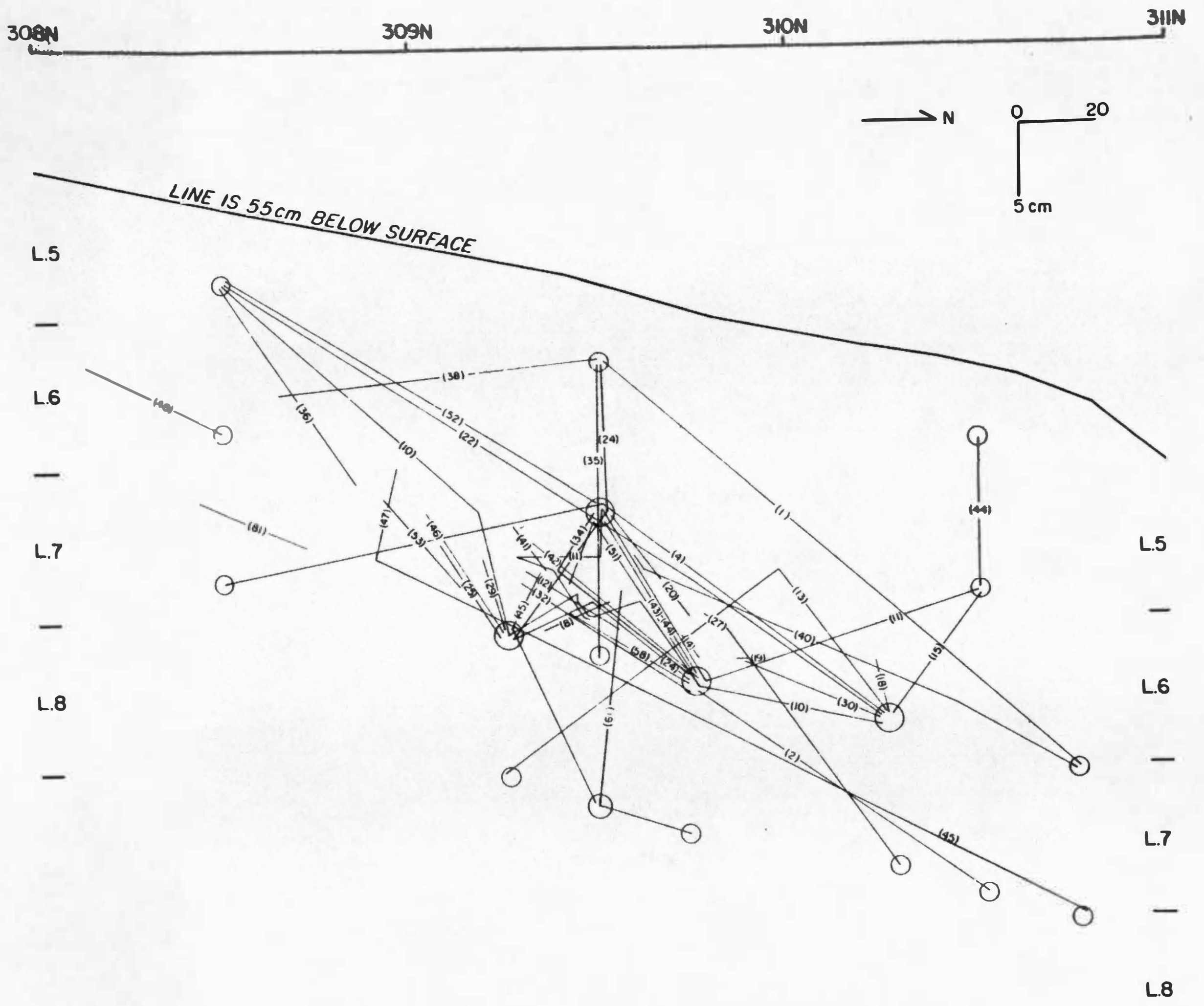


Figure 5.13 Vertical distribution of Ridley Chert refitted pieces, Area B, 40MU141. Refit numbers (Table 5.4) are shown in parentheses. Refits from same provenience unit are not shown.

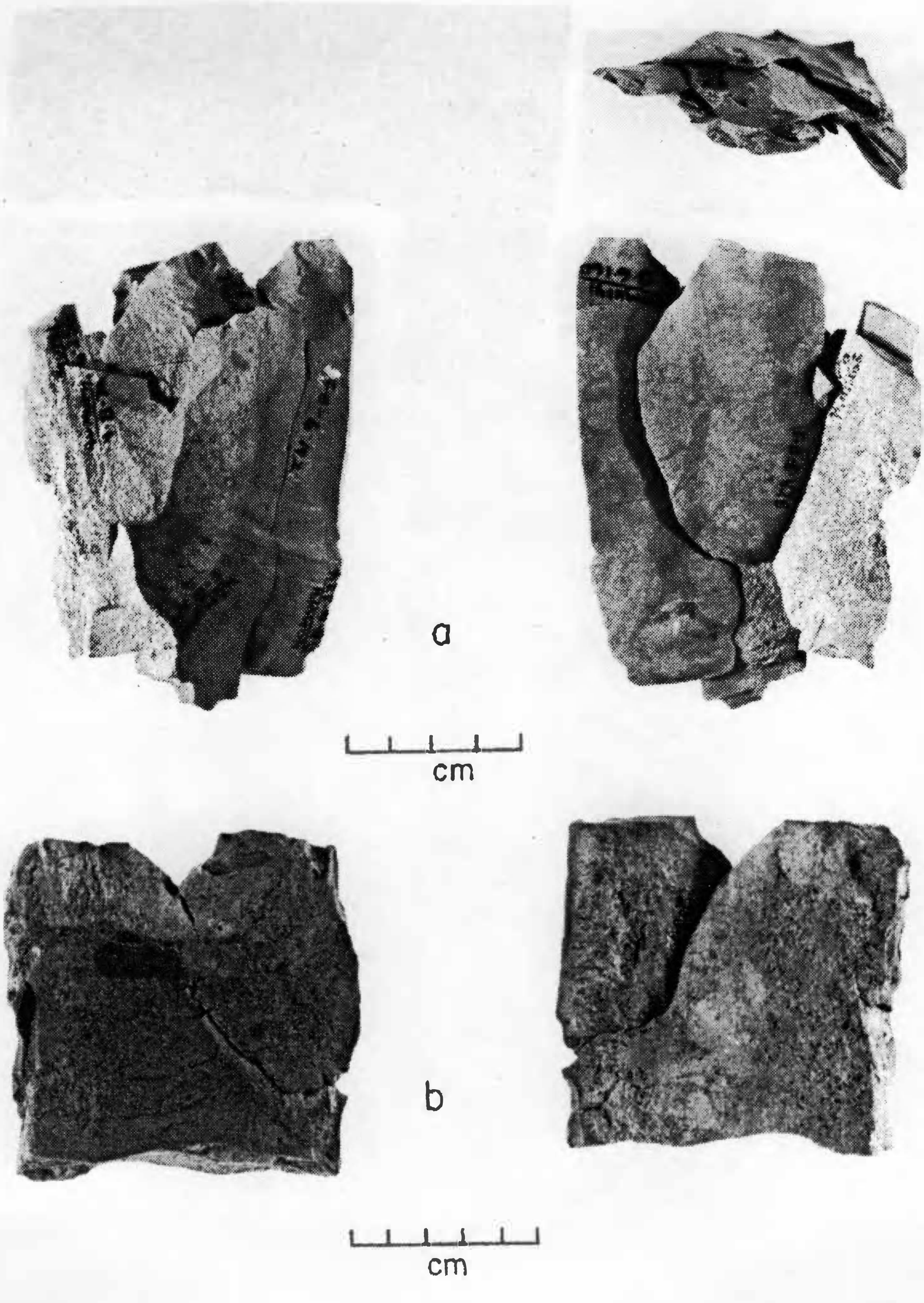


Figure 5.14 Core reduction sequences, Ridley Chert, Area B, 40MU141. a: Reconstructed views of refit number 10, including platform view, representing the production of blade-like flakes from a local Ridley Chert core. b: Secondary decortication flakes, refit number 43, from early stage reduction of a Ridley Chert cobble.

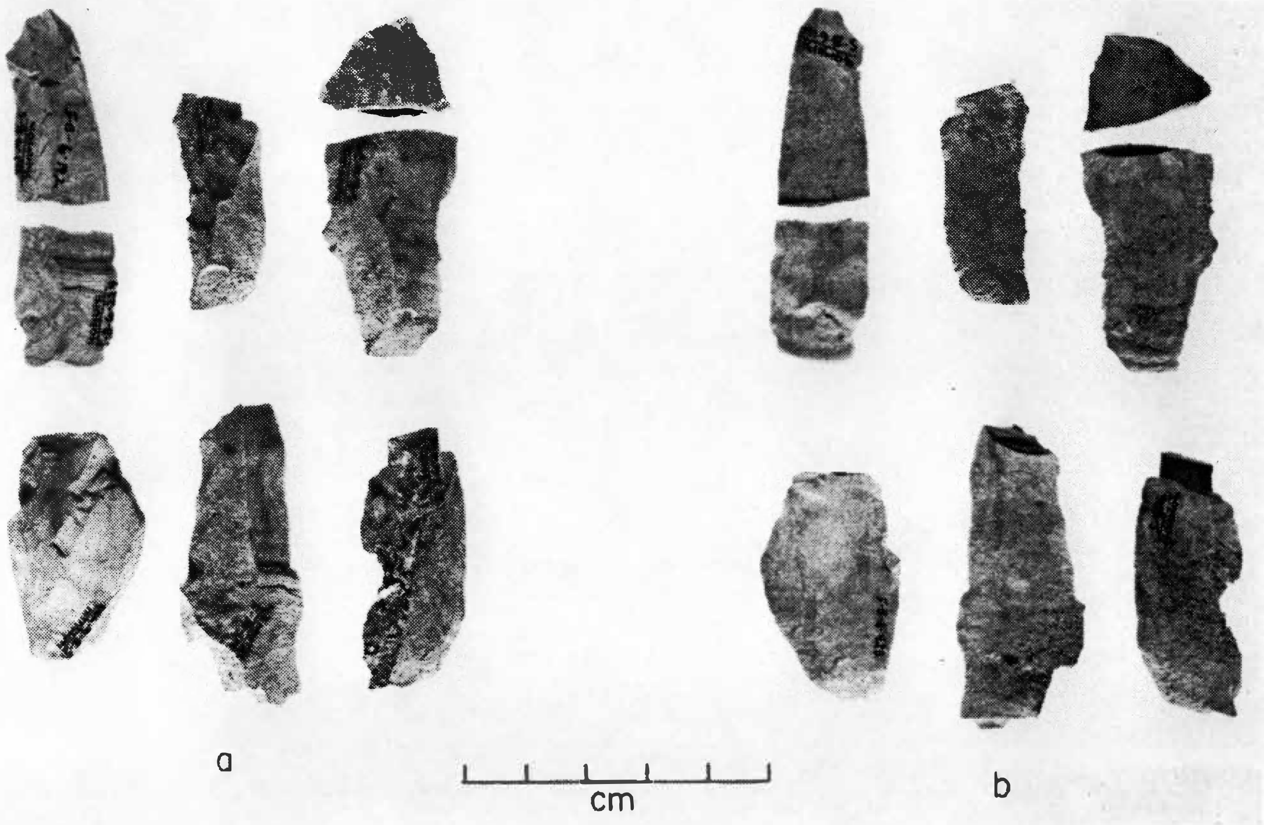


Figure 5.15 Partially exploded dorsal and ventral views of the secondary decortication and tertiary flake core reduction sequence of refit number 10, Ridley Chert, Area B, 40MU141.

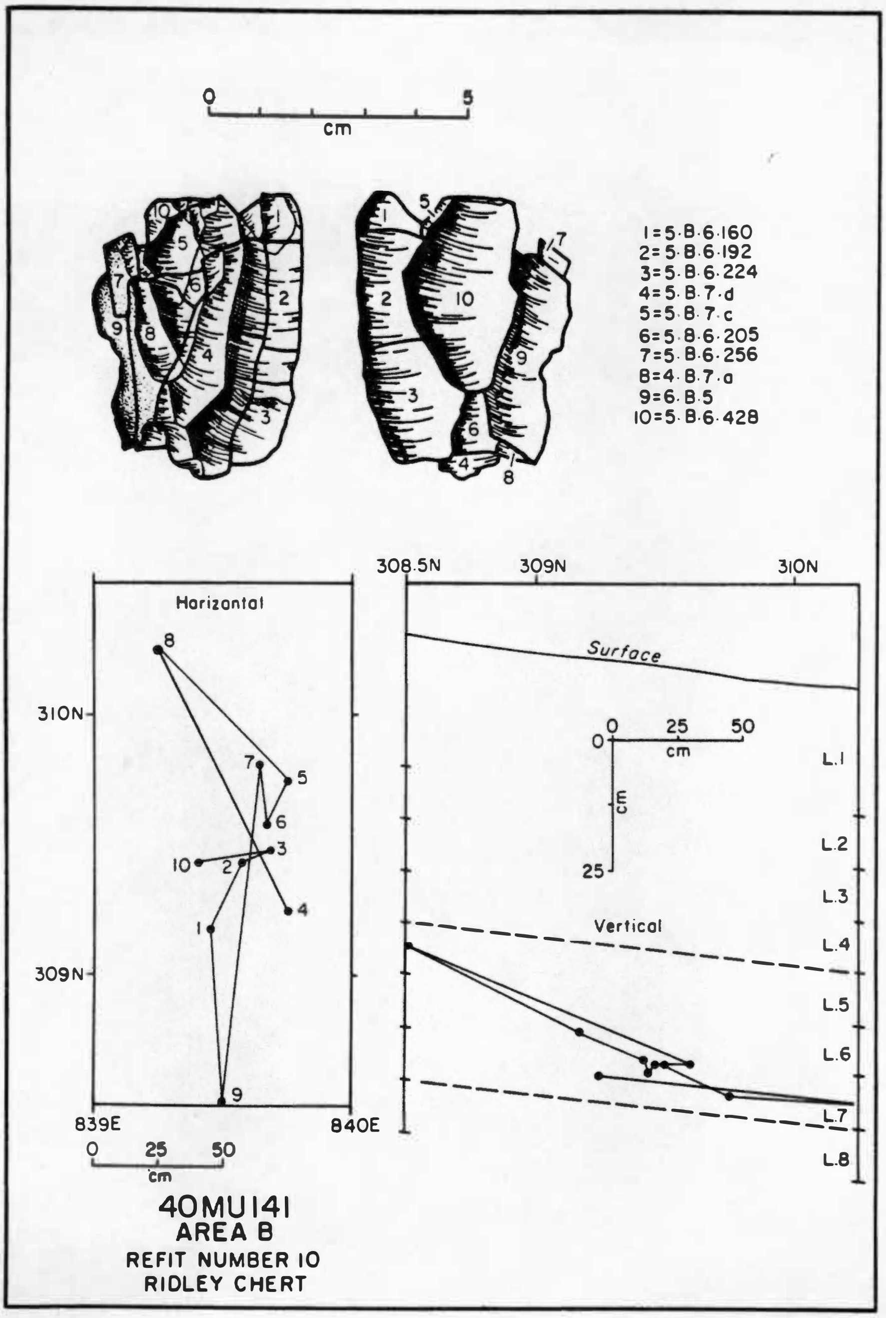


Figure 5.16 Horizontal and vertical distribution of Ridley Chert refit number 10, Area B, 40MU141.

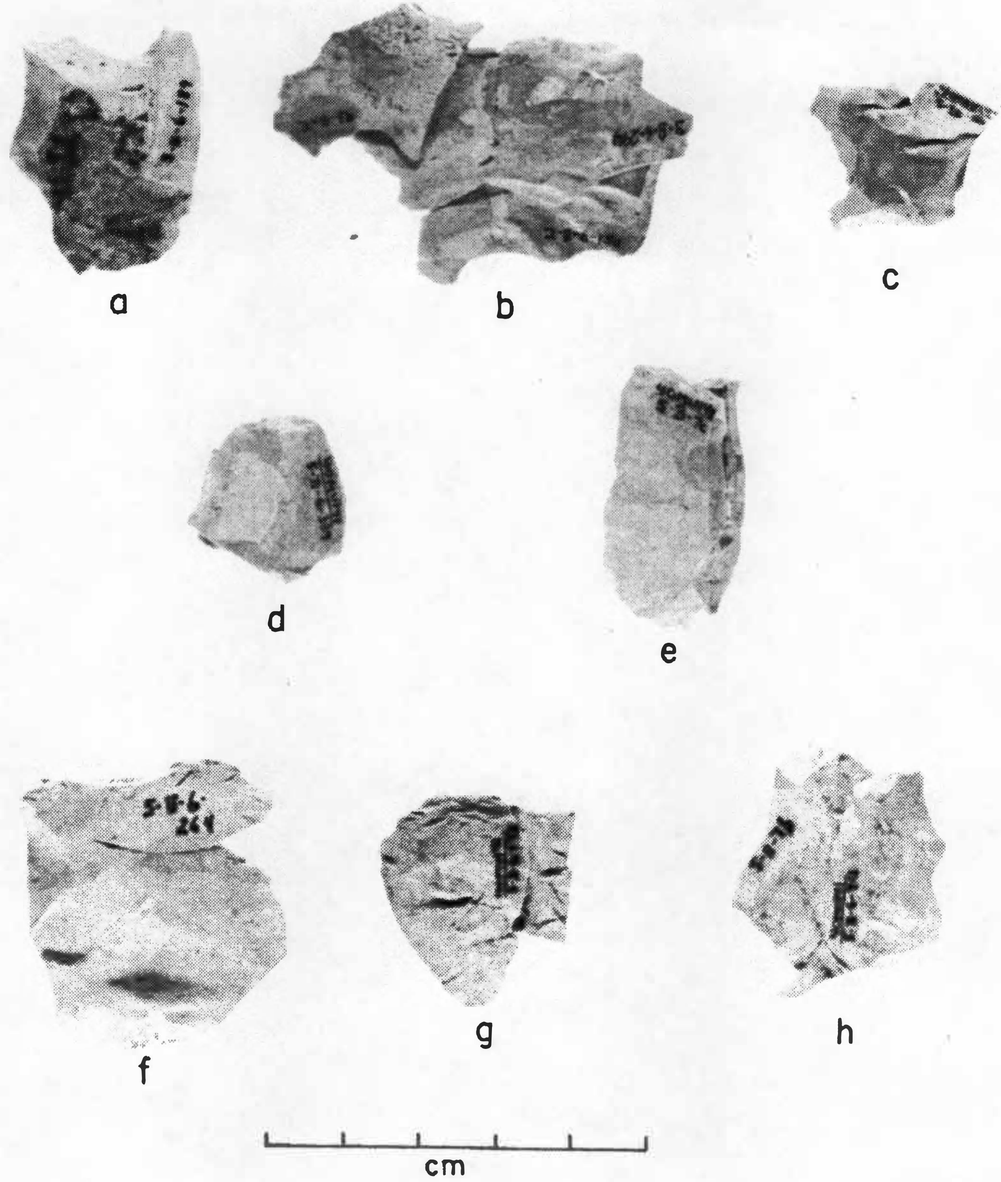


Figure 5.17 Ridley Chert core reduction and biface thinning sequences, Area B, 40MU141. a: secondary decortication flakes, refit number 32 (as in Table 5.4). b: Secondary and tertiary flakes, refit number 40. c: Broken flakes, refit number 11, later refitted to the core-biface reduction sequence in Figure 5.19. d: Secondary decortication and two biface thinning flakes, refit number 45. e: Tertiary flakes, refit number 42. f: Tertiary flakes, refit number 12. g: Tertiary flakes, refit number 41. h: Broken flakes, refit number 28, representing part of reduction sequence shown in Figure 5.19.

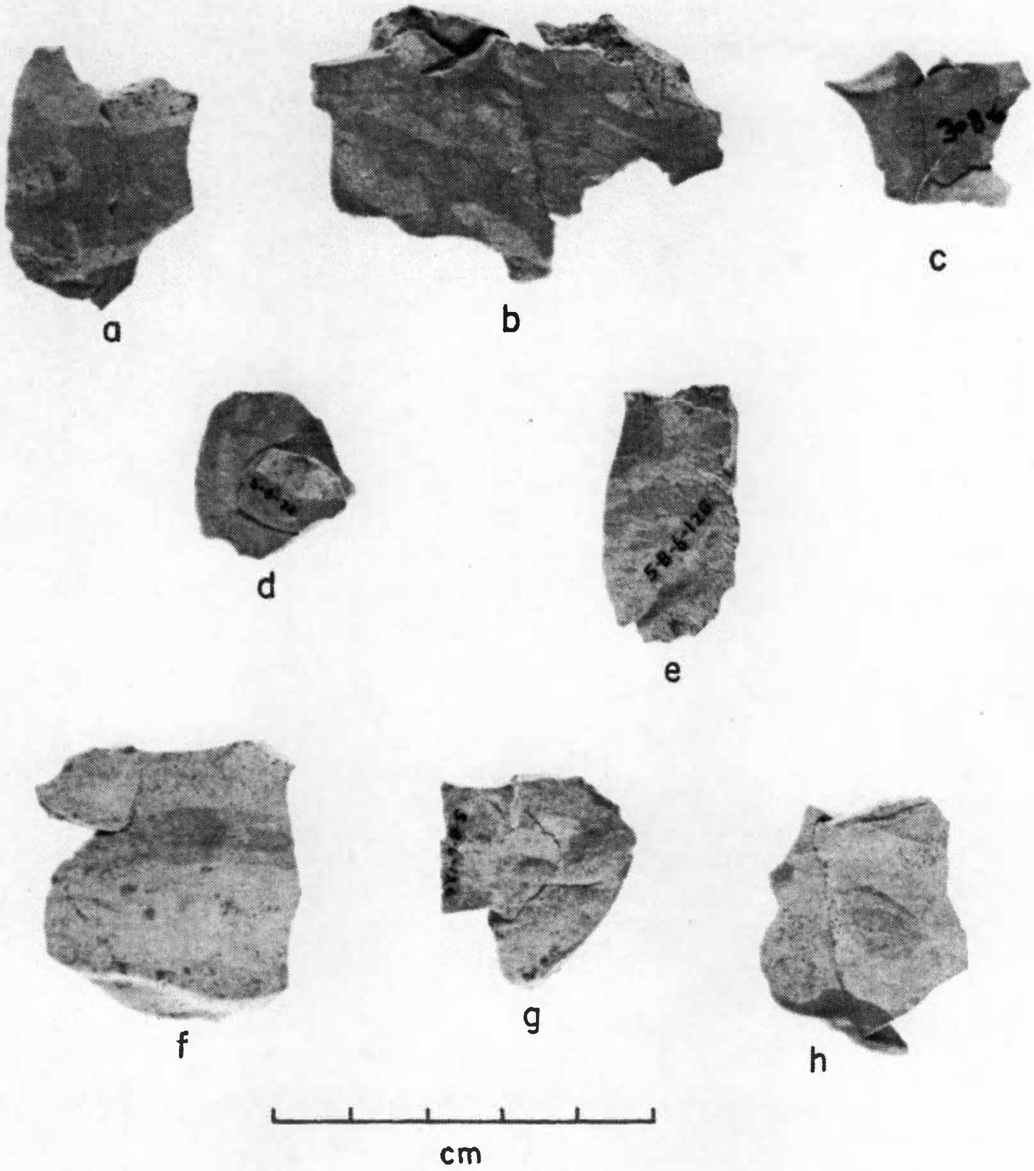


Figure 5.18 Ventral surfaces of Ridley Chert refits illustrated in Figure 5.17.

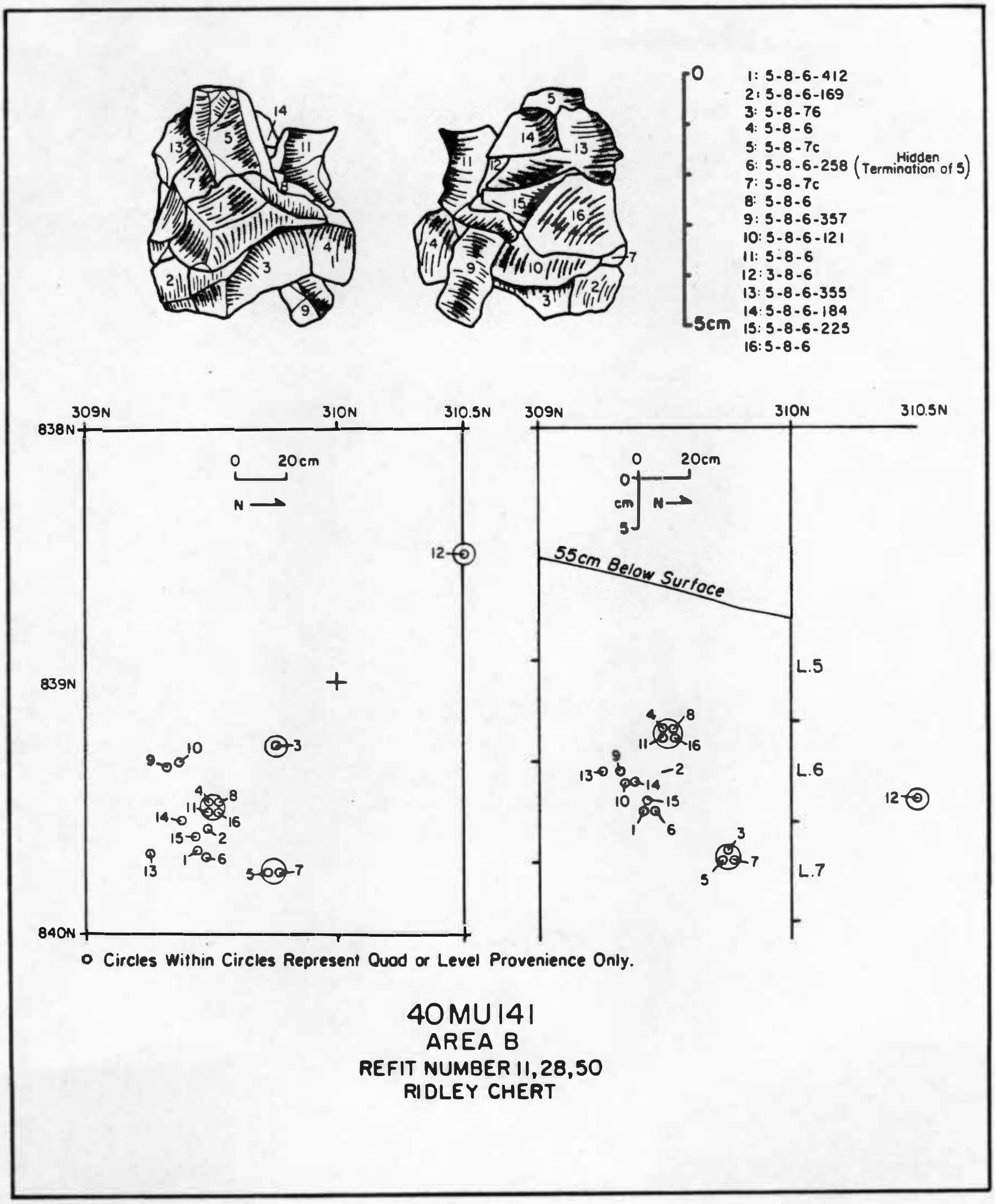


Figure 5.19 Horizontal and vertical distribution and reconstructed views of Ridley Chert refit number 11, 28, and 50, representing the transition from core to biface reduction, Area B, 40MU141.

Table 5.5. Refits of Ridley-Carters-indeterminant and Bigby-Cannon cherts, Area B, 40MU141.

Refit Number	Provenience* 1x1 m unit	Description of items	Lithic Material
1	309n838e L7	biface thinning flake	Ridley-Carters-ind.@
	308n839e L6	biface thinning flake	
	308n839e L5	biface thinning flake	
2	309n838e L5	biface thinning flake	Ridley-Carters-Ind.
	308n839e L6#59	biface thinning flake	
	308n839e L5	biface thinning flake	
	308n839e L5	biface thinning flake	
	308n839e L5	broken flake	
	308n839e L5	broken flake	
	308n839e L5	broken flake	
	308n839e L6#50	broken flake	
3	309n839e L6	tertiary flake	Ridley-Carters-Ind.
	308n839e L6	broken flake	
4	309n839e L7a	broken secondary flake	Ridley-Carters-Ind.
	310n838e L6	tertiary flake	
5	309n838e L8c	tertiary flake	Ridley-Carters-Ind.
	309n838e L8c	broken flake	
6	308n838e L4	biface thinning flake	Ridley-Carters-Ind.
	309n838e L5	biface thinning flake	
7	310n838e L7c	tertiary flake	Bigby-Cannon
	310n838e L7c	broken secondary flake	
8	309n839e L7d	secondary flake	Bigby-Cannon
	310n839e L7d	broken secondary flake	
9	308n838e L6	tertiary flake	Bigby Cannon
	310n838e L8a	broken flake	

*The second part of the provenience entry indicates level and quad or level and specimen number for piece plotted pieces.

@The Ridley-Carters-Indeterminant chert category includes those pieces which could not visually be assigned to either the Ridley or Carters chert type with confidence. For the remainder of the study these pieces are included with Ridley Chert.

chert refits. The horizontal and vertical distributions of these sets are illustrated in Figure 5.20 and mirror very closely the Fort Payne and Ridley chert refits for Area B. Of particular interest, and illustrated as Figure 5.21a and 5.21b are two sets of biface reduction flakes (refits 1 and 2 for indeterminant Carter-Ridley chert). Refit 2 consists of flakes removed from a biface which was about 6 cm wide (Figure 5.21a). The fairly wide, relatively thick platforms and subtle bulbs of force on these flakes suggest that this thinning was done by soft hammer percussion. This example documents the production of preforms at a site, and some specific details about the preform, even though the specimen was not recovered (see also Frison and Stanford 1982; Knudson 1973). Figure 5.21c and 5.21d represent additional examples of core reduction sequences. Figure 5.22 is a schematic summary of all refitted sets from Cave Spring, segregated by excavation area and material type.

Two aspects of the Cave Spring Site refitting study are especially relevant here. First, only a very small portion of the site area, a fraction of one percent, was excavated. Previous studies involving refitting have generally focused on sites where extensive excavation has made a considerably higher proportion of the site materials available for refitting. This will have a direct influence on the percentage of recovered materials which is potentially refittable. Secondly, the sediments at Cave Spring are very fine textured (silty clay) and most previous refitting studies have represented sites with looser, usually sandy, matrices. This, of course, is one of several variables which

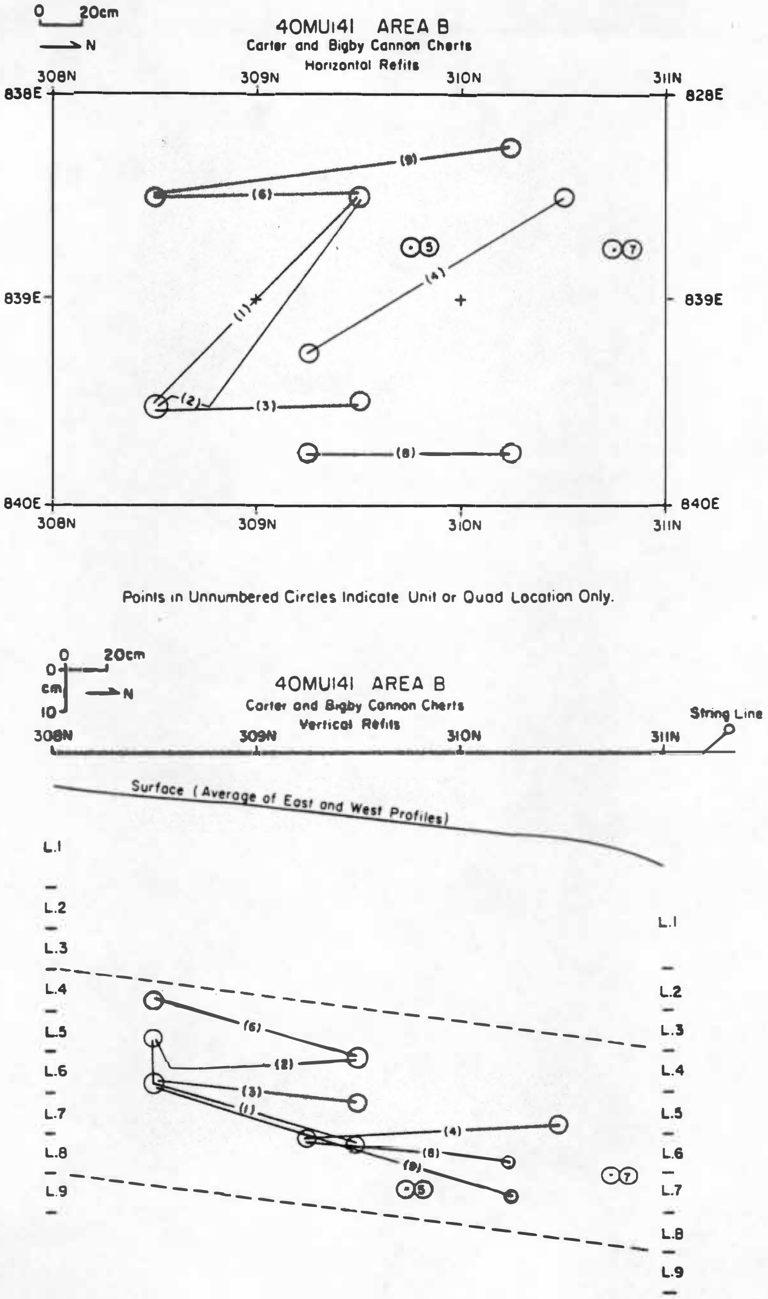


Figure 5.20 Horizontal and vertical distribution of refits of Ridley-Carter-indeterminant and Bigby Cannon cherts, Area B, 40MU141. Refit numbers (Table 5.5) in parentheses indicate separate pieces and numbers in circles are refits with the same provenience.

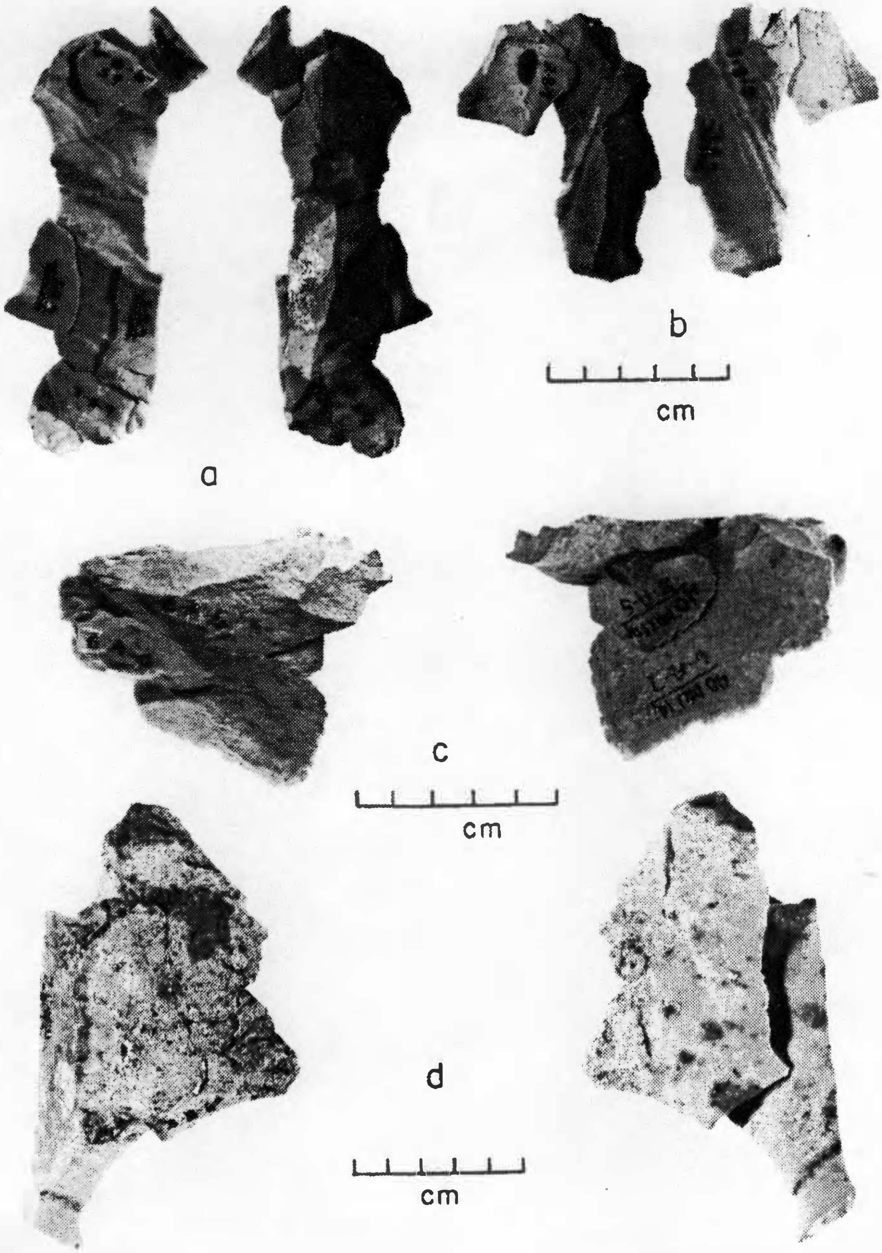


Figure 5.21 Biface and core reduction sequences, areas A and B, 40MU141. a: Refit number 2 of Ridley-Carter-indeterminant chert representing biface thinning flakes removed from a 6 cm wide preform. b: Refit number 1 of Ridley-Carter-indeterminant chert showing a biface reduction sequence. c: Area A refit number 9, Fort Payne Chert, tertiary flake sequence. d: Refit number 4 of Ridley-Carter-indeterminant consisting of a secondary decortication and tertiary flake.

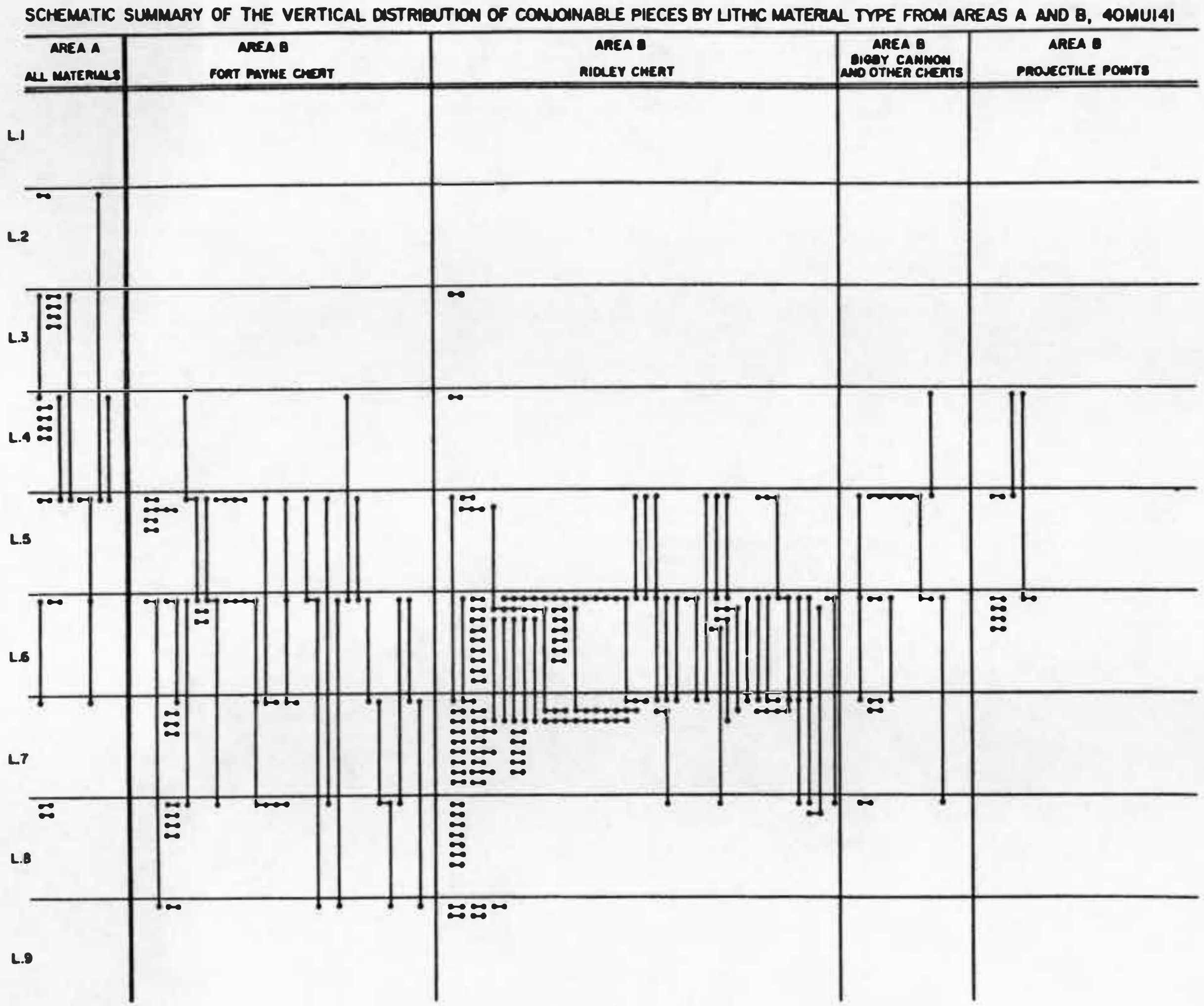


Figure 5.22 Schematic summary of the vertical distribution of conjoined pieces by lithic material type from areas A and B, 40MU141.

should influence the degree of post-depositional movement which can be expected to occur over a given period of time.

In summarizing the refitting work with this collection, two aspects become paramount. These are the obvious occurrence of post-depositional vertical movements, and the relatively high frequency of refits considering the small proportion of the site which was excavated.

Fort Payne chert has a considerable diversity of colors, textures, and inclusions. Therefore, it was generally easier to isolate Fort Payne pieces which were probably derived from the same cobble than it was to isolate such sets of Ridley Chert pieces. Ridley Chert is generally more homogeneous and grades from coarse to fine textured and from light gray to grayish-brown in color. The greater distinctiveness of many Fort Payne cobbles enhanced finding conjoinable pieces from different provenience units, resulting in a higher percentage of multiple level matches. About 55 percent of the Fort Payne refitted sets included pieces representing more than one level, whereas only about 35 percent of the Ridley sets included pieces from more than one level. The Ridley refits confirm that the majority of refits occurred in the units which produced the highest densities of material. Figure 5.22 summarizes the linkages between levels as documented by conjoined pieces. In Area A, the peak density of cultural material and the majority of refits occur in levels 3 through 5. The buried horizon is deeper in Area B where levels 5 through 7 contain the majority of material and refits.

For materials vertically dispersed from one original surface, there should be only one peak density. This is true for both areas A and B at

Cave Spring. Figure 5.22 and the other illustrations of vertical refits indicate that the artifacts recovered vertically dispersed through the T1a soil and surrounding sediment were originally deposited on one primary surface and subsequently moved as a result of various natural processes. Conjoinable pieces provide linkages between levels 4 through 9 in Area B, though the majority of refits, and of the total sample, is from levels 5 through 7. Refit 16 of Fort Payne Chert in Area B, for example, includes pieces from levels 5, 6, and 9, a minimum vertical distance of 40 cm even given the slope of the T1a paleosol in Area B.

The significance of these findings is that <u>no cultural-historical or behavioral importance can be attributed to this vertical distribution of artifacts.</u> Differences in the vertical occurrences of chipped stone pieces in the area of the T1a paleosol are apparently not the result of intermittent past human actions, but must be attributed to post-depositional processes. Therefore, one of the more important findings of the refitting at Cave Spring is that post burial vertical movement of chipped stone pieces in compact silty clay sediments, in settings similar to the Cave Spring site, can be expected to occur on the order of .25 to .5 m over a period of about 7000 years.

Therefore, analyses of artifact aggregates from such contexts should <u>not</u> be conducted with the a priori assumption that materials vertically separated by tens of centimeters or recovered from adjacent stratigraphic units (e.g. T1a paleosol vs. overlying sediments) represent different depositional episodes or behaviorally significant analytical/collection units. Before analyzing "assemblages" in "stratified" situations every effort should be made to determine whether

the collections are truly discrete as this will directly affect the analytical approach and assumptions made. It has also been documented, at Cave Spring and elsewhere, that artifacts and other particles can move through stratigraphic boundaries without destroying the distinctiveness of the units (Bunn et al. 1980; Cahen 1976; Cahen and Moyeryersons 1977; Villa 1982; Courtin and Villa 1982). A large number of vertical artifact movements may occur, perhaps reflected as small krotovinas on cleaned horizontal surfaces, without destroying or necessarily distorting stratigraphic boundaries or lenses viewed in a vertical profile. This has considerable ramifications for the interpretation of stratified sites.

Because of the documented vertical dispersal, refitting enables us to analytically "collapse" the materials from Cave Spring so they represent a single artifact aggregate from one depositional surface. Refitting cannot, however, provide direct evidence that only a single episode of occupation was responsible for the occurrence of materials on this reconstructed surface. Such interpretation requires consideration of other aspects of the recovered materials.

Concerning horizontal displacement, with only one exception, refitted pieces were all within about 2.5 m of each other and most were within one m. This, obviously, is due largely to the constraints of the excavation itself. Pieces of a projectile point, part from Area A and the other from Area B, were refitted over a distance of about 12.5 m. This suggests that if a larger area had been excavated more "long-distance" refits could have been accomplished. Therefore, based on the available information, we cannot assess all aspects of horizontal

refitting at Cave Spring, such as defining specific activity or discard locations.

It is justifiable, however, to argue against the occurrence of significant horizontal size sorting. Several refitted sets include large cores, preforms, or pieces of blocky debris to which one or several very small pieces, found in close proximity, were conjoined. This would not be expected if post depositional disturbance by stream action had been an important factor.

At Cave Spring refitting was used to check the integrity of the deposit. Refitting could be equally beneficial in spatial studies of this or other sites. Spatial studies of group organization and activity areas can be enhanced immeasurably by refitting and defining tool sets and potential relationships between artifact concentrations or loci within components. Technological aspects of reduction sequences, manufacturing processes, use, reconditioning, and discard of various tool types can be monitored. This can be very valuable in typological studies and in the documentation of assemblage variability due to function, curation, logistics, or other reasons.

CHAPTER VI

TYPOLOGY IN THE CONTEXT OF COMPONENT DEFINITION: THE EVA-MORROW MOUNTAIN PROBLEM

> Very commonly . . . named categories are arbitrary segments of a continuum of variation in form. Such categories have considerable descriptive value and may be of use in quantitative work, but the limitations imposed by their nature should not be ignored. (Isaac 1977:104)

Introduction

Given that a single occupational surface can be identified for the mid-Holocene Archaic activities at Cave Spring, still to be evaluated is the number of different cultural groups responsible for the materials. In the Cave Spring artifact sample, projectile point-knives are the only "diagnostic" artifacts with a sizable enough sample to allow evaluation of stylistic variability potentially referable to the "cultural distance" or cultural affinities of the site's occupants.

The problem addressed here is whether the formal variability represented in the projectile point-knife sample resulted from the activities of one or more than one group. Two previously recognized projectile point "types" were recovered from the excavation in roughly equal frequencies--Eva and Morrow Mountain. The problem of how many distinct cultural groups occupied Cave Spring is confronted by a typological analysis aimed at evaluating the potential cultural significance of morphological, functional, and stylistic variability within the projectile point-knife sample. Before proceeding with the typological discussion, consideration is given to the meanings

attributed, in this and following chapters, to selected terms relevant to discussing the number of components. Then the concept of multistage types is developed as a framework for approaching the Cave Spring projectile point-knife sample. The chapter concludes with an analysis of the Cave Spring sample using the multistage type model.

Toward Component Definition

The actual number of occupational episodes at most prehistoric sites cannot be known with certainty. Any number of ephemeral visits to a site may occur which leave no preserved traces in the archaeological record. Furthermore, for those occupational activities for which preservable traces are left, there are a large number of variables which influence the type, quantity, and distribution of materials discarded, lost, or cached at a site. And, of course, many perishable items left at an occupation area will not survive to reach the recovery context. Finally, many factors can act to aggregate collections of artifacts on a surface (Foley 1981).

Before pursuing this evaluation of the number of cultural groups represented by artifacts in the T1a paleosol at Cave Spring, it is appropriate to first consider the meaning here attributed to selected terms. These definitions are as follows.

Occupation or Occupational Episode. As used here, the word occupation refers to a group of people living at a particular place. That is, the essentially uninterrupted use of a locus by one or more individuals from the time of their arrival at the location until their departure (Dunnell 1971:151, 202; Binford 1982:5).

Occupational Surface. A ground surface on which one or any number of separate, discrete or overlapping, occupations have occurred.

Occupational Phase. The total of all occupational episodes of a single cultural group on one surface at one place (Hofman 1975b:84-99). The occupational episodes represented in an occupational phase may be a palimpset and will not necessarily reflect the same kinds of activities or the same social sub-groups (e.g. Binford 1982). The cultural material from an occupational phase will all belong to the same phase in the Willey and Phillips (1958:21-24) system.

Assemblage. Culturally associated feature, debris and artifactual remains representing related occupational episodes or phases. Mixed assemblages are those representing more than one occupational phase at a single site. However, occupational phases at different sites may represent segments of the same cultural assemblage. It is assumed that no assemblage occurs (or is recovered) in complete form at one site, at least when we are considering mobile hunters and gatherers (Clarke 1968; Binford and Binford 1966; Hofman 1982b). Assemblages, therefore, are generally studied in partial form as represented at one or several sites.

Component. Component is used here as a referent to a partial assemblage as represented by a discrete occupational phase or episode (cf. McKern 1939:308). It is possible that several components, either horizontally or vertically separated, and representing the same cultural assemblage, may be represented at a site.

Aggregate. A conglomerate or collection of artifacts or features contained within a single geological deposit which may represent any

number of related or unrelated occupational episodes and phases and which may be redeposited.

These definitions are intended simply to aid in clarifying this discussion of estimating the number of occupations represented at Cave Spring. As a result of the refitting study it has been determined that the artifactual remains were deposited on one primary surface. And, that the materials have not undergone severe horizontal displacement due to river action. This allows two important assumptions. First, it is possible (not necessarily probable) that one assemblage, one occupational phase, or even one episode is represented. And, because there is no evidence of post depositional loss of stone artifacts due to horizontal displacement, we can assume that the stone tools and debris left at the site aboriginally are still there. The site is not a naturally sorted aggregate. The integrity (Binford 1981a:19) of the site is very good, in that the deposition of the materials resulted from past human activity rather than, for example, river flooding.

At least one occupational episode occurred, but it is not possible to determine if horizontally discrete components are represented at the site or if overlapping features or overlapping intensive use (activity) areas are present which would indicate repeated occupations. Some of the variables which influence the quantity and arrangement of cultural materials left on an occupational surface include the following (Binford 1978a, 1978b, 1979, 1980, 1982; Hofman 1982b):

1. number of people
2. nature of group (sex and age composition)
3. length of stay(s)

4. number of occupational episodes
5. kinds of activities conducted
6. variety of activities conducted
7. redundancy of activities
8. redundancy in areas used
9. individual and group idiosyncracies
10. season(s) of occupation
11. preservation
12. curation
13. disturbance factors, including reuse of old materials
14. type(s) of technology represented
15. confinement of activities, e.g. in structures or around fires in cold weather.

We are not now able to adequately contend with all these factors. However, there remains a great deal which can be learned. Excavation in different areas of the site and on a larger scale would assist in evaluating some of these factors, such as redundancy and activity diversity. But, even given the limited data base we can attempt some general interpretations. It is not feasible to expect to be able to determine the precise number of occupational episodes represented at Cave Spring given our present information. So, I will attempt an appraisal of the potential number of occupational <u>phases</u> represented. This, by evaluating the technology and typology of the recovered artifacts and determing if the materials could belong to a single past cultural group or lineage, or if more than one distinct aboriginal group

was likely responsible.. The typological analysis in this chapter is directed toward this problem.

Toward Multistage Types in Lithic Artifact Analysis

It is argued that the general approach to typological studies used in modern archaeology is not wholly appropriate for realistic investigation of Archiac chipped stone bifacial implements. Nor are the generally static type concepts usually employed by American archaeologists entirely suited to a systems analysis of chipped stone artifact variability. A brief synopsis of traditional archaeological types is presented here, in part to emphasize the need for a more realistic framework for approaching analyses of Archaic bifacial tool samples. The concept of multistage types as formalized below is intended to provide a more appropriate analytical construct for pursuit of behavioral information, at least in the present situation.

For purposes of exemplifying an underlying problem with most currently used typologies, it is useful to contrast chipped stone artifact typological analyses with ceramic typological studies. The primary reason chipped stone typology must be approached differently than ceramic typology is not simply because the manufacture of the first is subtractive and the latter an additive process (Deetz 1967). Rather, it is the extreme potential difference in use and recycling trajectories which ultimately sets lithic artifacts apart. When ceramic vessels are produced they retain their original form, decoration, and functional limitations until they are broken, discarded, cached or buried. A water bottle made at a domestic site will not be used as a salt pan at an

extractive site. Nor will the stylistic information on a ceramic vessel change significantly in clarity or form after its original manufacture. These same aspects of form, style, and function are, however, not nearly so stable or predictable for chipped stone artifacts. A cobble which was originally used as a core at an extractive site may become a preform at a domestic site, a projectile point at a hunting camp and kill site, a knife at a processing site and a burin or scraper at another domestic site. All along this use-trajectory will be left traces (debris and use-wear) from the induced formal variation and reduction incurred during an artifact's experiences in these re-tooling processes. Spanning a potentially wide range of functional-formal variations, such tools will nevertheless reflect the activities of the same group during one period of archaeological time.

Such variations and modifications also occur within single categories because of raw material availability, breakage, and resharpening which are also influenced by a variety of contingencies. From this perspective it becomes obvious that the definition of useful cultural-historical types for chipped stone artifacts can be considerably complicated by the inherent "instability of form" which chipped stone tools commonly experienced during their uselife. It is this problem which raises the need for the multistage type concept, and it is lack of recognition or acknowledgement of this problem which distracts greatly from otherwise highly useful papers such as Read's (1982) analysis of Cody complex projectile point-knives.

Archaeological materials are static entities outside their original dynamic cultural context (Binford 1977b, 1978a; Schiffer 1972). Simply

because we are able to define clusters among archaeological entities, such as chipped stone artifacts, does not mean that the same clusters were static and discrete functioning parts of the cultural-behavioral context from which they were derived. It can be demonstrated that a chipped stone technology is a reduction system which approximates a continuum in the cultural context (Figure 6.1; Collins 1975). During the reduction of any given artifact, however, there are generally stages (e.g. transport, storage, use, or breakage) when the continuum is broken and the artifact assumes a static morphological state. There is the possibility of breakage or discard after each flake removal in the production of, for example, a biface artifact. Likewise, breakage, discard, or loss may occur at many points during artifact use and maintenance.

Archaeologically, however, we see "clusters" of forms partially because breakage and discard tend to occur during limited segments of the overall lithic reduction system (Crabtree 1966; Frison and Bradley 1980; Greiser 1977; Hofman 1978a; Roper 1979). Also, a total lithic system usually cannot be expected to occur in, or be recovered from, a single archaeological component (Clarke 1968; Jelinek 1976). The cultural assemblage as defined by Clarke (1968), which contains products of the lithic reduction system, is only sampled and thus we should find "clustering" to be more apparent to the archaeologist because the total range of variability will rarely be available to study (Jelinek 1976:20-21). The rarer intermediate forms are those most likely to be missing in the archaeological sample. By considering only partial assemblages which are composed of the broken pieces and

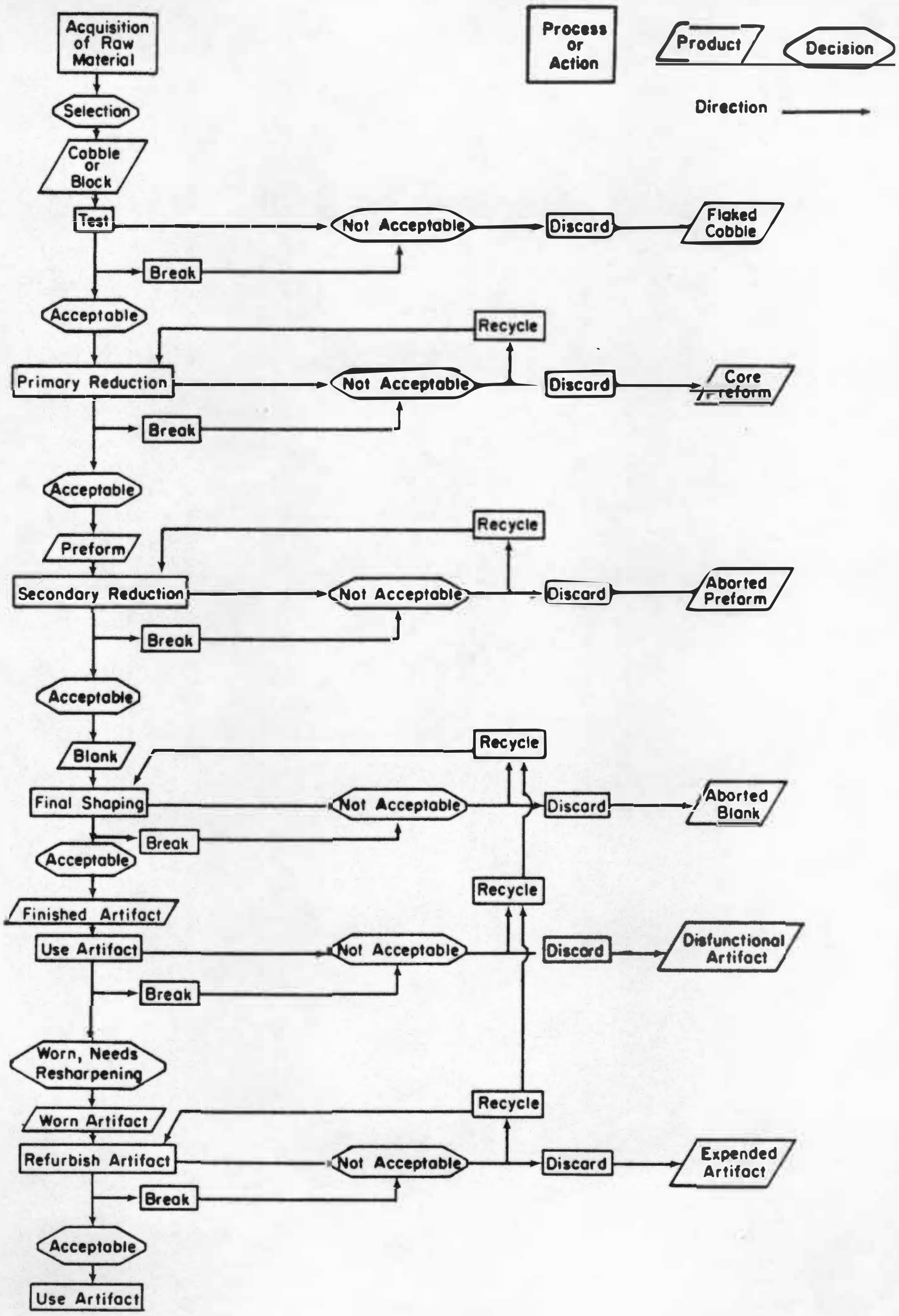


Figure 6.1 Schematic flow diagram of the "continuum of variation" experienced by some chipped stone artifacts between the acquisition of raw material and entry into the archaeological record.

expended-discarded artifacts, we may define clusters in chipped stone tool samples which are at best poor reflections of the continuum of forms that were part of the original dynamic cultural system. Much of the archaeological record, with respect to chipped stone artifacts, is composed of worn out or otherwise disfunctional specimens. The categorizing or typing of these items will not in itself provide information pertaining to the total range of forms which were once present. Such typing and pigeon-holing can be misleading unless the overall reduction system is also taken into account.

Our ability to analytically define clusters, discrete groupings, or "types" for lithic artifacts from the archaeological record far surpasses our ability to accurately attribute meaning to such patterning. In part, this problem is the result of applying a typological approach appropriate for ceramics to the study of lithic artifacts. Archaeologists generally <u>expect</u> to find discrete clusters and are not typically concerned with the intermediate forms or linkages between specimens representing the same (formally and functionally variable) reduction trajectory.

Because classification should be formulated with regard to specific problem orientations (Brew 1946, 1971; Hill and Evans 1972; Rouse 1960; Thomas 1979), there are potentially as many typologies as there are problems to be addressed using a given set of entities. Attributes used in defining types, like the types themselves, are commonly not completely independent. For example, many of the same attributes used when classifying artifacts for chronological ordering may be useful for stylistic comparisons between contemporary assemblages (Calabrese 1972,

1973; Kay 1975, 1980). It should be emphasized that archaeological types are abstractions and that it is these abstractions or a series of attributes, rather than specimens, which archaeologists generally analyze (Dunnell 1971:158; Thomas 1974:6-7). Unfortunately, such analytical types have generally been treated as static, hard and fast, behaviorally "real" groupings.

Multistage types are only one of many kinds of types used by archaeologists. The primary distinguishing characteristic of multistage types is that the variations in form and function of specimens within multistage types more closely approximate the range of variability expected in the cultural setting than do traditional static types. Some selected traditionally used archaeological types can be summarized for purposes of contrasting them to multistage types as follows.

Morphological or Descriptive Types. Non-problem oriented descriptive documentation of material classes is generally considered descriptive typology (Read 1982; Steward 1954; Thomas 1974, 1979), and is documented in a vast array of archaeological reports (e.g. Bell 1971; Haury 1950:329, Titterington 1938). Descriptive documentation in some instances may eventually aid more precise identification or interpretation of problematical morphological types (Hofman 1978c, 1980).

Temporal Types. Also designated as historical index types (Steward 1954), temporal types have been of primary concern in the development of regional chronologies, cultural-historical integrative studies, and in the definition of horizon markers (Ford 1954; Krieger 1944:108-111; Phillips 1970:23; Willey and Phillips 1958:31-33).

Stylistic Types. Stylistic types emphasize the spatial variation which occurs between artifact samples while the temporal variable is held relatively constant. Or, they may emphasize variation between assemblages of different ages, representing one or more traditions, when their temporal relationships have been established (e.g. Close 1978; Flannery 1976:254; Jelinek 1976; Sackett 1973, 1977). Stylistic types can be documented to have cultural specificity without implying that they also reflect emic classifications (Binford 1972:196; Thomas 1974:12-13; Watson, LeBlanc and Redman 1971:131-132). Stylistic types attributable to relatively short segments of archaeological time (phases, horizons) reflect what Wiessner (1983) has characterized as emblemic style. Archaeologists have been concerned with emblemic style in studies of group boundaries and intergroup relationships (e.g. Binford 1963; Kay 1975), and it is defined (Wiessner 1983:257) as ". . . formal variation in material culture that has a distinct referent and transmits a clear message to a defined target population . . . about conscious affiliation or identity . . . ." Emblemic style serves to help denote ingroup-outgroup distinctions. Wiessner (1983:269) provides an example of the function of projectile point style among hunters and gatherers.

> Thus for the San, the emblemic style carries a clear message to members of a linguistic group as to whether arrows come from their own group or a foreign one. In the former case it signals that the maker also holds similar values. In the latter case, the stylistic difference may either signal another set of values and practices, if the two groups are known to each other, or if not, that the maker is foreign and his behavior unpredictable.

Hunters might encounter projectile points lost by other groups while hunting or as a result of transport by wounded, escaped prey animals. Interaction among hunters from different groups who accidentally encounter one another away from their respective camps is more likely to be cooperative (at least at first) if they possess similar emblems or "flags" such as the same point style and associated technological complex. In this perspective, style also serves a function (Sackett 1977). Obviously, stylistic types are of particular concern here given the problem of defining the number of cultural groups responsible for the projectile point-knives from Cave Spring.

Functional Types. "Functional types are those based on cultural use or role rather than on outward form or chronological position" (Steward 1954:55). Even though some earlier studies had been specifically functional in orientation (e.g. Semenov 1964), study of artifact function did not become a critical concern of many archaeologists until the middle 1960s (Keeley 1980:1). Largely as a result of a paper by Binford and Binford (1966), interest in functional interpretations of lithic artifact assemblages increased considerably. Although the 1966 study was not based on an explicitly functional typology (Mellars 1970; Binford 1973), the Binfords' study demonstrated the potential significance and relevance of a functional approach to archaeological interpretation. Studies have shown that form alone is insufficient for defining artifact function (Ahler 1971; Keeley 1980; Semenov 1964, 1970). Information important in ascribing function to artifacts includes context, form, material, attributes of use or attrition, and associations (Hofman 1980:137-138).

<u>Technological Types.</u> An example of technological classification is seen in the various aspects of Levallois industries of the Old World in which artifacts of variable form and function are distinctive primarily by their method of manufacture (Bordes 1967). Specific technologies or production methods can result in "stylistically" distinctive assemblages, but the degree to which the style of artifacts derived from different technologies will differ varies considerably. Artifacts traditionally included in the same stylistic or functional types have occasionally been shown to include more than one technological type (Green 1975; Hofman 1977, 1978b; Judge 1970). The interrelated nature of different kinds of types is again evident. Technological classification of some archaeological materials is often appropriate in situations where stylistic or functional classifications do not pertain. For example, much lithic waste from manufacture and maintenance of chipped stone artifacts does not serve a function and typically reflects style only indirectly or secondarily. Crabtree (1972), White (1963), and Wyckoff (1973) have presented technological typologies of lithic waste.

<u>Multistage Types.</u> The overlapping, non-discrete nature of different kinds of types mentioned above results largely from the fact that such partitioning of specimens into types is an archaeological endeavor which artificially compartmentalizes lithic reduction and lithic tool-use systems. The concept of multistage types is intended to partially confront this problem by considering morphology, function, technology, and, indirectly, style to simply reflect "expected"

variation in the reduction and uselife sequences of specific artifact groups.

Multistage types are commonly multifunctional and may exhibit a considerable range of morphological variation. Multistage refers to artifact groups which may progress through several different functions and forms during their useful life within a single cultural system. Although chipped stone artifacts have not been previously defined in terms of multistage types, such types have occasionally been recognized by archaeologists. Sollberger's (1971) treatment of Late Prehistoric bifacial knives from the Southern Plains and their technological/functional variation is one example. The functional and formal variation documented for Dalton points (Goodyear 1974; Morse 1971), Knudson's (1973) study of Plainview points, Peterson's (1978) study of Agate Basin points, and Wheat's (1976) analysis of Cody complex points are others. The morphological and functional variation of multistage types represent the static states of tools which played dynamic and sometimes multiple roles in their cultural context. Unlike the type cluster (Faulkner and McCollough 1973:142; Klippel and Maddox 1977:105; Luchterhand 1970; Winters 1967), they are not just similar types used by potentially related groups. Multistage types represent relatively limited segments of the overall lithic reduction systems of specific groups.

Multistage types include artifacts historically equal in archaeological time, elements of the same cultural assemblage, but which may exhibit different shapes and functional attributes (cf. Bacon 1977). Multistage types only become discrete and clear-cut when viewed on a

larger scale than the other types discussed here. They must be considered in terms of a cultural group's overall activities and assemblage. It will often be impossible to adequately define multistage types without first defining, within specific limited time and space frameworks, morphological, stylistic, functional, and other more fundamental types. Multistage types will often not be definable based on evidence from single components. This type grouping is in no way a replacement for functional, stylistic, or other such types. Rather, it represents a different analytical level--one aimed more directly at the overall operation of cultural systems.

Figure 6.2 illustrates schematically the procession of functional applications to which projectile points of one multistage type may be applied. In step with distinct uses, some of the points will incur significant modifications due to breakage and resharpening which will result in morphological variability.

As an example of the multistage type in a cultural context, we can consider a hypothetical biface reduction situation. Given a known range of anticipated activities, a prehistoric hunter makes a series of three triangular biface blanks to add to his tool kit. He envisions eventually using one or all of these specimens as a knife, projectile point, drill, or saw. The first biface is notched and hafted to a dart shaft. It is used during a hunt and for initial butchering of a deer and is broken, retipped, dulled, and resharpened several times. The second biface is notched and used as a knife hafted to a short handle, perhaps a dart forshaft. It is dulled and resharpened several times and eventually broken. The largest fragment of this broken knife is

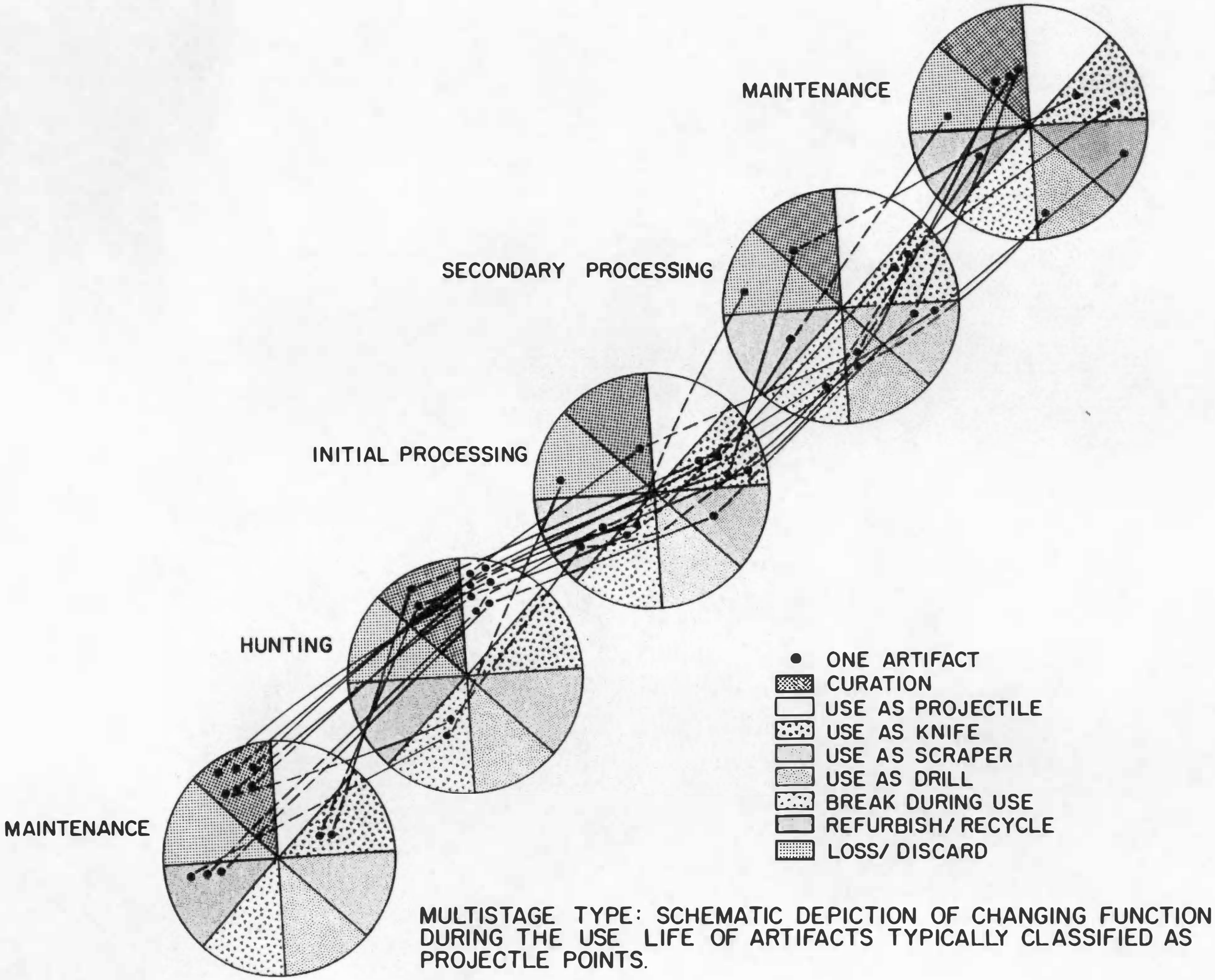


Figure 6.2 Schematic depiction of changing functions of a projectile point-knife multistage type during a trajectory of use in the cultural system.

retipped in such a way as to form a drill with a wide base and is refitted to a haft. Because of bad weather, the hunter remains in camp for two days and manufactures bone and antler tools. The making of these tools requires a saw so he serrates the hafted dart point's edges and uses it to saw grooves in the bone and antler so they can be snapped into tool blanks of proper size. This process further reduces the dart point-knife-saw's blade edges. While drilling out a socketed antler handle he also breaks the hafted drilled, which was originally a knife. But, because his drilling is not finished, he further reduces the dart point/saw to make a second drill. This leaves him with the third biface in original form and depending on his upcoming needs it can be easily notched and hafted as a dart point or knife, used for sawing or made into another drill. This hypothetical scenerio is intended simply to emphasize the highly situational and diverse nature of Archaic biface tool use and the nature of multistage types.

Obviously, the complexity of many multistage types may never be completely known. If the interpretation and understanding of the operation of dynamic past cultural systems and not just descriptions and static interpretations of small segments of those systems is a goal, then multistage types are highly useful constructs. Information on segments of the continuum of variation within specific multistage types may often be available primarily in the form of debitage from shaping and retooling artifacts or in the form of broken or expended, discarded specimens. Multistage types are polythetic sets of attributes such that, as a general rule, no single attribute is both necessary and sufficient for membership to the type. All types represent analytically

derived clusters which are not totally discrete one from the other but which collectively can be envisioned as overlapping sets imposed upon a given collection of entities (Clarke 1968).

The above comments on selected types used by archaeologists should serve to point out the indiscrete nature of these classifications. Stylistic types can potentially be attributed to functional aspects and vice versa (Sackett 1977). Morphological types may overlap considerably with temporal or functional types (Ahler 1971; Binford 1973:234-235; Thomas 1979), or they may be relatively discrete. Stylistic variability may be the result of technological as well as cultural differences (Green 1975; Judge 1970) and functional attributes may also correspond to technological or temporal ones.

The Eva Biface Reduction System

Interest in the typology of Middle Archaic projectile points in Middle Tennessee developed as a result of finding what have traditionally been considered two distinct projectile point types in the buried stratum at Cave Spring. Projectile points directly comparable to Eva and Morrow Mountain types, such as those reported from the Eva site (Lewis and Lewis 1961) and the Normandy Reservoir area (Faulkner and McCollough 1973), were found together and in place at Cave Spring. Lewis and Lewis (1961) and others interpreted these two point forms to have different chronological and cultural significance at the Eva Site (located 112 km west of Cave Spring). This interpretation is questioned here because at Cave Spring these two morphological types were found in the same stratum and were not vertically or horizontally separated

(Figure 6.3). An alternative to Lewis and Lewis' interpretation is offered. The alternative hypothesis is that the basally notched Eva and short stemmed Morrow Mountain points are actually components of a single lithic reduction system and products of a single cultural group's activities at Cave Spring. This reinterpretation of the Eva-Morrow Mountain problem in western Tennessee and development of the Eva biface reduction scheme proposed here is based on consideration of the Cave Spring sample and other Eva specimens from the proposed Columbia Reservoir area, reexamination of the Eva site sample (N=205), examination of the Anderson site (40WM9) sample (N=609), through the courtesy of Ken Steverson and Bruce Lindstrom, and interpretation of published information on Eva samples from the region.

Figure 6.4 illustrates a reconstruction of that portion of the Eva lithic reduction system represented by "completed" bifacial artifacts. The triangular bifaces at the left or "beginning" portion of this diagram are themselves the product of several stages of reduction and decision making on the part of the prehistoric knappers (e.g. Callahan 1979; Muto 1971). The variety of forms represented in Figure 6.4 is based on actual materials from the Eva site components (Lewis and Lewis 1961).

Basic conclusions to be drawn from this reconstruction of the Eva system are as follows:

1. Any given biface has the potential to assume a variety of different forms during its uselife.

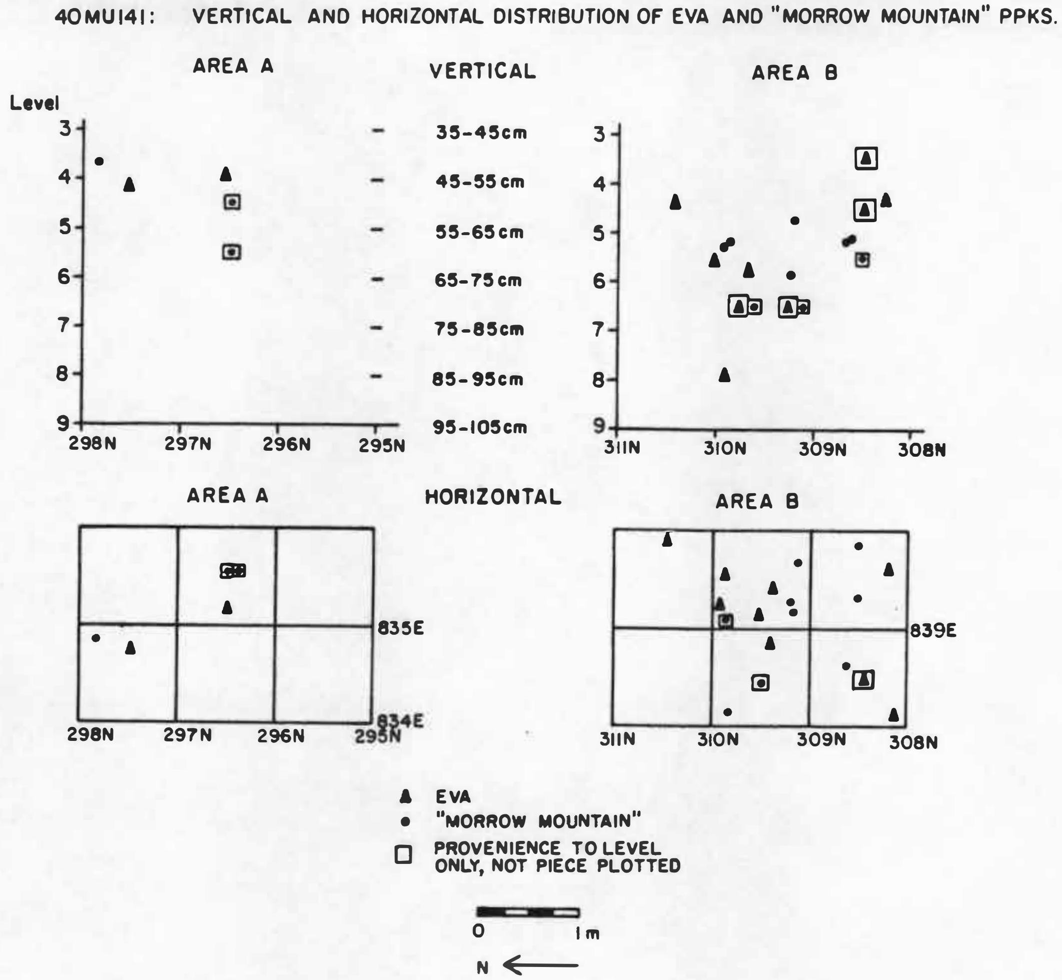


Figure 6.3 Horizontal and vertical distribution of Eva and "Morrow Mountain" projectile point-knives, areas A and B, 40MU141.

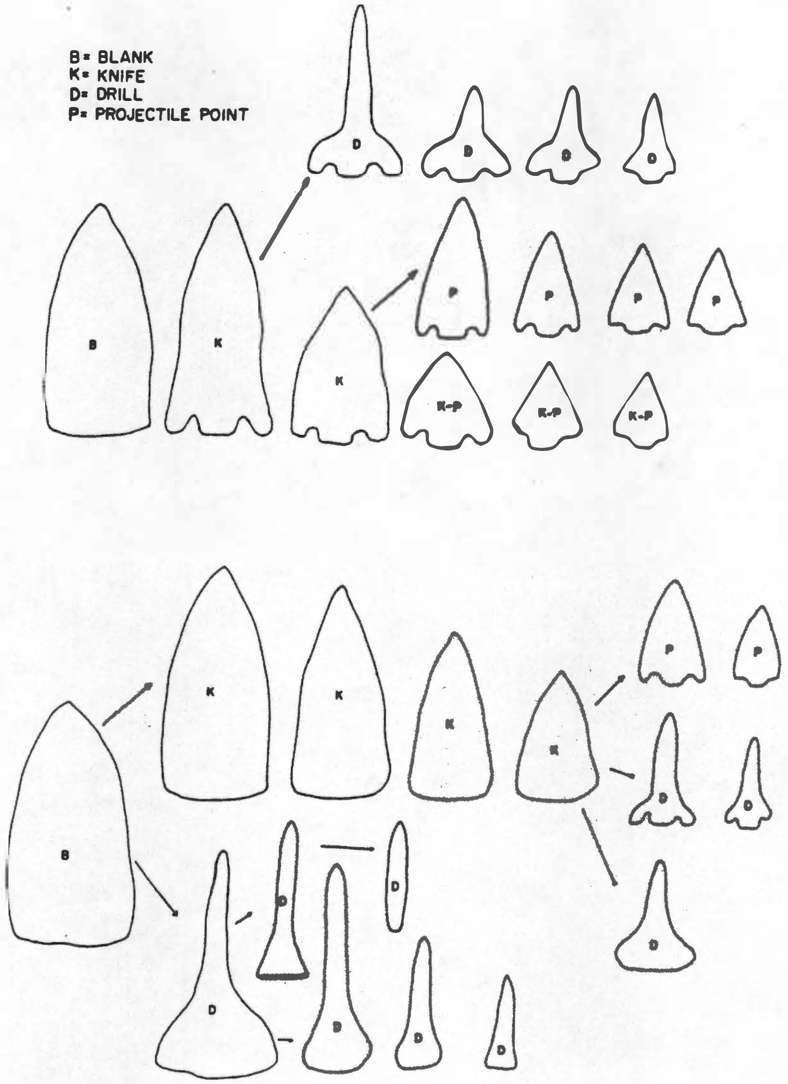


Figure 6.4 Hypothetical reconstruction of the Eva biface reduction system, based on specimens from the Eva site.

2. The majority of bifaces will be periodically reduced and actually will assume several different forms during their period of use in the systematic context.

3. Any given biface has the potential to assume a variety of different functions during its uselife.

4. The majority of bifaces may in fact function in more than one kind of activity during their period of use in the systemic context.

5. Bifaces of different forms may be functionally isomorphic.

6. Bifaces of different forms may represent the same sociocultural or archaeological unit.

7. Bifaces of the same form may be functionally discrete.

8. The bifaces in this system represent a near continuum of variation and a tremendous range in form when viewed vis a vis the cultural context.

9. When archaeological samples which contain limited parts of this biface reduction system are studied as petrified

entities, discrete clusters or types can usually be defined.

10. Interpreting the significance of particular type groupings of chipped stone artifacts should be done, if possible, following a basic and explicit statement outlining the lithic reduction system of which they are a part.

We can impose a series of types upon the Eva biface system shown in Figure 6.4. Figure 6.5 represents a functional typology of the bifaces. Figure 6.6 illustrates a morphological or descriptive typology of the bifaces which is essentially like the one discussed by Lewis and Lewis (1961). The kind of problems which are often encountered in applying a specific typology to a collection of chipped stone tools without some perspective of the overall reduction system can be illustrated by the Eva example.

In their analysis of the Eva site materials, Lewis and Lewis initially sorted the bifaces into intuitive, monothetic, morphological groupings. They then compared the diagnostic "types" to those reported from other sites and evaluated their results against stratigraphic information. Finally, they proposed a series of phases which are still commonly used taxonomic units.

Comparative analysis revealed no precedent for the group of basally notched points which they had segregated. This large group was therefore named the Eva type and has become widely known as a Middle

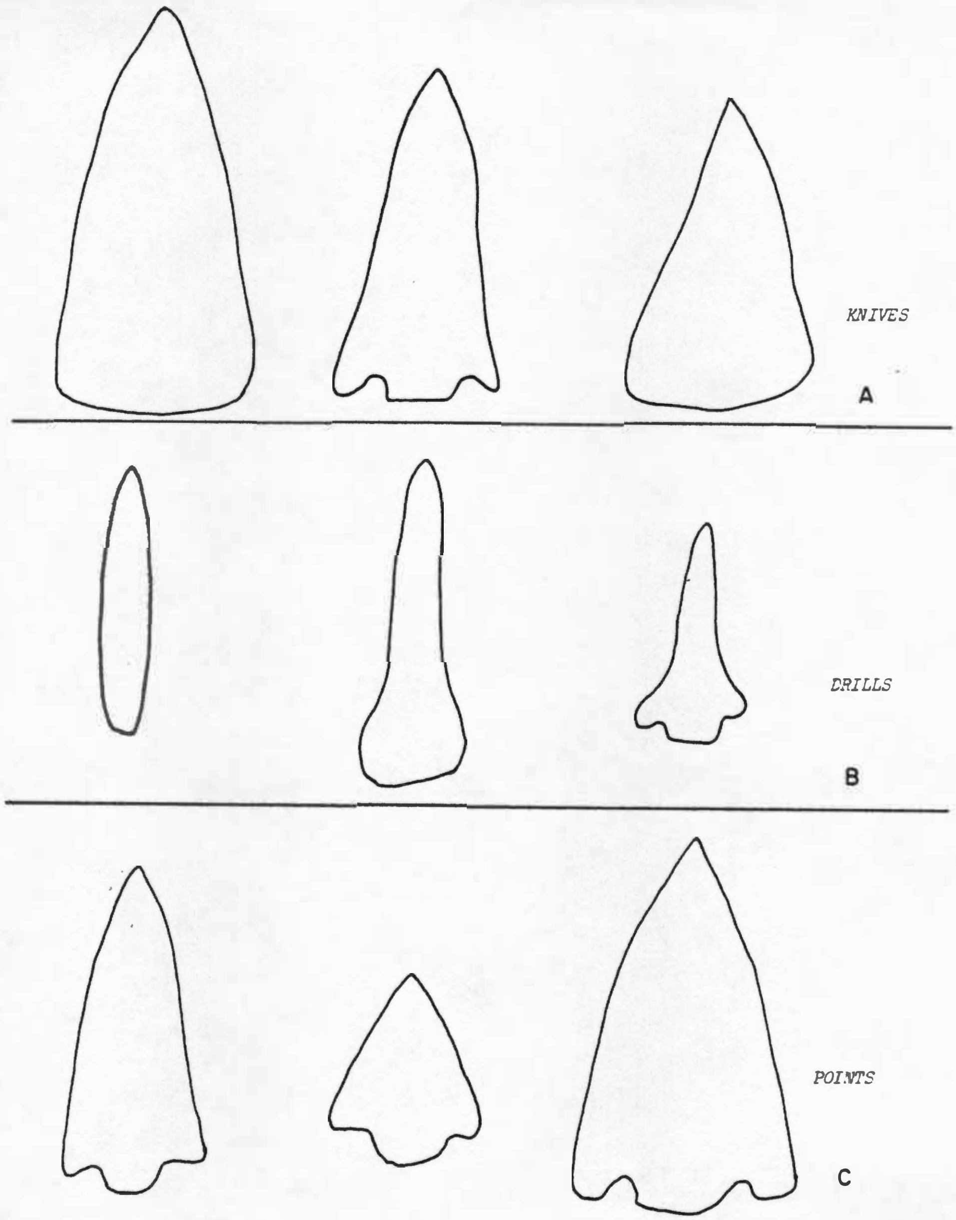


Figure 6.5 A functional typology of Eva bifaces.

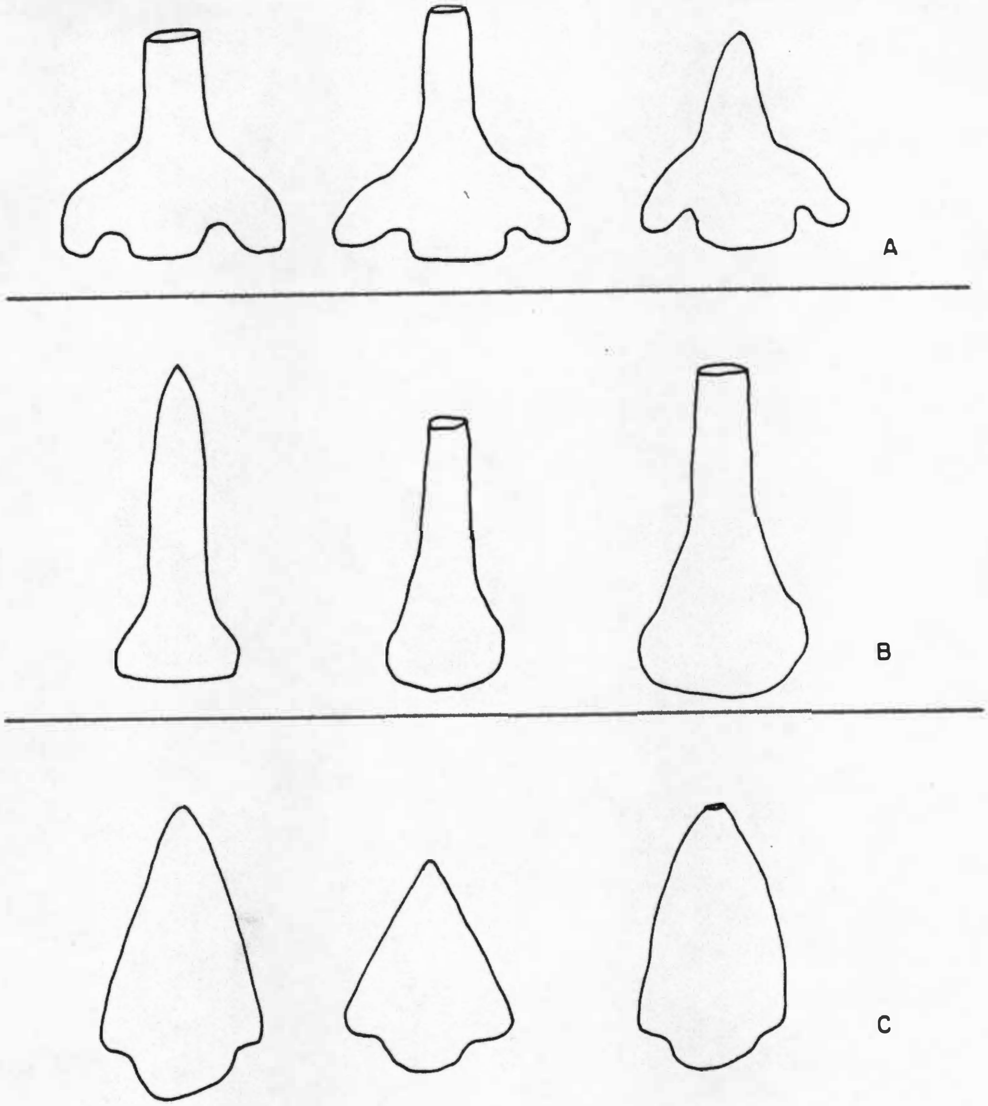


Figure 6.6 A morphological typology of Eva bifaces (after Lewis and Lewis 1961).

Archaic diagnostic (Bell 1958; Cambron and Hulse 1964; Faulkner and McCollough 1973; Kneberg 1956). A second common form found at Eva was unnotched short stemmed specimens which Lewis and Lewis attributed, because of general outline, to the Morrow Mountain type previously defined by Coe (1960, 1964) based on specimens from the Doerschuk site in North Carolina 800 km east of Eva.

The question posed is, do these morphologically similar points from Eva and Doerschuk reflect cultural relationships between the people who occupied these distant sites, or are these point forms simply coincidental static states in two distinct biface reduction systems? The impression received from reading the Eva report (Lewis and Lewis 1961:37) is that the "Morrow Mountain" points from the Eva Site are more closely related, culturally and historically, to the Morrow Mountain specimens from North Carolina than they are to the Eva points found at the Eva Site. The ramifications of this interpretation on Middle Archaic research in the Middle South has been pronounced.

Based on the Lewis' interpretation, subsequent researchers have expected to find Eva and Morrow Mountain points as parts of discrete or stratigraphically separated assemblages in the region. Repeatedly, however, this has not been the case. Even differentiation of the two point types has frequently proven difficult and their co-occurrence in archaeological deposits in the Middle South has usually been attributed to mixing (Brookes 1979; DeJarnette, Kurkjack and Cambron 1962; Faulkner and McCollough 1973:153-154; Long and Joselyn 1965; Walthall 1980). Now, however, an alternative hypothesis, the Eva biface reduction model as generalized in Figure 6.4, includes these two point forms as elements

of a single more encompassing system of lithic reduction. This is not to imply that the Morrow Mountain type in the North Carolina and eastern Tennessee region is not a valid type. Rather, simply because of morphological similarities, the type name may have become over-extended geographically. This alternative interpretation is as plausible as that of Lewis and Lewis and can be evaluated against the archaeological evidence. In the southern Appalachian, region Morrow Mountain assemblages have repeatedly been documented that completely lack Eva projectile points (e.g. Broyles 1971; Chapman 1977, 1979; Coe 1964). In fact, Eva projectile point-knives are apparently very rare in southern Appalachia and the upper Tennessee River Basin. The Appalachian Morrow Mountain points are, therefore, believed to represent a biface reduction system which lacks the basally notched Eva form.

It is apparent that the Eva-Morrow Mountain problem, and other problems like it (e.g. Green 1975), are of considerable consequence to archaeological analyses and interpretations. In the present case, two dramatically different interpretations are possible for the same collection. One, is that the points represent two distinct cultural groups and the Morrow Mountain group has cultural ties extending hundreds of miles to the east with groups using similar point forms. The second, is that both point forms (and all intermediate forms) simply represent different stages in a generalized biface reduction system which is represented variously, and in partial form, at many Middle Archaic sites in the Middle South region. In this second interpretation, both forms can be in the biface repertoire of a single group and no long distance cultural relationships are implied.

In presenting this second interpretation, due consideration must be given to the evidence for stratigraphic separation of Eva and Morrow Mountain points at the Eva Site. Eva was a stratified but heavily pertubated midden deposit about two meters deep. Numerous burials, pits, caches, and other features were present which, along with natural factors such as roots and rodents, would have contributed to the vertical dispersal of materials. Although mixing of assemblages was not considered a problem by Lewis and Lewis (1961), it undoubtedly occurred to some unknown extent. The neglect of disturbance factors is only one of several problems in their analysis of the Eva materials. In defining their phases, chronological and contextual control was completely inadequate which led to the repeated inclusion of numerous types within the same phase which are now known to be chronologically distinct (e.g. Ledbetter, Benton, and Sykes in the Big Sandy Phase; Morrow Mountain and Big Sandy in the Three Mile Phase; and Eva, Kirk, and Cypress Creek in the Eva Phase). The use of "phase" by Lewis and Lewis simply designated a temporal and cultural unit much larger than appropriate (Willey and Phillips 1958).

Furthermore, all "components" at Eva were treated as if they were functionally identical occupations. Winters (1969:132-133, Table 74) has argued, based on the kinds of artifacts recovered from the different strata at Eva, that not all components reflect the same type of activity.

> Only one stratum of the Eva Phase (V) has the characteristics of a hunting camp, with its sparse representation or total lack of general utility tools, fabricating and processing implements, domestic equipment, ceremonial items, ornaments, etc. All of the other strata have a rich and <u>varied</u>

> assortment of these functional categories, with the exception of two: domestic and recreational equipment. (Winters 1969:132-133, emphasis added).

Stratum IV, the "Eva component proper" (Lewis and Lewis 1961:13), is also distinct in several ways from the other components and this difference is here believed to have direct bearing on the projectile points represented. When Winters (1969) compared the Eva "components" he treated all the bifaces as "knives" under his general category "general utility tools." Klippel (1971a:79) has pointed out that many of the items Winters referred to as knives, and those categorized as "bifaces" by Lewis and Lewis, are very likely preforms for particular projectile point types (Sollberger 1970). The position assumed here is that most of the triangular bifaces recovered from Eva (Lewis and Lewis 1961:47) are indeed preforms. This is not to imply that they never functioned as tools (e.g. Judge 1973:88). As noted by Lewis and Lewis, nearly all the triangular biface "preforms" were broken. This likely represents manufacture failures. It is probably more than coincidence that Stratum IV at Eva, which produced numerous larger Eva points and most of the large triangular preforms, also had the highest frequency of antler tine flakers. Manufacture of Eva points from bifacial preforms using antler flakers was surely an important activity during the Stratum IV occupations.

The smaller Eva II and "Morrow Mountain" points at Eva were most common in Stratum II where few antler flakers and few triangular preforms were found. Also, characteristics given for the Eva II "type" when compared with the larger Eva I, suggest reworking of broken points or refurbishing of dulled specimens (Lewis and Lewis 1961:40). Evidence

such as ". . . considerably more retouching of all edges. . .," ". . . barbs. . . more sharply pointed" (indicating lateral reduction of lower blade and barb edges), and the ". . . stem . . . often shorter than the barbs. . ." (perhaps from rebasing broken points), all point to the possibility of reworked projectiles. During Stratum II occupations at Eva, old points were apparently being curated and reconditioned rather than manufactured, as was the case in Stratum IV times. Thus, we should expect to observe considerable variation between these point samples, even within the same point type.

Lithic tool production, use, maintenance, recycling, and discard in the systemic context approximate a continuum of forms. In archaeological studies we recover limited samples of chipped stone artifacts from particular components which in themselves only contain a portion of a cultural group's chipped stone assemblage. By analyzing samples of partial chipped stone assemblages archaeologists often define clusters of forms which, while "real" in and of themselves, have relatively little chronological or cultural significance. These clusters are often of limited value in approaching problems of culture history or process.

The Eva-Morrow Mountain Problem at Cave Spring: Toward a Solution of Alternative Hypotheses

In this initial attempt to evaluate the hypothesis that Eva and Morrow Mountain points from Cave Spring actually represent segments of one biface reduction system, one multistage type, a series of interrelated variables is considered. Evidence for retipping, rebasing, lateral resharpening, barb loss, and notch variability is investigated.

In general, with due consideration of the limited sample from a single site, there should be evidence for a continuum of variability within the selected attributes rather than wholly discrete clusters which could reflect two culturally/functionally distinct types. An argument for extensive variability within a sample of points used by one cultural group can be enhanced if we can first demonstrate that variability in selected key attributes commonly occurred during artifact use and maintenance. The outline or general morphology of Archaic points cannot be given exclusive or preemptive status in classification if we accept that key attributes such as blade shape, base outline, and notch form can vary to extreme degrees during the useful life of each specimen.

Retipping. Resharpening the distal end of projectile points was a common maintenance solution when point tips were broken (Bradley 1974; Friston, Wilson, and Wilson 1976; Peterson 1978; Wheat 1976). One attribute which is often affected by retipping a point is the tip angle, the angle formed by the distal juncture of a point's blade edges (the tip angle measurement and other measurements taken on the Cave Spring sample are shown in Figure 6.7). The actual effect retipping has on the tip angle, however, is related to several variables, including the original point length, the amount broken off, the artifact's use (e.g. as dart tip or knife), and the context of breakage (e.g. during a hunt, while butchering, during manufacture).

Evidence of retipping may occur as a distinct change in the contour of lateral blade edges, sometimes marked by an abrupt change in the angle of the blade edges near the tip (e.g. Figure 6.8a; Lewis and Lewis 1961: Plate 10a, b, c; Plate 11a, b, c). Also, a distinct change in

40MU141
Projectile Point – Knife Measurements

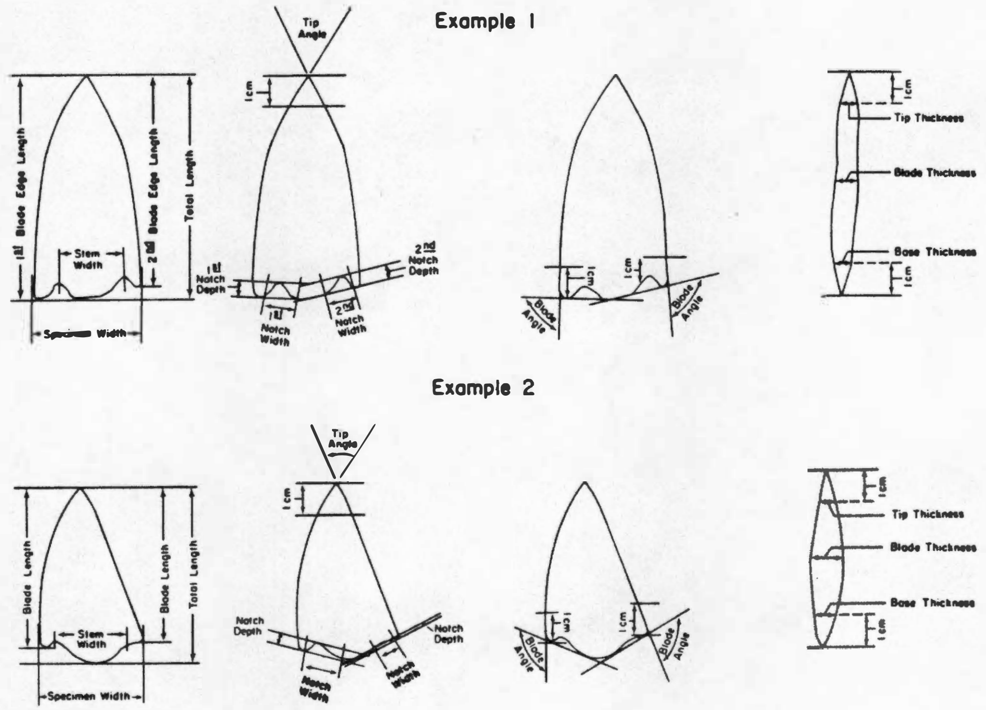


Figure 6.7 Definition of measurements taken on the Cave Spring projectile point-knife sample.

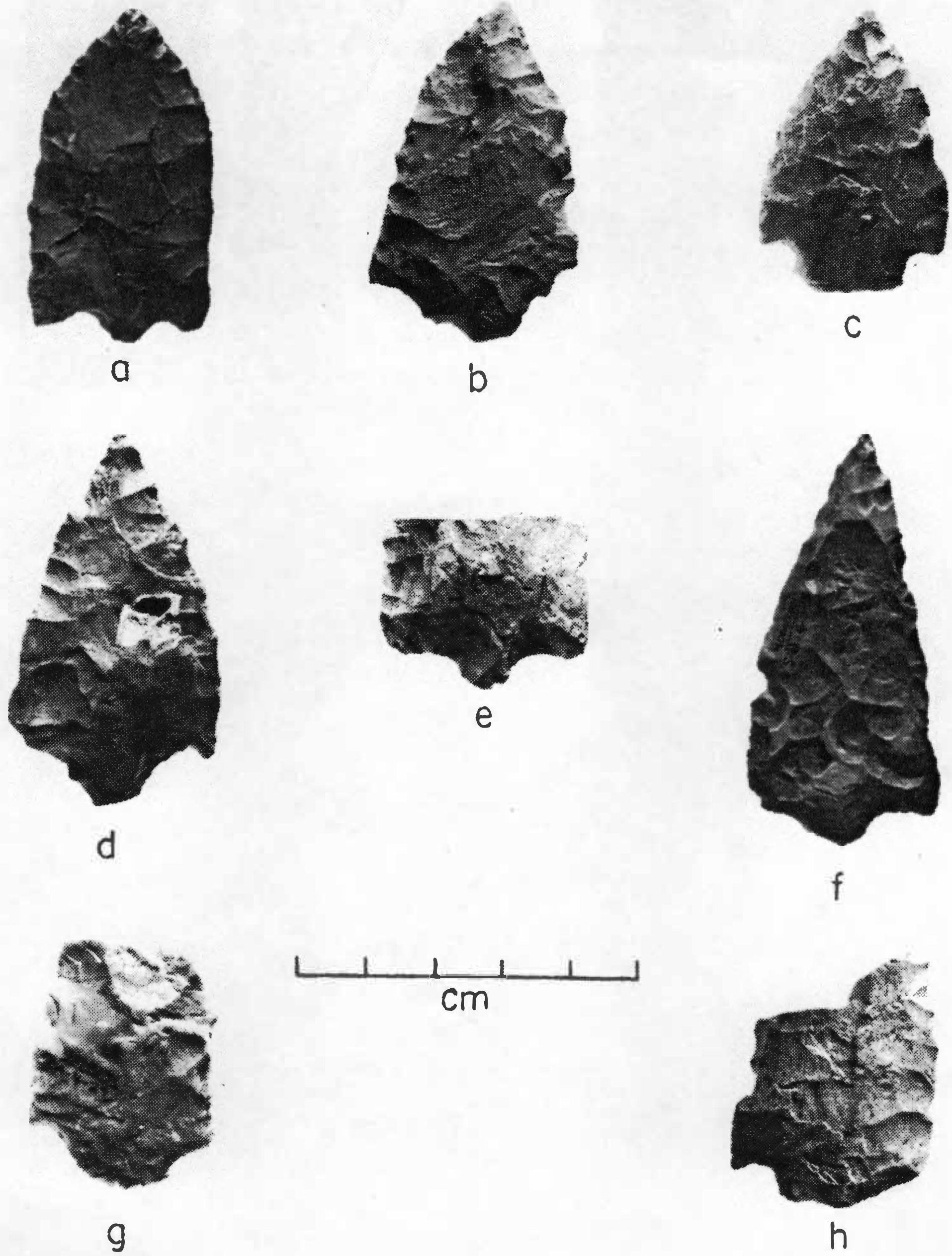


Figure 6.8 Eva projectile points from the Cave Spring site, 40MU141.

flaking pattern may occur at the distal end of retipped points. The tip angle will commonly be larger (more abrupt) on specimens which were resharpened after the original tip broke. Also, retipped points will be shorter than before they were broken and resharpened. Given fairly standard size preference for newly made points (made by the same group during a limited period out of a common material), we can predict that retipped points will be shorter than specimens which have not been reworked or repeatedly resharpened. Specimens retipped more than once or after a break has occurred across the blade well below the tip will exhibit greater tip angles, on the average, than other specimens. Therefore, if specimens are consistently retipped after distal breakage, the greatest tip angles should occur on generally shorter specimens.

Figure 6.9 is a scattergram of the variables length and tip angle. In the Cave Spring sample we do, in fact, see that the tip angles of greater than 65 degrees occur on specimens shorter than the mean length (54.5 mm) for the sample. The mean tip angle for the sample is 61 degrees (Table 6.1).

Finally, given a biconvex longitudinal section as most common for points in their initial form (thickest in the middle and tapering toward either end), retipped points may have the original taper foreshortened, thus making the final point thicker closer to the reworked end than the original. Tip thickness measurements for the Cave Spring points were taken at 1 cm from the distal end (Figure 6.7). Retipped points should be shorter and have thicker tip measurements than the originals. In Figure 6.10 the specimens with thickest tip measurements occur on specimens which are below the mean length. It is concluded, therefore,

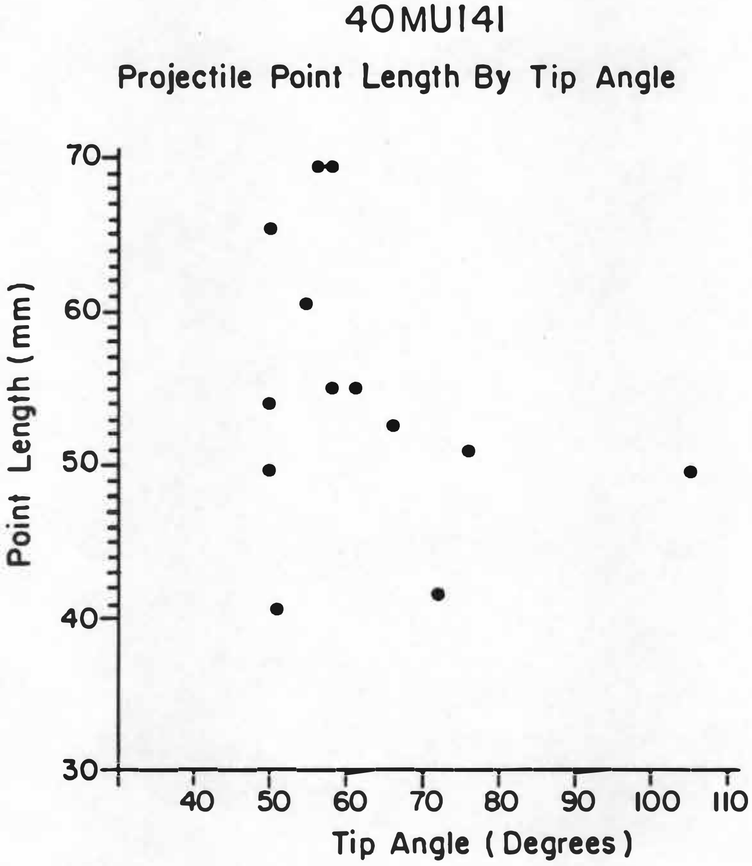


Figure 6.9 Plot of projectile point-knife length by tip angle, 40MU141.

Table 6.1. Summary statistics of 49MU141 projectile point measurements.*

Measurement	Number of cases	Mean	Standard Deviation	Minimum	Maximum
Length	13	54.5	9.3	40	69.5
Shoulder Width	31	30.4	3.2	23	38
Base Thickness	34	7.9	1.8	6	12
Blade Thickness	13	7.8	1.6	5	11
Tip Thickness	17	5.5	1.0	5	8
Notch Width (a)	35	9.3	2.1	3	12
Notch Depth (a)	35	2	1.4	1	5
Notch Width (b)	27	9.8	2.7	6	15
Notch Depth (b)	27	1.3	1.3	1	5
Stem Width	26	18	2.8	12	23
Edge Length (a)	13	52.5	10.1	38	70
Edge Length (b)	13	51.6	9.6	37	67
Tip Angle	18	61.1	13.1	50	105
Blade Angle (a)	36	108.2	13.2	83	134
Blade Angle (b)	30	110.8	14.9	82	139

* The manner of reading these measurements is shown in Figure 6.7.

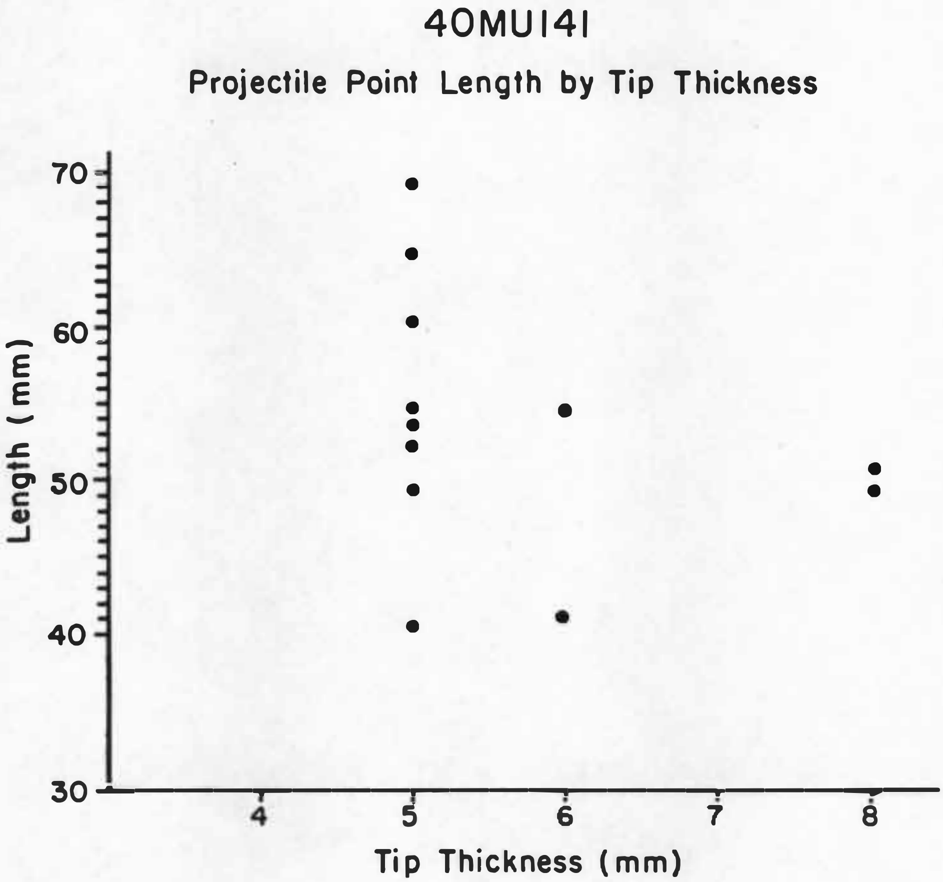


Figure 6.10 Plot of projectile point-knife length by tip thickness, 40MU141.

that distal blade form was not stable in the systemic context (Bacon 1977), and it cannot be used to distinguish Eva and "Morrow Mountain" projectile point-knives in the Middle Tennessee region.

Rebasing. Basal variability within Eva points is great (Lewis and Lewis 1961: Plates 8, 10, 11; Lindstrom 1981:26, 28). Factors which contribute to basal variation (notch size, stem form and width, base form, barb/shoulder prominence) include the shape of the original blank, the shape and size of basal notches, breakage or retouching of barbs or shoulders, preferences of the user or maker, and the intended function of the specimens. In the event that an Eva point broke at or near the stem/blade juncture or in the lower blade area, rebasing may result in a stem narrower than the original if notches are rechipped from the base. And because Eva point blades and preforms are essentially triangular in outline, the shoulders may be slightly narrower on rebased specimens than on the originals. A break across the lower blade or stem results in a relatively flat surface which can create difficulty in rethinning the base and stem to proper dimensions for accepting a new haft. Rethinning the base can result not only in a narrower stem but in one which is shorter than the original as well. Because there is no evidence for Eva preforms with concave bases, it is probable that Eva points on which the base element is shorter than the barbs are rebased specimens (e.g. Lewis and Lewis 1961: Plate 8: l, m, o).

The nearer a break occurs to the tip end of a point, the narrower the shoulders when the point is rebased. This is due to the triangular shape of the preform and blade. Therefore, rebased points should, on the average, exhibit narrower shoulders than points which have not been

severely broken and rebased. It must be noted, however, that shoulder width is also dependent upon lateral resharpening and original blank size. Figure 6.11 is a plot of stem width to shoulder width and shows that specimens with stem width below the mean of 18 mm have generally narrow shoulders near or below the mean shoulder width of 30 mm.

In both stem width and shoulder width measures, the distribution is multipeaked rather than a smooth unimodal curve. Despite the small sample, this suggests that specimens with stems narrower than 17 mm were probably rebased and that those with shoulders narrower than 30 mm were probably rebased and/or had extensively resharpened blade edges. Basal variation is also relatable to functional differences. For example, deep notching may be correlated with use or expected eventual use of specimens as hafted cutting tools rather than just as projectiles. Points made for use solely as projectiles may not have been notched. In wide-ranging hunting situations use of multipurpose projectile point-knives with deep notches and strong hafts may have been preferable in order that the tools could serve multiple functions. Short-term hunts staged out of established residential base camps may have made multipurpose compact tool kits less necessary, and points could be hafted without concern for whether they would have to be used as butchering tools because other tools for butchering would have been available. Omitting the notches and making a "Morrow Mountain" with a very slight stem rather than a deeply notched "Eva" would have lessened the risk of blank breakage during this final stage of manufacture. Studies have shown (e.g. Ahler 1983) that breakage during notching is a relatively common occurrence.

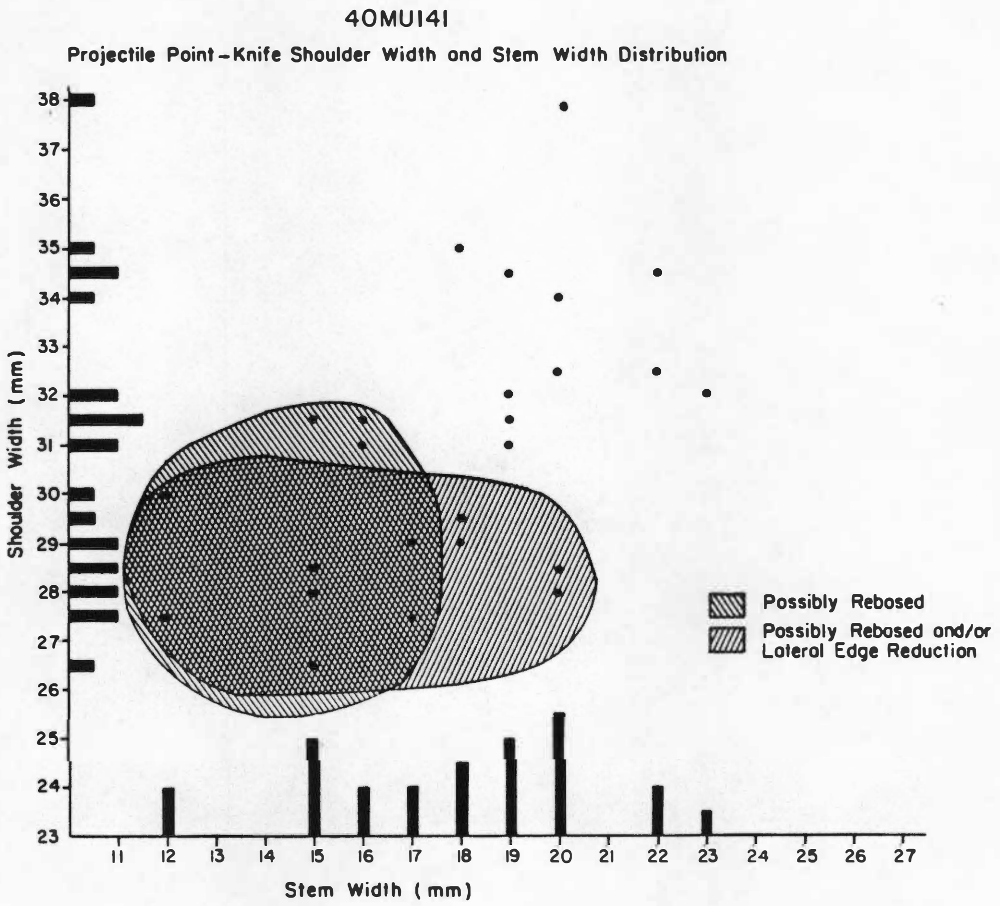


Figure 6.11 Plot of projectile point-knife stem width by shoulder width, 40MU141.

Lateral resharpening. Rechipping of blade edges may occur during retipping or rebasing. It may also occur independent of breakage during resharpening of dulled "knife" edges or tips. There are several lines of evidence which support the argument that lateral resharpening occurred frequently at Cave Spring. For projectile points which functioned repeatedly as cutting implements, resharpening of blade edges would have been a recurrent event, and would have had a profound impact on blade form and overall point morphology. It has been widely recognized that blade morphology is generally not a reliable key to classification of Archaic dart point/knives (e.g. Ahler 1971; Bacon 1977; Frison, Wilson, and Wilson 1976; Goodyear 1973) because of the extreme blade variability which can occur within types.

Attributes which may result from lateral resharpening include "islands" of flake scars isolated by resharpening episodes and representing earlier stages of biface reduction. These flake scar islands generally occur near the center of the point blade and are most common near the proximal (widest) end of the blade. These remnant scars are often isolated by step or hinged terminations of more recent flake removals which did not carry completely across the blade midline and did not feather out. One reason remnant flake scar islands repeatedly occur near the blade-stem juncture is because of the haft elment extending slightly onto the face of the blade and thus inhibiting removal of long retouch flakes, and, at the same time, inducing step and hinge fractures on retouch flakes removed after a specimen has been hafted. Examples of relict flake scar islands occur on several Cave Spring points (Figure 6.12).

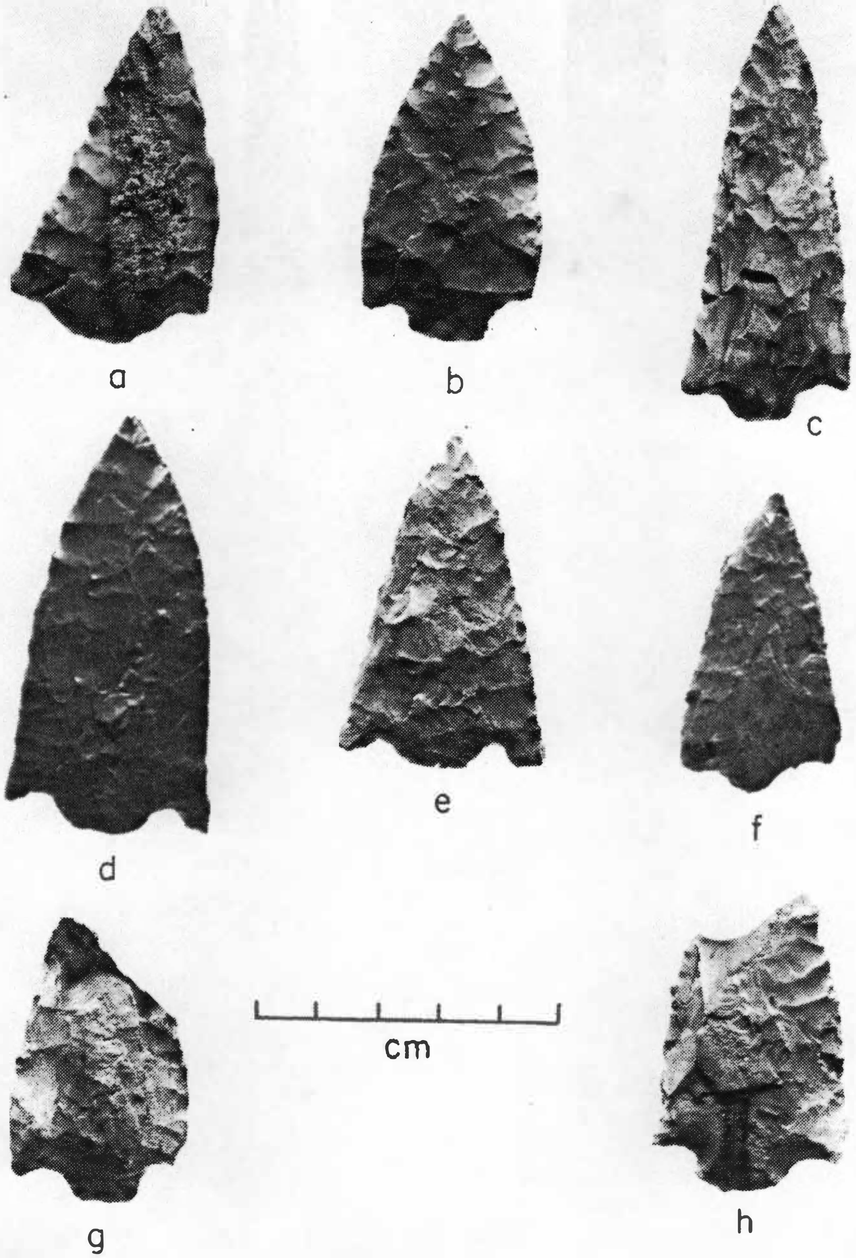


Figure 6.12 Eva projectile point-knives, 40MU141. Most specimens exhibit relict flake scar islands on the lower central portion of the blade.

Another recurrent feature on Eva points which undoubtedly reflects resharpening is a small abrupt step in the blade edge outline which occurs near the proximal end of the edge (the outside edge of the shoulder or barb). Apparently, resharpening of blade edges on some hafted points did not always extend to the barbs or extreme lower blade edges in the area of the haft. This small step can also be seen on the lower blade edges of Eva points from the Eva Site (Lewis and Lewis 1961: Plate 10e, 11i) as well as on several Cave Spring specimens.

Repeated usage of Eva points as knives can result in asymmetrical blades, indicating that retouch was more common or more intense on one side of the blade than on the other (e.g. Figure 6.12a and 6.13f). The frequency of using hafted dart points for cutting can be expected to vary from component to component and should strongly influence the frequency of asymmetrical blades. Therefore, for comparative purposes, I have presented in Figure 6.14 a symmetry plot of the Cave Spring points based on the angle of each blade edge in relation to the base. Nearly 70 percent of the points have blade edges which are within 10 degrees of symmetry. Only one specimen (3.4%) has blade edge angles which differ more than 20 degrees from each other. In behavioral terms, we might predict that assemblages with symmetrically bladed Eva points were less directed toward cutting and scraping (or other general processing activities) than assemblages with a high proportion of greatly asymmetrical blades. Given essentially symmetrical Eva point blanks and initial point forms, the degree of asymmetry may be useful as one yard stick of the intensity of reworking.

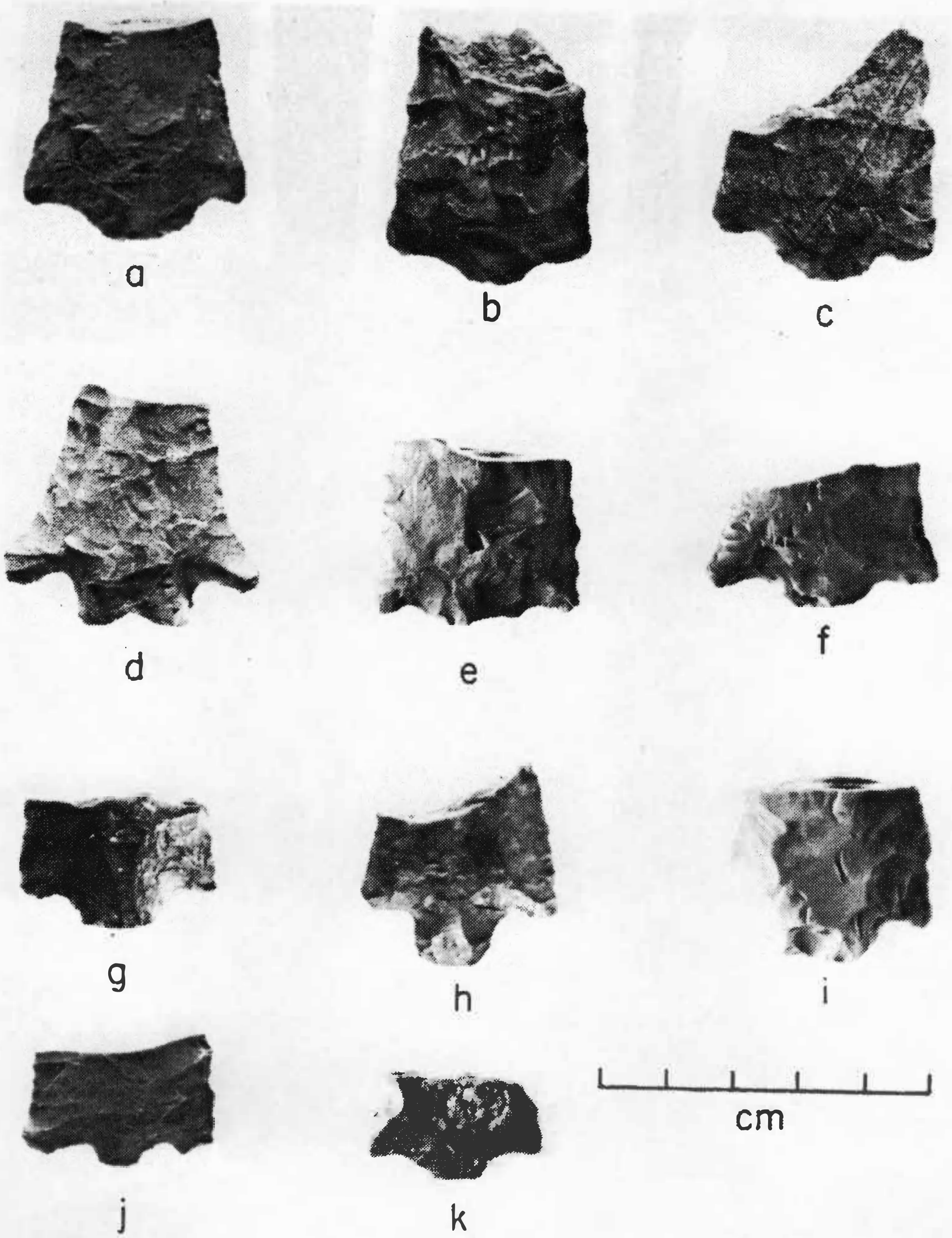


Figure 6.13 Eva projectile point-knives, 40MU141.

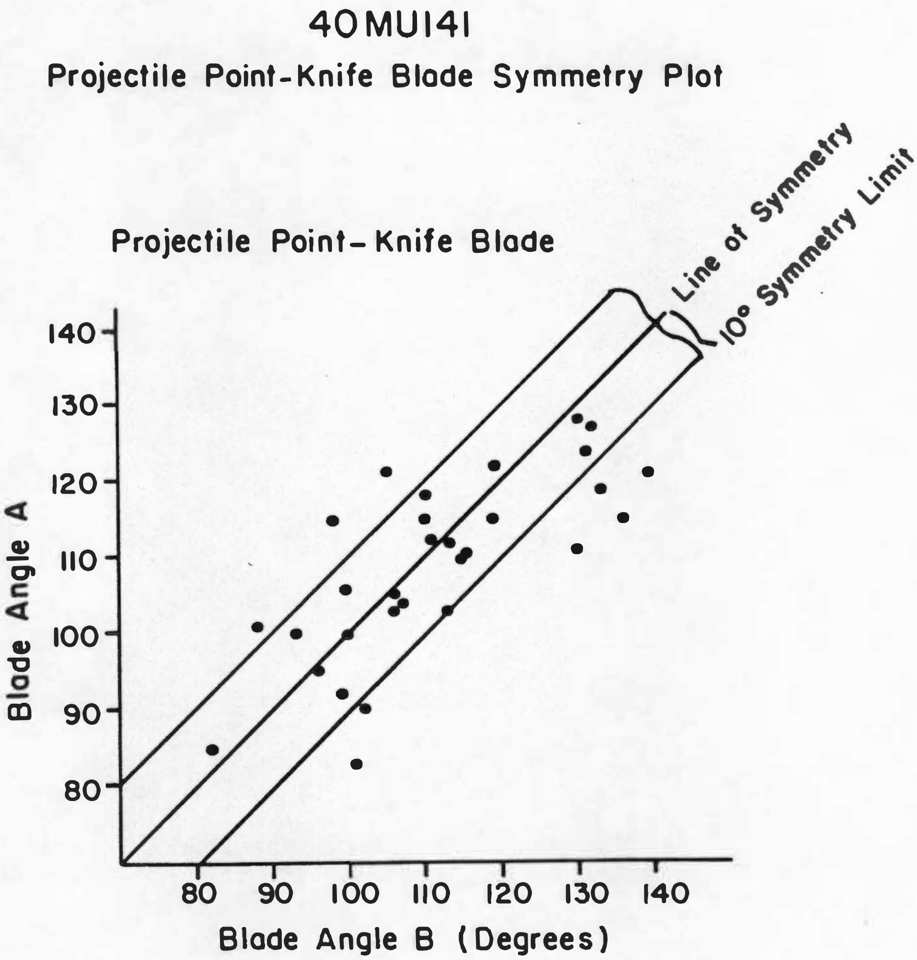


Figure 6.14 Symmetry plot of blade angle measurements for Eva projectile point-knives, 40MU141.

At Cave Spring the most common artifact type is projectile points. The manufacture and maintenance of points is assumed to have been a primary focus of flint knapping at the site. If projectile points were being finished and resharpened at the site, there should be a high frequency of small (less than one cm in size) biface thinning flakes representing this activity. A sample of 7,947 flakes less than one cm in greatest dimension were studied in detail. This sample, from levels 2 through 10 of Square 309N-839E, represents 20 percent of the flakes less than one cm from Area B or 17.45 percent of all the flakes from the 1980 testing of the site which are less than one cm. Of this sample, 15 percent (N=1192) were complete with platforms and 75 percent were biface thinning flakes. The remainder were questionable biface thinning flakes or tertiary flakes (Table 6.2). From these figures, I estimate that at least 75 percent, more than 34,000, of the 45,550 Cave Spring flakes less than one cm in size represent biface thinning flakes from biface edge shaping or resharpening.

Notch variability and barb loss. One of the most pronounced changes which can occur in the overall appearance of Eva points is the loss of the prominent barbs. Barb prominence on newly made points is dictated by such factors as preference, ability of craftsmen, notch size and shape, and size and shape of the blank. Barbs are vulnerable to breakage during manufacture, use, resharpening, or general handling. Barb width may be reduced during resharpening of lateral edges, but barbs were apparently not always retouched when blade edges were resharpened. Narrow barbs can result from notching a narrow blank or renotching a point broken across a narrow blade.

Table 6.2. Crosstabulation of material type by flake type for flakes less than one cm in size, 40MU141.

MATERIAL TYPE	SECONDARY FLAKES	TERTIARY FLAKES	BIFACE THINNING FLAKES	TOTALS
Ridley	2	199	574	755 (65%)
Bigby Cannon	1	1	2	4 (.3%)
Fort Payne	6	96	309	411 (34.5%)
Indeterminate	0	0	2	2 (.2%)
	9 (.8%)	296 (24.8%)	887 (74.4%)	1192*

* This total represents a 17.45 percent sample of the less than 1 cm size flake category from Test Areas A and B. A total of 45,550 flakes less than 1 cm in size collected at Cave Spring.

Along with tips, barbs are extremely fragile elements of projectiles. Broken barbs rapidly transform a basally notched point into an unnotched or very slightly notched form. It is pertinent to note that several of the "Morrow Mountain" specimens illustrated by Lewis and Lewis (1961:Plate 8, b, c, f, g) from the Eva site have broken shoulders and may originally have been barbed, based on an examination of the actual specimens.

The presence of notches, notch size, and notch placement are also dictated by hafting type, intended tool function, preference, available

fabricating equipment and such. Notch size (depth) may have been strongly influenced by whether or not points were intended to serve in heavy duty or repeated cutting tasks. Deep notches may have allowed more secure haft attachment for knives, but may have had little advantage for projectile points. Notch depth and width are quite variable on the original Eva sample (Lewis and Lewis 1961:Plates 8, 10, 11; Figure 6.15). Likewise, the "notches" on the Cave Spring points are variable (Figure 6.16). Data for Figure 6.15 are taken directly from the illustrations in the Eva report to allow cross checking, and because it is not possible to be certain how the non-illustrated specimens were classified by Lewis and Lewis. It should be noted, however, that all of the illustrated specimens are slightly larger than actual size. The configuration of the width and depth measurement distributions is of interest here, not the actual size of the notches.

In studying notch variability two problems must be confronted at the onset: notch definition and measurement. Any definition of notches, such as "a concave edge at least half as deep as wide but not exceeding 20 mm," will automatically create two discrete groupings; notched and unnotched. Such a definition, if arbitrarily derived, will create discrete groupings when continuous variation may in fact be present. This problem is avoided by first measuring the notch region on the Cave Spring specimens and then evaluating whether discrete notched and unnotched groupings could be established by a "natural" break in the measurements. This approach is preferable to arbitrarily deciding where such a break ought to be.

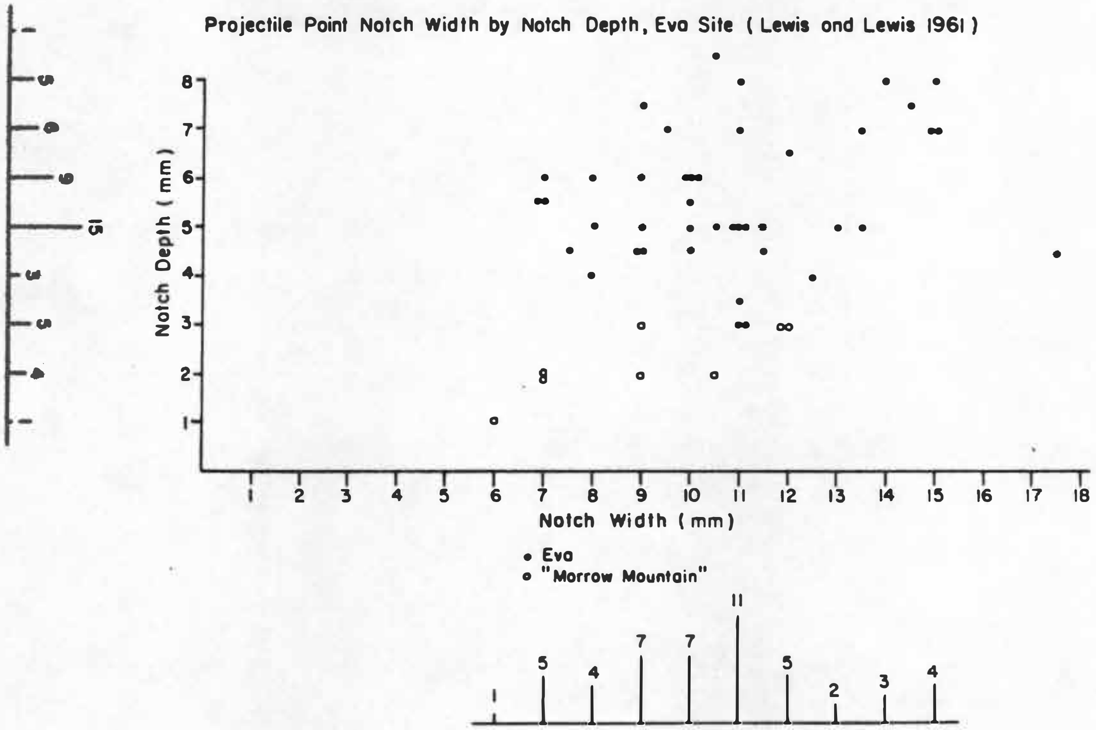


Figure 6.15 Plot of projectile point notch depth by notch width for Eva and "Morrow Mountain" projectile point-knives from the Eva site. (Data derived from Lewis and Lewis 1961: Plates 8, 10, 11).

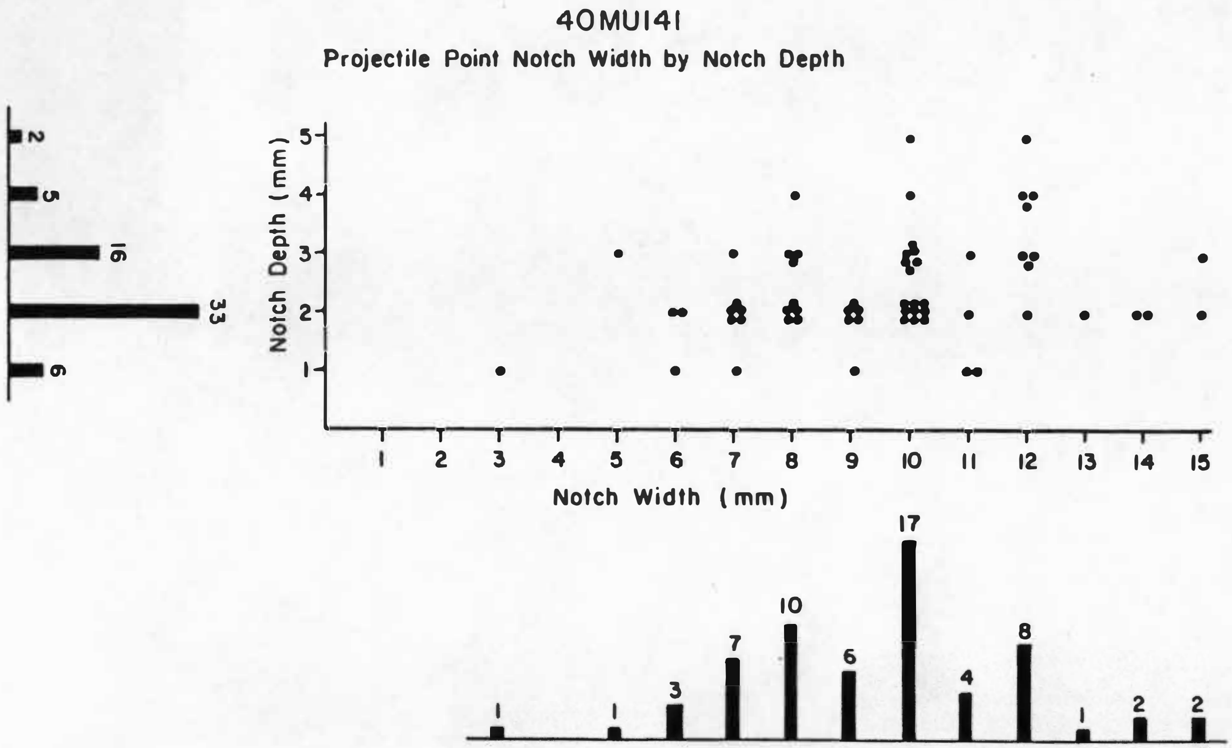


Figure 6.16 Plot of projectile point-knife notch depth by notch width for Eva points from 40MU141.

Measurements of the "notches" or concave marginal edges in the base/stem area of the Cave Spring points were read as shown in Figure 6.7. Notch width was measured as a straight line between the widest part of the concavity between base and barb or shoulder. Depth was read as the deepest recess of the concavity perpendicular to the width line. Figure 6.16 illustrates the distribution of notch width and depth measurements of the Cave Spring Eva point sample. This scattergram does not support the argument for two distinct groupings, notched and unnotched. Fairly even unimodal distribution of both notch dimensions is evidenced. This is as expected if the "Morrow Mountain" shaped specimens truly represent Eva points on which the barbs have been reduced by some combination of reworking and breakage or which were simply shallowly notched in original form.

Summary. One intention in this initial study has been to suggest that the "Eva" and "Morrow Mountain" points from the Cave Spring Site were actually made and used by the same cultural group during a single occupational phase. We have seen that even given the relatively small sample, numerous lines of available evidence are presented to argue that variability of Eva points due to factors such as breakage, reworking, and resharpening can be extremely great and can include forms which have traditionally been classified as Morrow Mountain points. This should lead us, at the very least, to carefully reconsider the classification of projectile points as Morrow Mountain which come from components or sites in the western and middle Tennessee region where Eva points are also recovered. Hopefully, such reconsideration will encourage the processual study of potential multistage types, which I believe the Eva

type to be. This should in turn considerably benefit studies of component relationships, functional, and stylistic variability of assemblages and better integration of the archaeological record toward studies of past human behavior.

CHAPTER VII

THE CAVE SPRING COMPONENT ASSEMBLAGE

Introduction

This discussion is directed toward the collection of 53,151 pieces of chipped and broken stone tools and debris recovered at Cave Spring. This sample is composed primarily (85.72 percent) of small flakes and flake fragments less than one cm in greatest dimension. A 17.5 percent sample of these small flakes was studied in detail.

The purpose of this chapter is primarily documentary. The sample under consideration comes from considerably less than one percent of the site area. Information about the sample is presented, primarily in tables and figures, but the observed correlations and interpretations should be considered as no more than working hypotheses to be reevaluated, supplemented, discarded or refined as continuing research shows necessary. The available information about the structure of the Cave Spring Site indicates there were areas of greater and lesser activity and areas of differential artifact discard.

It is not appropriate at this stage to attempt a comprehensive definition of the range of Middle Archaic activities which were conducted at Cave Spring. We can, however, propose a minimum range of activities given the available sample, and also predict what other aspects of the site may be like given the present interpretation of site function.

Definition of Analytical Categories

The cultural material categories used herein are adapted from previously established groupings applied to a variety of assemblages. The data processing was facilitated by use of the Cultural Material Coding Format established for the Columbia Archaeological Project (Hofman and Turner 1980). Most of the following terminology can be found in White (1963), Crabtree (1972), Wyckoff (1973), Hofman (1975b, 1978d), and Cantwell (1979).

Projectile Point-Knives. This category follows the usage of projectile point-knives in Faulkner and McCollough (1973) as a collective term for hafted projectile points and cutting tools (Ahler and McMillan 1976).

Drills. These bifacial perforators have long bits with basal sections suitable for hafting or hand-held use. All of the Cave Spring specimens have heavily dulled edges and wear evident on flake scar ridges of both faces of the bits. They were apparently used for drilling holes in fairly dense material such as bone, antler, wood or soft stone. One Cave Spring specimen is made from an Early Archaic bifurcate point, the bit edges of which have been reworked exposing unweathered stone on an otherwise patinated piece. Another drill is completely bifacially flaked with a triangular base, and the third was manufactured from an elongated decortication flake.

Preforms. Bifacial artifacts in this category are interpreted as aborted specimens representing intermediate stages of biface tool production (Fitting, DeVisscher and Wahla 1966:39; Saunders 1974:213-216). The category has been subdivided based on attributes

such as percent of cortex, width/thickness ratio and edge regularity. Initial stage preforms have more than 50 percent cortex on one or both faces. Intermediate preforms have less than 50 percent cortex on both faces. Late stage preforms lack cortex or exhibit less than 10 percent on either face, have even margins, and the thinning process is apparently complete. The Cave Spring preforms are all broken; most exhibit production failures (cf. Amick 1982; Johnson 1979, 1981) and were aborted before completion. Of the 14 preforms, two are early stage, five intermediate and six are late stage with one indeterminate because of the small fragment size.

Bifacial Scraper. A single biface (intermediate stage preform) from Cave Spring has a steep (greater than 50 degrees) edge with unifacial wear evidence. This documents the recycling of an aborted preform for a secondary function.

Biface Fragments. Small unclassifiable pieces of broken bifaces which may represent segments of projectile points, preforms or similar artifacts are categorized simply as miscellaneous biface fragments.

Spokeshave. A unifacially retouched scraping tool with a concave working edge greater than one cm in length. (Specimens with concave working edges less than one cm would be classified as "notches".) This is regarded as a relatively specialized scraping tool.

Denticulate. Retouched flakes with one or more serrated edges, including at least two notches and three projections in an alternating sequence, are classified as denticulates. This edge form makes them suitable for sawing-cutting tasks and less efficient in many scraping operations, except very coarse work. The Cave Spring specimen is

considered a "light duty" denticulate because of its thin edge (less than four mm), limited wear and small attritional scars on the functional edge. It was possibly used on soft or pliable material such as meat, skin or fiber. Heavy duty flake tools have thicker edges (generally thicker than four mm) and usually exhibit "nibble" attritional scarring (numerous short step fractures) on the functional edges and may have projections rounded or smoothed from use on harder materials such as bone, antler or wood.

Gravers. Flakes with small projections prepared on an edge or at the juncture of two margins are classified as gravers when the projections exhibit wear or attritional scarring. The Cave Spring gravers exhibit pointed projections which were potentially used for piercing thin material, scribing lines, carving or grooving.

Cores. Chert cobbles, blocks or angular fragments from which at least one series of flakes have been removed are considered cores. Expended cores have generally been intensively flaked and were abandoned due to small size or loss of productive flake removal facets. Core fragments are those specimens broken after or during the flake production process.

Flaked Cobbles. Cobbles, nodules or chert blocks which have one, two or very few flakes removed, sometimes from more than one surface or end, are classified as flaked cobbles. This category is used as defined by Wyckoff and Taylor (1971:28). These pieces may represent prospective cores or tool blanks which were aborted early in the reduction process due to some undesirable characteristic or flaw.

Abrader. Granular siltstone, sandstone or limestone may be used to abrade edges during biface manufacture or core reduction, to shape stone or bone tools or to sharpen such tools. A small "siltstone" fragment recovered at Cave Spring probably represents a broken abrader. The closest source of this granular stone is about 1.6 kilometers south of the site.

Flake Tools. The various lots of flake tool types have been derived through application of a simple hierarchical scheme of attribute sets. The hierarchy is based on a series of binary states: retouched flakes versus those with only attritional scarring (utilized flakes); cutting versus scraping tools, and light duty versus heavy duty tools (Figure 7.1). Those modified flakes which cannot be so segregated, are attributed to either indeterminant-intermediate retouched flakes or indeterminant-intermediate utilized flakes. The other resulting categories are: light duty scrapers on retouched flakes, heavy duty scrapers on retouched flakes, light duty cutting tools (knives) on retouched flakes, heavy duty cutting tools on retouched flakes, light duty scrapers on utilized flakes, heavy duty scrapers on utilized flakes, light duty cutters (knives) on utilized flakes and heavy duty cutters on utilized flakes.

Retouched flakes are those which exhibit patterned unifacial flake removal at least along the functional margin. This intentional retouch served to modify flake edges to make them suitable for specific tasks. Attritional scarring and polish usually occur along the functional edge on top of the retouch. In determining the edge angle of these tools, the retouched edge, not the spine plane angle, is of primary concern.

	RETOUCHED/ UTILIZED	CUTTING/ SCRAPING	LIGHT DUTY/ HEAVY DUTY
flake tools n=24	retouched flake tools n=13 (54.17%)	retouched cutting tools n=4 (16.7%)	light duty cutting n=3 (12.5%)
			heavy duty cutting-sawing n=1 (4.2%)
		retouched scraping tools n=9 (37.5%)	light duty scraping n=2 (8.3%)
			heavy duty scraping n=7 (29.2%)
	utilized flake tools n=11 (45.83%)	utilized cutting tools n=4 (16.7%)	light duty cutting n=3 (12.5%)
			heavy duty cutting-sawing n=1 (4.2%)
		utilized scraping tools n=7 (29.2%)	light duty scraping n=5 (20.8%)
			heavy duty scraping n=2 (8.3%)

SUMMARY: total cutting=8 (33.3%)
total scraping=16 (66.7%)
total heavy duty cutting=2 (8.3%)
total light duty cutting=6 (25%)
total heavy duty scraping=9 (37.5%)
total light duty scraping=7 (29.2%)

Figure 7.1 Hierarchy of nonformal flake tools, 40MU141.

Utilized flakes are recognized by one or more edges which have become incidentally modified through use. The functional edges exhibit use polish or a series of small to minute flake scars. Incidentally modified or utilized flake tools may have served the same tasks as some retouched flakes, but were selected for use because their edges were naturally suited to the performance. It is the spine plane angle (the angle between the original dorsal and ventral flake surfaces) which is of primary interest in classification of utilized flakes.

Scraping tools are those used in such a fashion that the material being worked passes across the tool more or less perpendicular to the functional edge. Tools used in such manner require fairly strong edges and tend to have steeper functional edge angles than cutting tools. They also generally exhibit unifacial wear and any striations caused during use will tend to be perpendicular to the edge (Semenov 1964). Unifacially worn tools with steep edge angles, greater than 45 degrees and usually more than 65 degrees, are assumed to have been used primarily as scrapers.

Cutting tools, knives and saws, are distinguished by acute edge angles less than 65 degrees and usually less than 45 degrees, bifacial wear and striations which, when present, are oriented more nearly parallel rather than perpendicular to the functional edge.

Light duty tools have thin edges (less than four mm, see Cantwell 1979), attritional scars with feathered terminations on the working edge, and use polish which results from working relatively soft, pliable materials.

Heavy duty tools have stronger edges, more than four mm thick, often severe attritional scarring in the form of nibbling, and sometimes intensive wear polish as results from processing tough, dense or hard material.

This scheme is intended only to provide a quick, rough estimation of general functional activities, usually without reliance upon microscopic use wear studies. It provides only a first approximation and allows for general functional comparisons between flake tool samples from one or more assemblages. For example, samples with numerous heavy duty cutting and scraping tools, perhaps indicating fabricating work in bone, antler or wood, might be easily distinguished from samples dominated by light duty cutting and scraping tools perhaps indicating butchering or processing of meat, skin or fiber. The main point is that this system allows relative differences to be discerned between samples which might prove worthy of more detailed study, and it also aids in recognition of basic functional variability.

Primary Decortication Flakes. Cortex, waterworn rind, or severely weathered surface covers the entire dorsal surface of these flakes. Cortex may or may not occur on the platform. These flakes represent the initial stage of core and biface reduction.

Secondary Decortication Flakes. These flakes exhibit cortex or weathered rind on some portion of their dorsal surface, and represent early to intermediate stages of core or biface reduction. They usually have platforms which are broad and relatively flat as compared to biface thinning flakes. The angle between the flake platform and dorsal surface is usually steep, commonly 60 to 90 degrees. And the dorsal

edge of the platform may have been prepared by grinding, crushing or trimming but this is less common than on tertiary flakes. Also included with secondary flakes in this study are broken flakes which lack platforms, but which have some dorsal cortex. It is possible that a few of these cortical flakes lacking platforms were actually primary decortication flakes or early stage biface thinning flakes.

Tertiary Flakes. These core reduction flakes have no cortex on the dorsal surface, but may occasionally have platform cortex. Platforms are generally flat but may be ridged, and the platform to dorsal surface angle is steep (50-90 degrees). Prepared platforms are common and tertiary flakes commonly have a higher incidence of manufacture with soft hammer percussion than early stage decortication flakes. Features such as thin prepared platforms, diffuse bulbs of force and lipping on the ventral platform edge may be common in some samples.

Biface Thinning Flakes. Biface thinning flakes are characterized by several distinctive attributes. The proximal, platform end of the these flakes have diffuse bulbs of force, acute angles between the platform and dorsal surface (usually less than 60 degrees), a lip on the ventral edge of the platform overhanging the ventral surface, and usually multifaceted (bifacial) platforms. Platforms may also be peaked (only two facets and one ridge) or smooth. Smooth platforms on bifacial thinning flakes are commonly slightly concave due to removal from a previous flake scar. The dorsal flake surface often exhibits a series of previous flake removal scars. Thinning flakes removed during early stages of biface reduction may have some cortex and those removed with a billet generally have broader platforms than pressure or punch flakes.

Three size groups of biface thinning flakes were segregated within the Cave Spring sample; those less than one cm in length, those between one and two cm long or wide, and flakes greater than two cm long or wide or with platforms greater than three mm thick. The latter group primarily reflects preform reduction whereas the first two probably reflect finishing and retouching of biface implements.

Broken Flakes. Classified as broken are those flakes which lack platforms and dorsal cortex. Flakes lacking platforms but with cortex on some part of the dorsal surface are not included here but with secondary decortication flakes. None of the flakes in the broken flake category have platforms. Flakes with intact platforms are included in the previously described groups. This is because flakes which have broken across the distal end after removal cannot be distinguished from flakes with step terminations. The broken flake category includes both tertiary and biface thinning flake fragments which are indistinguishable due to the absence of platforms.

Core Rejuvenation Flakes. These flakes represent attempts to trim cores of overhanging platforms and/or deep hinge or step flake scars which would interfere with successful flake removal. They may have thick platforms which reflect attempts to "clean up" a flake removal face on a core, or they may be oriented perpendicular to the original core platform when overhanging platforms are struck off from the side (Wyckoff 1973). These flakes represent core reduction activities and are usually associated with tertiary flakes, intermediate to late stage core reduction.

Blocky Debris. These blocky or tabular pieces usually show some evidence of flake scars on their surfaces, but do not have typical flake attributes such as bulbs of force, platforms or recognizable dorsal and ventral surfaces. They generally result from testing or initial reduction of cobbles or tabular pieces of chert which contain incipient fracture planes or weathering cracks. Knapping such chert pieces results in angular fragments which usually reflect early stages of cobble-nodule reduction or tool manufacture. This category is comparable to Binford and Quimby's (1963:278) "shatter."

Fire-Cracked Rock. This category includes broken or cracked cobbles or blocks of chert of any size which do not exhibit evidence of flaking or intentional modification but which have attributes derived from exposure to extreme heat (House and Smith 1975). Crenated fractures, angular fractures, pot lids, fire crazing and discoloration are characteristics of these pieces. They are assumed to have been associated with hearths and used as heat retainers or boiling stones.

Lithic Resources

Chert nodules are common in some beds of the Ridley and Carter Limestone and as residual on slopes in the Central Duck River Basin. Chert cobbles are common in the gravels of the Duck River and in ancient strath terrace gravels along the river. Much of this chert, however, is of relatively poor quality for the manufacture of chipped stone bifaces.

Ridley Chert is available near the site as gravel, in limestone matrix and as residual on upland slopes where it has weathered from limestone. Nodules and cobbles of Ridley Chert are typically flawed

with numerous incipient fracture planes. The angular pieces of chert isolated by fracture planes are sometimes fairly homogeneous and of moderate knapping quality, but often small in size. Initial reduction of Ridley Chert cobbles generally results with numerous pieces of blocky debris. Experiments have shown that Ridley becomes more virteous when heat treated and may change from light gray to gray brown to pink or pinkish brown in color (Lee G. Ferguson, personal communication). Distinctive fossil inclusions aid in identification of Ridley Chert (Theis 1936:79; Wilson 1949:37-38). About 69 percent of all chipped stone items greater than one cm from Cave Spring are Ridley Chert, as are 65 percent of the flakes less than one cm.

Fort Payne Chert, the second most common material at Cave Spring, occurs in gravels in the Duck River near the site and in higher strath terrace gravels. Fort Payne outcrops on some high knobs and ridges within the Central Basin and is common in gravels and in matrix (sometimes thick beds) in the Highland Rim on the east and west borders of the basin. Cherts from the Fort Payne Formation exhibit considerable variety in color, texture, inclusions, homogeneity and overall suitability for the manufacture of stone tools. The Fort Payne Chert represented at Cave Spring as tool stone is generally of higher quality and is more malleable than Ridley Chert. Several of the Fort Payne artifacts from the site are large enough (6-10 cm) that the original stone from which they were made likely came from a distant source, such as less weathered gravels nearer the eastern Highland Rim. Fort Payne cobbles on the gravel bars near the site are most commonly less than 5 cm in size and many of the larger cobbles are badly weathered or

internally fractured. Amick (1981, 1982) has documented sources of high quality Fort Payne Chert more than 20 km from Cave Spring. Over 28 percent of the Cave Spring chipped stone greater than one cm in size is Fort Payne and 34.5 percent of the less than one cm flakes is Fort Payne.

Bigby Cannon Chert, with distinctive fossil inclusions (Theis 1936:75-76; Wilson 1949:125-129), is derived from formations in the outer Nashville Basin. In the Cave Spring area it is quite rare in modern river gravels, but fairly common in ancient strath terrace gravel (Amick 1981). Just under two percent of the chipped stone larger than one cm and only 0.3 percent of the flakes less than one cm from Cave Spring are of Bigby Cannon Chert.

St. Louis Chert, represented by only 0.12 percent of the greater than one cm chipped stone and none of the smaller fraction, is of high quality, homogeneous, with no visible grain and is the most vitreous of the materials recovered. Sources of the nodular blue or green St. Louis Chert are in the St. Louis Limestone on top of the Highland Rim. The closest known reliable sources of this material are well over 50 km from Cave Spring.

Other cherts or pieces of the above mentioned cherts which were unclassifiable constitute only 0.67 percent of the over one cm sample and only 0.2 percent of the less than one cm flakes.

The only non-chert stone from Cave Spring is the light brown, fine grained "siltstone" abrader. This piece probably has its origin about 1.6 km south of Cave Spring on a hill where Hermitage Formation Limestone is exposed and severely weathered (Wilson and Hershey 1963).

"The Hermitage Formation is a slightly phophatic shaly and sandy limestone or calcareous sandy shale. When weathered it frequently has the appearance of a sandstone" (Theis 1936:77). Also concerning the Hermitage Formation, Wilson (1949:88) writes, "One of the common features of the thicker slabs is the frequent occurrence of an unleached core of blue limestone and a periphery of leached yellowish-brown siltstone." This material occurs occasionally throughout the area in the form of ground stone tools such as abraders.

Composition of the Cave Spring Sample: Notes on Prehistoric Activities

The Cave Spring component assemblage sample is adequate for development of hypotheses to direct future work at the site or others with similar artifact composition. The term component assemblage is used here to refer to that portion of a cultural group's total assemblage which is represented at a particular site. There is at present no means of evaluating the representativeness of the Cave Spring sample until additional field work is done. The size and nature of sample necessary to gain an accurate picture of any site's contents and structure will depend directly upon the type of site, redundancy of activities, variety of activities, number of occupational episodes, spatial discreteness of occupations and other such factors. We may have in the available sample a fairly adequate reflection of the overall site. But even if not, we have the potential to gain an understanding of part of the site, and to also aid in designing future investigations.

Some non-projectile point artifacts from Cave Spring are illustrated in Figure 7.2, and the distributions of artifacts and debris

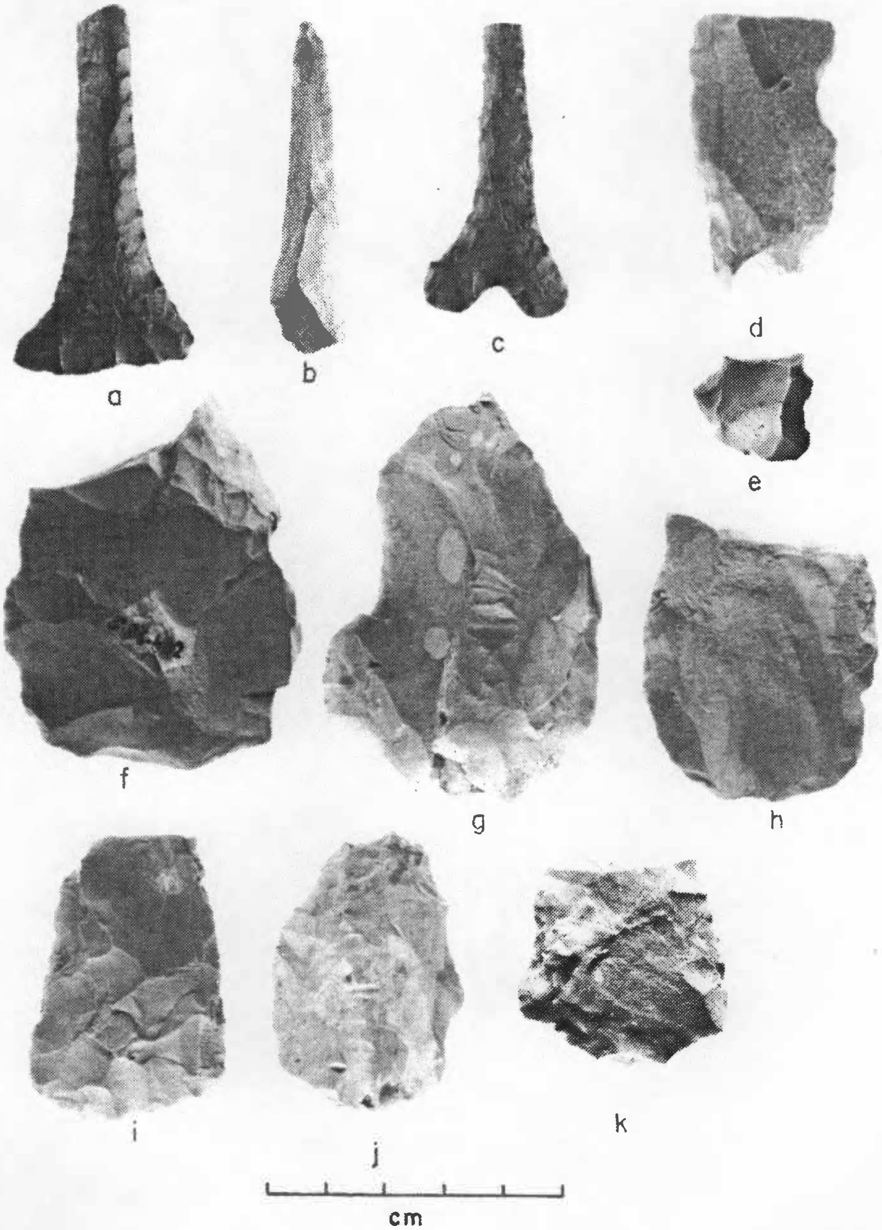


Figure 7.2 Drills, flake tools and preforms, 40MU141. a-c: Drills from Area A. d: Spokeshave from Area B. e: Graver from Area B. f-j: Ridley Chert preforms from Area B. k: Ridley Chert projectile point-knife fragment.

are shown in Figures 7.3 through 7.7. Early Archaic artifacts in the sample are shown in Figure 7.8. Most debris categories have been illustrated in Chapter V and projectile points were figured in Chapter VI. Tables 7.1. through 7.6 provide basic quantitative information about the Cave Spring sample, and the following discussion is directed toward these.

The frequency of artifact types by lithic material types is shown in Tables 7.1 and 7.2. Flakes greater than one cm in size are listed in Table 7.3, and nonflake debris in Table 7.4. From these tables some interesting observations can be made. First, although the majority of the pieces are Ridley Chert, the majority of the artifacts are Fort Payne Chert. And there are more bifacial artifacts than flake artifacts or cores; more biface thinning flakes (counting those less than one cm in size) than core reduction flakes. Projectile points are the single most common artifact type, more common even than flake tools. These facts indicate that use and maintenance of bifaces were primary concerns of the site's occupants. It is also highly probable that the original biface assemblage brought to the site was dominated by Fort Payne Chert, whereas the bifaces carried away from the site included a proportionally higher frequency of Ridley Chert pieces than the original. This is evidenced in the inverse relative frequency of biface thinning flakes to bifaces of these chert types (Table 7.5).

The following argument is presented as an hypothesis for the sequence of events that created the noted variation in raw material frequencies of bifaces and biface thinning flakes. The occupants of Cave Spring would have arrived with a tool kit including projectile

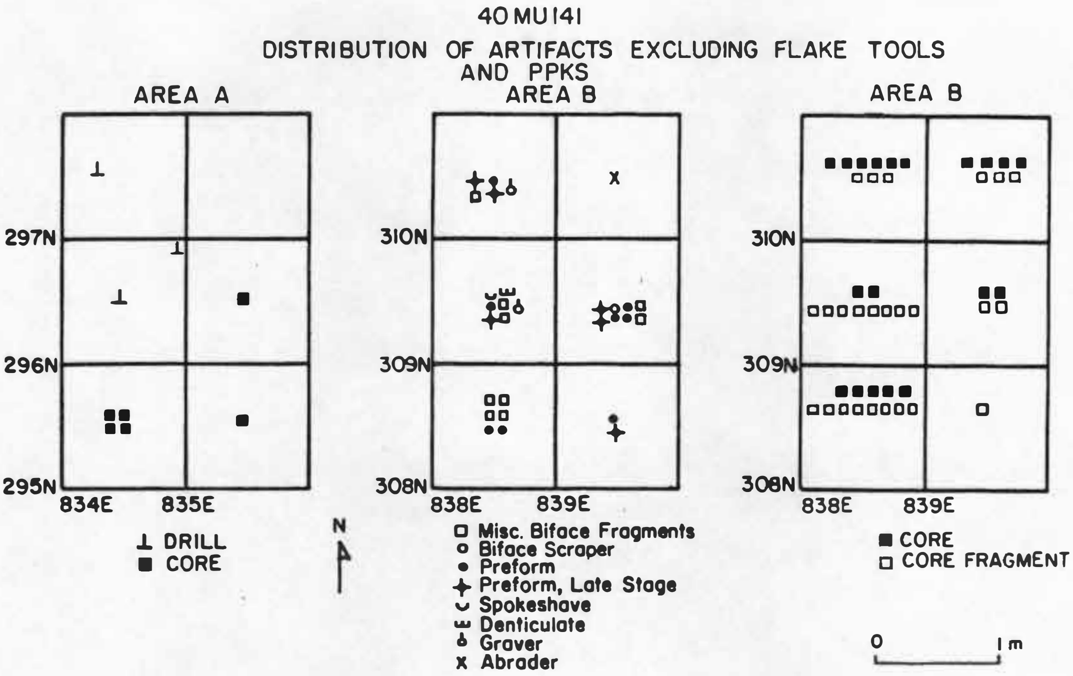


Figure 7.3 Distribution of selected artifacts from areas A and B, 40MU141.

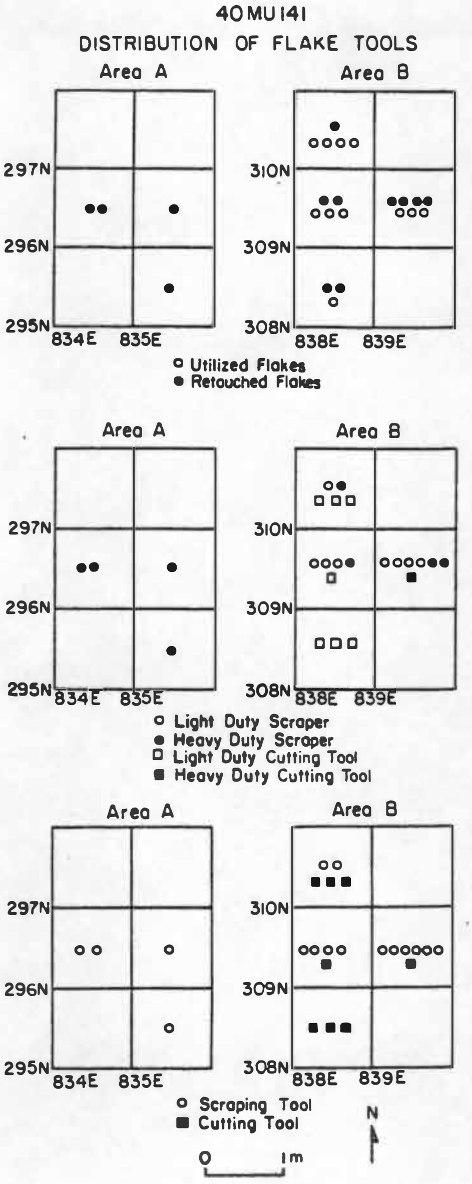


Figure 7.4 Distribution of nonformal flake tools, areas A and B, 40MU141. The total number from both areas is 24.

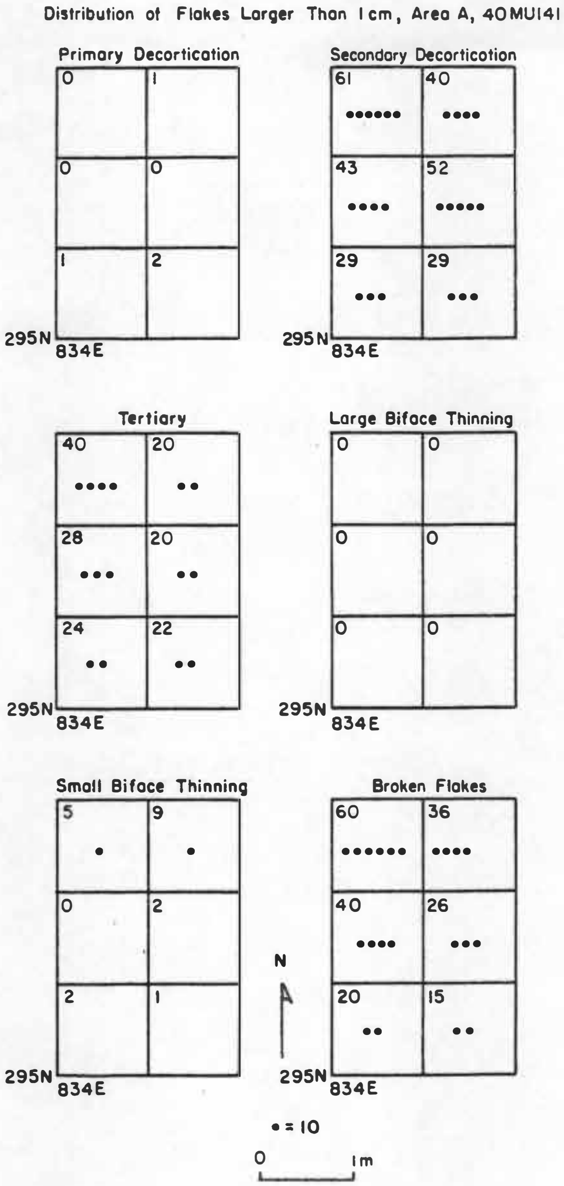


Figure 7.5 Distribution of flakes larger than one cm in size by types, Area A, 40MU141.

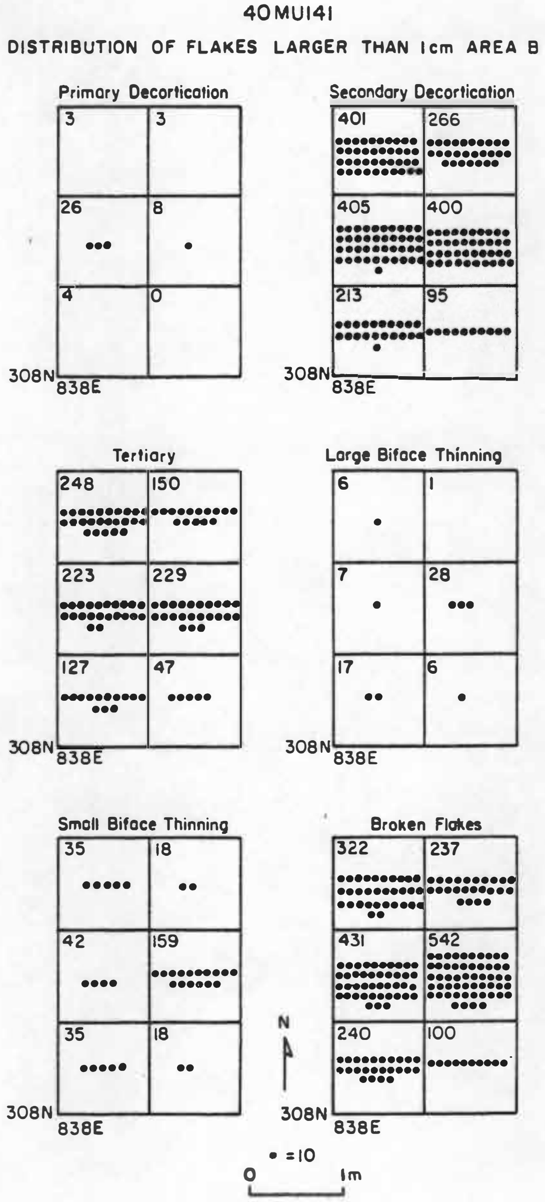


Figure 7.6 Distribution of flakes larger than one cm in size by types, Area B, 40MU141.

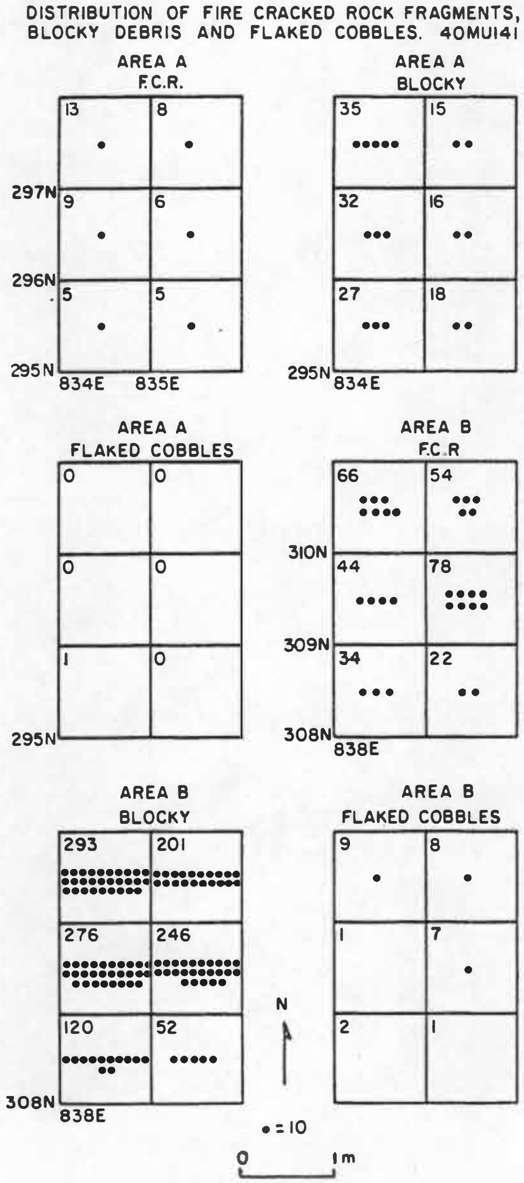


Figure 7.7 Distribution of nonflake debris, fire cracked rock, blocky debris, and flaked cobbles from areas A and B, 40MU141.

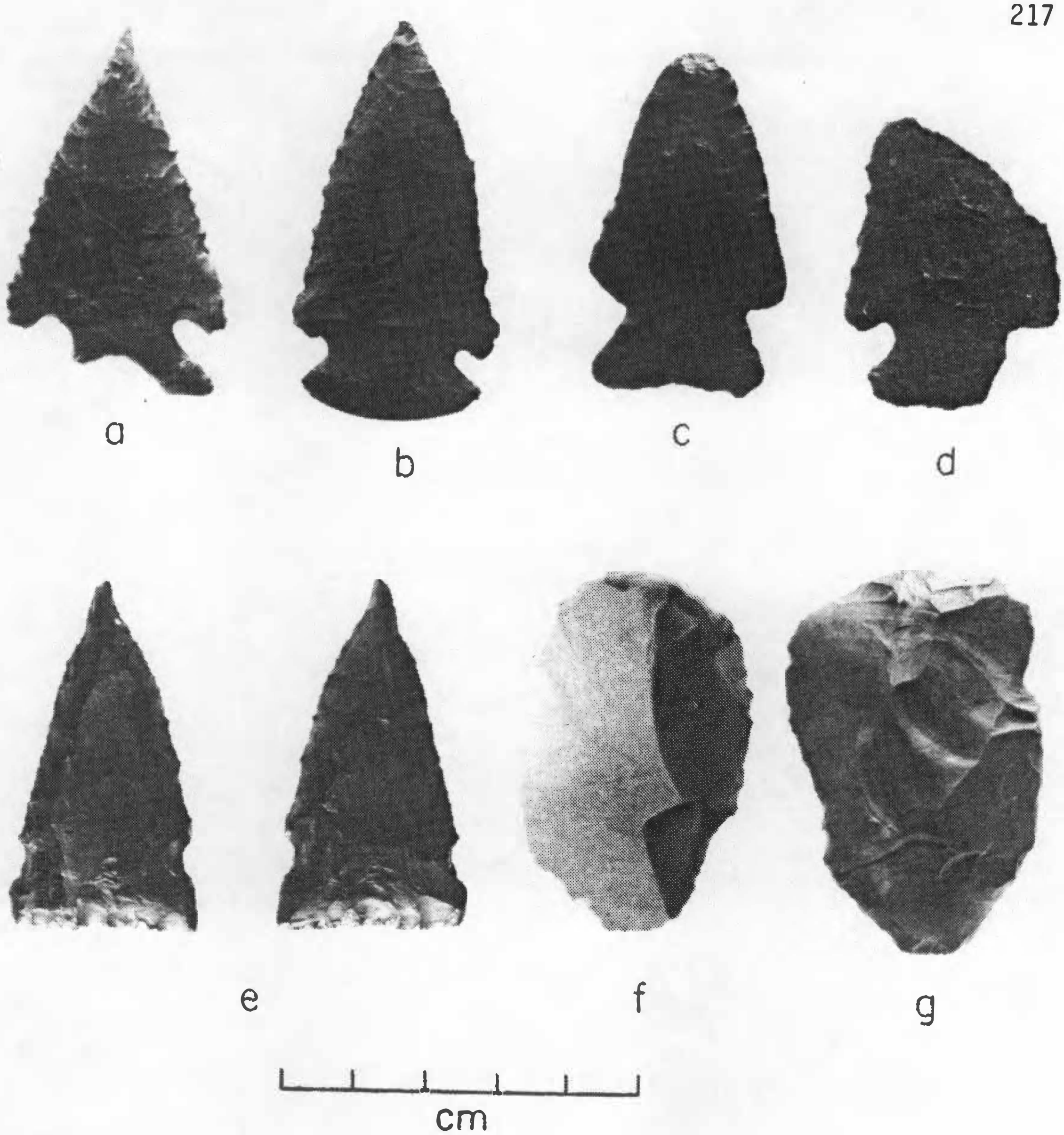


Figure 7.8 Early Archaic artifacts from 40MU141 excavations. a, c-d: Kirk Cluster. b: Plevna. e: Big Sandy. f-g: unifacial scrapers. Specimens a, c, and d are from levels 6 and 7 in Area B. Specimens c and d are heavily waterworn. Specimens b, e-g are from Trench 80D and all are from T1a soil or backdirt except b which is from 112 cm below the surface in sediment below the T1a soil. Specimens e-g are patinated and have been recycled, marginal retouch has exposed unpatinated interiors.

Table 7.1. Chipped stone artifacts by material type, 40MU141.*

Artifact Type	Ridley	Fort Payne	Bigby Cannon	St. Louis	Totals
Projectile Point-Knives	16	38	0	0	54*
Biface Scraper	1	0	0	0	1
Preforms	6	8	0	0	14
Biface Frags.	2	7	0	0	9
Spokeshave	0	1	0	0	1
Denticulate (light duty)	1	0	0	0	1
Pointed Gravers	1	1	0	0	2
Cores	26	20	4	0	50
Drills	0	3	0	0	3
Flake Tools	10	8	4	2	24
Totals	63	86	8	2	159

* The total for projectile points does not include three Early Archaic projectile points made of Fort Payne recovered in Test Area B, or three Early Archaic points of Fort Payne recovered from Trench 80 D. Of the 54 Middle Archaic projectile points and fragments listed on this table, 34 are from areas A and B, 17 are from Trench 80 D, 2 are from Trench 2448, and 1 is from post hole probe 13. All other chipped stone items listed are from areas A and B.

Table 7.2. Flake tools by flake type, 40MU141.

Tool Type	Primary Decort. Flake	Second. Decort. Flake	Tertiary Flake	Broken Flake	Biface Thinning Flake	Total
Spokeshave		1				1
Denticulate (Light duty)		1				1
Pointed Graver		2				2
Light duty Retouched Scraper		1	1			2
Heavy duty Retouched Scraper		3	2	1		6
Light duty Utilized Scraper		1	3	1		5
Heavy duty Utilized Scraper		1	1			2
Light duty Retouched Cutting Tool			2	1		3
Heavy duty Retouched Cutting tool		1				1
Light duty Utilized Cutting tool			2	1		3
Heavy duty Utilized Cutting tool				1		1
Intermediate Retouched Scraper				1		1
Total	0	11	11	6	0	28

Table 7.3. Chipped stone debris by material type, test areas A and B, 40MU141.*

Material Type		Primary Decort. Flakes	Secondary Decort. Flakes	Tertiary Flakes	Biface Thinning Flakes <2 cm	Biface Thinning Flakes 1-2 cm	Broken Flakes	Core Rejuv. Flakes	Blocky Debris	Tested Cobbles	Totals
Ridley	#	27	1380	836	52	244	1460	1	1041	9	5050
	%	56.25%	67.88%	70.97%	80%	75.08%	70.56%	33.33%	78.21%	31%	71.32%
Fort Payne	#	21	580	316	12	75	561	2	250	19	1836
	%	43.75%	28.53%	26.82%	18.46%	23.08%	27.11%	66.66%	18.78%	65.5%	25.93%
Bigby Cannon	#	0	54	21	1	6	40	0	17	0	139
	%		2.66%	1.78%	1.54%	1.84%	1.93%		1.28%		1.96%
St. Louis	#	0	5	0	0	0	2	0	0	0	7
	%		.25%				.09%				.09%
Indeterminate	#	0	14	5	0	0	6	0	23	1	49
	%		.68%	.42%			.29%		1.73%	3.4%	.69%
Totals:	#	48	2033	1178	65	325	2069	3	1331	29	7081
	%	.67%	28.71%	16.63%	.92%	4.29%	29.22%	.04%	18.80%	.4%	

* This table includes only those items larger than 1 cm in size.

Table 7.4. Non flake debris by material type, 40MU141.

Material Type		Fire Cracked Rock	Blocky Debris	Tested Cobbles	Totals
Ridley	#	124	1041	9	1174
	%	36.05%	78.21%	31.03%	
Fort	#	217	250	19	486
Payne	%	63.08%	18.78%	65.52%	
Bigby	#	3	17	0	20
Cannon	%	.87%	1.28%		
Indeterminate		0	23	1	24
Totals		344	1331	29	

Table 7.5. Bifaces and biface reduction debris of Ridley and Fort Payne cherts, 40MU141.

Material Type		Projectile Point-Knives and Frags.	Preforms	Biface Frags.	Biface Thinning Flakes >2 cm	Biface Thinning Flakes 1-2 cm	Biface Thinning* Flakes <1 cm
Fort Payne	#	38	8	7	12	75	309
	%	70.37%	57.14%	77.78%	18.75%	23.51%	35.35% (8854)*
Ridley	#	16	6	2	52	244	565
	%	29.63%	42.86%	22.22%	81.25%	76.49%	64.65% (16,192)*
Totals		54	14	9	64	319	874 (25,046)

* Counts for the biface thinning flakes less than 1 cm in size are based on a sample of 17.45% of the total number of flakes in this size range. Numbers in parentheses are the esimated total number of biface thinning flakes less than 1 cm from areas A and B at 40MU141.

Table 7.6. Summary frequencies of 40MU141 projectile point shape classes.

Attribute:	Attribute State	Number of Cases	Percentage of Cases
Completeness:			
	Complete	7	15.2%
	Basal sections	28	60.9
	Tip sections	4	8.7
	Mid sections	7	15.2
Lateral Edge Outline:*			
	Straight	7	14
	Concave	4	8
	Convex	39	78
	Undetermined	21 (specimens)	
Cross Section:*			
	Biconvex	34	73.9
	Rhomboid	4	8.7
	Plano convex	3	6.5
	Medium ridges	2	4.3
	Bi plano	1	2.2
	Undetermined	2	4.3

* Shape classes follow Cambron and Hulse 1964.

points and possibly some preforms. During the performance of tasks at the site and prior to arrival, some of the projectile points were broken. Others were dulled during processing activities which made resharpening necessary.

Refurbishing of the biface tool kits involved not only resharpening of dulled and broken points-knives, but also manufacture of new points to replace expended ones. Locally available materials were used as much as possible in the fabrication of new artifacts for purely economic reasons: easy accessibility. The locally available material would have included some Fort Payne from the river gravel, primarily small and weathered pieces. In the site area larger pieces of interest for biface manufacture were predominately Ridley. The problem was to locate suitably sized pieces of Ridley which were not too flawed by numerous internal fracture planes. Some of the original equipment (predominantly Fort Payne) would then be discarded for the newly made (predominantly Ridley) bifaces. This sequence of events may have occurred during more than one occupation of the site. Because of the different qualities of Ridley and Fort Payne cherts, the projectile points made at the site may have been significantly different in size and other characteristics than the original points brought to the site, even though they were made by the same group.

One potential problem with this scenerio is the apparent "underrepresentation" of early stage biface reduction debris of Ridley Chert. The rarity of large Fort Payne biface thinning flakes may indicate that little initial bifacial reduction of this material occurred, as would be expected with the above hypothesis. If, however,

bifaces were being manufactured of Ridley chert during the occupation of Cave Spring, we should see the full range of biface reduction debris well represented.

But how many large (greater than two cm) biface thinning flakes should we expect to find given a known number of small (less than 1 cm) biface thinning flakes? Obviously several variables will influence the actual frequency of large and small flake representation, including archaeological recovery techniques, whether or not the entire reduction sequence was conducted at one place, the kind of force applicators used, the amount of pressure flaking (final shaping and retouch) compared to percussion flaking (initial shaping) which is required, the utilization and transport of desirable large flakes and the nature of the original tool blank (e.g. flake or biface). Perhaps relatively few bifaces were actually made <u>on</u> the site, but the projectile point-knives were repeatedly resharpened, thus producing a sample skewed to small flakes.

Experiments have shown that even for diverse kinds of biface manufacture, there are many times more small (less than one cm) flakes produced than large (greater than two cm) flakes (e.g. Ahler 1975:85-94; Henry, Haynes and Bradley 1976; Newcomer 1971). Furthermore, reduction of Ridley from nodules or tabular pieces to bifaces requires considerable "pre-biface" reduction which results in decortication and tertiary flakes, and because of the fractured nature of many Ridley nodules, much blocky debris. These debris categories are all well represented in Ridley chert at Cave Spring and may in fact represent early stages of reduction actually directed toward biface manufacture.

Also, some of the bifaces were manufactured from flake blanks rather than completely bifaced preforms (as evidenced by remnants of ventral flake scars on projectile point knife blades). In biface manufacture initiating with suitable flakes or thinned cores, there may be relatively few large biface thinning flakes removed during biface manufacture. And large thinning flakes may be carried away from a knapping area to serve as tools.

As concerns interpretation of site function, I argue that the occupants, perhaps mostly male hunters who discarded primarily expended Fort Payne biface artifacts and left behind predominantly Ridley Chert biface manufacturing debris, were short-term (though perhaps habitual or repeated) users of the site area. Short-term occupation(s) is supported by the limited variety of artifacts, and by implication, activities represented. All of the materials recovered are those which would be expected in the tool kits and discarded residue of ephemeral hunting parties. Tool fabrication and maintenance, heating and/or cooking, initial game processing, collection of vegetal materials for fuel or food are all activities indicated at Cave Spring and would likely occur during the temporary encampment of hunters. The high proportion of projectile points suggests hunting related activities. The fact that most of the projectile points are broken (Table 7.6) and the presence of a considerable amount of biface thinning-resharpening flakes and other debris indicate retooling and maintenance.

Cave Spring has a distinctive component assemblage which can be contrasted to component assemblages which occur at relatively more complex (semi-permanent?) habitation sites (such as Eva and Ervin) where

a greater diversity of artifacts and activities are evidenced and the artifact composition is not as skewed toward hunting equipment (Figure 7.9 and Table 7.7). And Cave Spring is distinct from lithic workshop components where more initial stage reduction debris and aborted unfinished tools predominate.

The limited relative frequency of flake tools at Cave Spring may represent the relatively specialized nature of the occupation. Retouched and utilized flake tools are relatively unspecialized artifacts which may be used in the performance of many tasks including skinning, butchering, scraping, woodworking, and so forth. It is possible that a higher proportion of these tools in some components may indicate a greater diversity of activities and not just more of the same (cf. Klippel 1971:50). The cluster of three drills in Area A may also represent limited, specialized activity at Cave Spring.

In summary, Cave Spring may represent a limited activity site (e.g. Wilmsen 1968) whose occupants were predominantly male and whose efforts were directed toward hunting related activities such as maintenance, refurbishing and manufacture of hunting equipment, initial game processing, cooking and/or heating and gathering. The charred botanical remains indicate some gathering, but whether it was only for fire wood and tinder or also included nut collecting for immediate and/or future consumption is unknown. Evidence for intensive plant food processing is lacking.

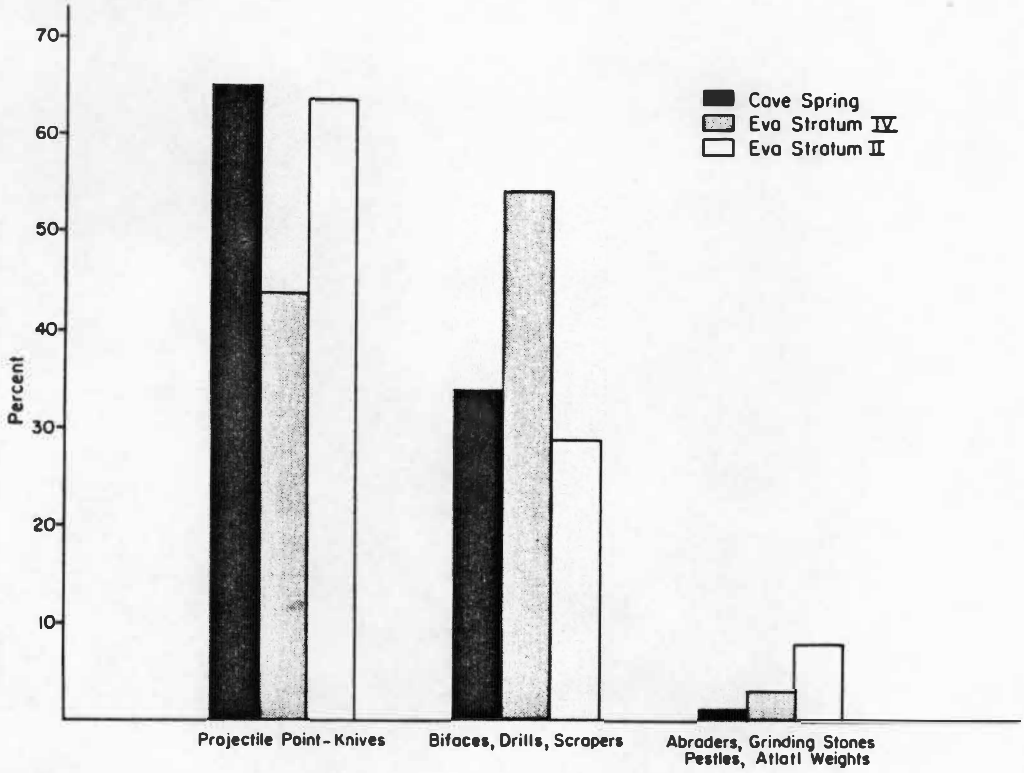


Figure 7.9 Relative frequency of major non-perishable artifact groupings from Cave Spring and Eva site components. Eva site data from Lewis and Lewis (1961:Table 5).

Table 7.7. Crosstabulation of major non-perishable artifact groupings from Cave Spring and Eva Site components.

Site/ Component		Projectile Point-Knives	Bifaces, Drills Scrapers	Abrader, Grinding stones Pestles, etc.	Totals
Cave Spring	o	54	28	1	83
	(e)	(42.6)	(37.2)	(3.2)	
Eva	o	204	255	12	471
Stratum IV*	(e)	(241.6)	(210.9)	(8.4)	
Eva	o	136	61	17	214
Stratum II*	(e)	(109.8)	(95.9)	(8.4)	
Totals		394	344	30	768
		df=4	X^2=61	p<.001	

*This date from Lewis and Lewis (1961:Table 5).

o=observed frequency
e=expected frequency

CHAPTER VIII

CAVE SPRING IN LOCAL AND REGIONAL CONTEXTS: THE EVA HORIZON AND CAVE SPRING COMPLEX

> There are cases that could be documented for eastern North America, where "cultural units" have been defined for sites that actually represent either seasonal or task specific occupation. (L.R. Binford, in Lee and DeVore 1968:287)

Introduction

This discussion is directed toward establishing units of archaeological integration pertinent to the Cave Spring site. The basic problem is that in the study of components which are in various ways related or similar to Cave Spring, the organizational concepts for intersite studies in the area are completely inadequate. Within the Central Duck River Basin, no archaeological phases or complexes have been defined for the Archaic period. We cannot completely remedy this situation here, but we can begin working toward a well defined temporal cultural sequence model.

Interest in proposing an Eva horizon for the middle and western Tennessee region is twofold. First, in comparative studies of broad geographical scope (regional, sub-area, area, or larger scale), needed are integrative unit concepts of larger magnitude than the phase. The horizon is here viewed as an organizational tool for groups of closely related phases which occur within the same time frame (Lehmer and Caldwell 1966). We may, for example, be interested in comparing mid-Holocene hunter-gatherer adaptations on an interregional scale to

examine how broad scale environmental changes affected groups in the Midsouth, Gulf Coast, Plains, Appalachian region, and so forth.

The second reason is that the only defined Middle Archaic horizon which might be seen to encompass the projectile point styles and assemblage at Cave Spring is the Morrow Mountain horizon (Walthall 1980; Chapman 1979). For reasons discussed in Chapter VI, the Morrow Mountain point type (and so the Morrow Mountain Horizon) is here believed to be somewhat of a misnomer for "Eva-Morrow Mountain cluster" (Faulkner and McCollough 1973) artifacts and assemblages in the middle and western Tennessee region. Eva projectile points (including those which may appear in outline similar to Morrow Mountain points), represent a distinctive technological biface reduction tradition and horizon style. Walthall's (1980:58-67) inclusion of the Three Mile phase and Sanderson Cove phase materials within the Morrow Mountain horizon is here viewed as an over-extension of what is otherwise a useful concept.

I argue that the Morrow Mountain horizon concept should, for the present, be restricted to the Southern Appalachian and upper Tennessee River Basin regions (Chapman 1979) to include the Morrow Mountain complex (Coe 1964; Cridlebaugh 1977), Morrow Mountain culture (Purrington 1981), Morrow Mountain phase (Chapman 1977a, 1977b) and the Old Quartz culture (Caldwell 1958). The western extent of the horizon is not presently established and may interdigitate in a complex fashion with the Eva horizon proposed here.

The Horizon Concept Reconsidered

As envisioned here, a horizon can be more than just an historical unit to which isolated finds or sites without phases can be attributed. Horizon styles need not be just, ". . . the horizontal stringers by which the upright columns of specialized regional development are tied together in the time chart" (Willey 1945:55). Horizon styles can provide our initial clues for developing interpretive models of ideological, economic, religious, and genetic groupings in the past. Defining and understanding variability within and among horizons is equally important as looking at inter-horizon variability from a chronological perspective.

Horizons may form an integral concept in studies of past dynamic cultural systems. If we circumscribe or limit our spatial research interests at the phase level we may inhibit our ability to learn and understand spatial variability, patterning, and processes. Phases are often expediently defined (given limited research bounds or geographical interests of archaeologists), and probably often do not include the full range of site types or actual geographical space used by the band(s) or lineage(s) which were responsible for the formation of those portions of the archaeological record recognized as phases (cf. Binford 1964).

The horizon is the same kind of unit concept as the phase (Dunnell 1971) but its larger scope may allow us to gain a more accurate perspective on the complexities of artifact, occupational, component, and assemblage variability which can result from the operation of a broadly integrated cultural group in the past (perhaps a series of exogamous bands forming several behaviorally integrated and

intermarrying lineages). The hunting-gathering bands which created the remains we recognize archaeologically as horizons may in many instances have been socially, ideologically, and to some extent genetically related and should reflect broadly similar adaptations to comparable regional environments. Obviously, viewed in this light, the horizon concept is a dynamic one which will need continued refinement, testing, and development in each instance of its application.

Proposed, then, is a horizon concept which differs significantly from the definition presented by Willey and Phillips (1958:42-43). I believe that the horizon (as distinct from horizon style) can be of much greater utility to archaeology if indeed we do recognize a distinct taxonomic (hierarchical) relationship between horizons, phases, and components. The need for redefinition of the horizon, or the need for a unit which includes closely related phases, has previously been indicated (Lehmer and Caldwell 1966; Lehmer 1971; Krause 1977).

Lehmer and Caldwell's (1966) original redefinition of horizon as a unit which can include several related phases is essentially the same as the use of horizon in this study. Lehmer (1971), however, changed this usage in his later work because of the notion that horizons lack time depth (Krause 1977; Willey and Phillips 1958; Krause 1977), and because horizons have generally not been defined on the basis of previously established phases.

Lehmer's (1971) variant is an integrative unit which is designed to be intermediate between horizon and tradition and includes several related phases. A variant has more time depth than a horizon but less spatial dimension.. I retain the term horizon rather than variant in

this study for several reasons. The Eva Horizon proposed here has a large enough geographical scope to constitute a horizon and may have no more time depth than a phase. Therefore, variant as defined by Lehmer is not wholly appropriate here.

A horizon must have some time depth to be a logical archaeological concept. Horizon styles, on the other hand, may appear, spread, and disappear rapidly in archaeological time and several distinct horizon styles may appear within a single phase. Willey and Phillips (1958:42-43) appear to interchange horizon and horizon style in parts of their discussion. Time is required for dispersion of distinctive traits throughout the region of a horizon, and any group of traits used to define a horizon will not appear and disappear instantaneously. Therefore, it is only logical to allow at least as much time depth for a horizon as for a phase, though the content which defines a horizon will be less than that of a phase due to its more encompassing nature and larger geographical scope. Furthermore, the characterization of an Archaic horizon as composed of related phases has been done in practice (e.g. Walthall 1980), even if this usage has not been previously discussed from a theoretical perspective.

As presented here, a horizon is composed of a series of related phases, subphases, and components, in much the same kind of relationship as exists between components and the definition of phases. The horizon concept can then provide a useful analytical concept (that of a broadly integrated or behaviorally comparable group occupying a region rather than a locality), rather than simply a chronological reference point. There are many instances in which a more comprehensive and accurate

perspective of the operation of a human behavioral system in the past can be derived from integration of data from sites representing more than one contemporary phase in a region.

For example, perhaps there is information on site types A, C and D in phase X but adequate information on site type B only in phase Y. If initial approach to the problem of defining a group's annual range of activities and site types is from a horizon perspective, we may develop an initial model may be developed which is more accurate and precise than if the problem is approached the problem from the phase level of analysis. Obviously, archaeologists commonly do this, substituting data or models from another region to help fill interpretive-analytical gaps in their immediately available information. By developing the horizon concept as an archaeological construct of the same nature as the phase, it can provide a useful unit of analysis in the common instances where the variability in the archaeological record is not well defined within a more limited time and space framework, such as the phase.

The horizon as an analytical unit is important for identifying or studying segments of temporal sequences within particular regions or areas. Equally important is the comparative investigations of coeval or technologically similar horizons in different regions as a means of studying the adaptive processes of distinct groups contending with different (or similar) environmental and social circumstances. Such studies could eventually form a body of information complementary to that derived from modern comparative studies of hunter-gatherers aimed at delimiting world-wide patterning useful in modeling behavioral systems (e.g. Binford 1980; Kelly 1980; Smiley et al. 1980).

Archaeologically recognized horizons are characterized in part by horizon styles, distinctive artifacts, art forms, features, burial types, or other characteristics which occur over a "large" area during a relatively brief period of time (Willey and Phillips 1958:32). For prehistoric hunter-gatherer groups in areas of North America lacking consistent preservation of perishables, projectile point types are the predominant horizon styles or markers because they can be recovered and identified at a wide range of site types.

The definition of horizon styles (and so horizons) can be problematical and fraught with pitfalls, however, when chipped stone artifacts are the primary basis for their recognition. The reasons for this are inherent in the unstable nature of chipped-stone projectile points in their systemic context. Lacking a well documented model accounting for variability in multistage projectile point types (such as Eva), the recognition of what morphological forms represent the same emblemic style can become essentially guesswork. It is not surprising, therefore, that many Archaic projectile point types or type clusters have not been as reliable in identifying horizon styles as are numerous ceramic types. Group organization and the nature of intergroup contacts will, obviously, affect the geographical extent of styles and how faithfully any given style is reproduced in different setting. Furthermore, there is no reason to expect Archaic horizons to be on the same order of geographical or temporal magnitude as Formative horizons.

Eva Horizon: Toward a Definition

The Eva horizon is presently viewed as encompassing the period between about 7,500 and 6,500 radiocarbon years before present (Table 8.1), approximately coeval with the Morrow Mountain horizon, and including Eva components (as recognized by the presence of Eva projectile point-knives) throughout the middle and western Tennessee region, northeastern Mississippi (Bense 1983; Brookes 1979; Connaway 1977; Thorne, Broyles, and Johnson 1981), and northern Alabama (Cambron 1973; Cambron and Waters 1961; Dejarnette, Kurkjack, and Cambron 1962; Futato 1975, 1977; Griffin 1974; Travis, Travis, and Lenser 1960: Work 1961).

In addition to these and other scattered components, the Eva horizon includes the Eva phase (Lewis and Kneberg 1959) in the Lower Tennessee valley (and here considered to include both Eva I and Eva II projectile point types) and the Cave Spring complex (discussed below) in the CDRB. The Eva phase should not be considered typical of the horizon, as its best known component (at the Eva site, Lewis and Lewis 1961) probably reflects a specialized task group camp or at best only a limited segment of the annual range in occupation types. There is no reason to expect a typical site type by which to characterize the Eva horizon or phases within it, because of the considerable functional variability of occupations at sites of temporary, intermittent, or long-term residence. Part of the artifact aggregate attributed to the Three Mile phase by Lewis and Kneberg (1959), including the Eva II points, also belongs within the Eva horizon as envisioned here.

Table 8.1. Eva Horizon radiocarbon dates from the Middle South, 6500-7500 B.P.

Site	County	State	Sample #	B.P. Date	B.C. Date	Sigma	Material	Reference
				5570 yr half life				
Ervin 40MU174	Maury	TN	GX-9082	6645	4695	185	nutshell	Hofman 1983
Cave Spring 40MU141	Maury	TN	UGa-3752	6885	4935	90	charcoal	Hofman 1982: Table 1
			UGa-3753	6540	4590	110	nutshell	
			A-2362	7250	5300	350	charcoal	
Eva 40BN12	Benton	TN	M-357	7150	5200	500	antler	Crane 1956:666
Eoff III 40CF107	Coffey	TN	UGa-777	6525	4575	165	charcoal	Faulkner 1977:281
Anderson 40WM9	Williamson	TN	GX-8215	6720	4770	220	charcoal	Joerschke 1983: Table 1
			GX-8365	6495	4545	205	charcoal	
Stucks Bluff 1LR34	Lamar	AL	GX-907	6450	4500	120	charcoal	DeJarnette et al. 1975:113
Walnut 22IT539	Itawamba	MS	DIC-1952	7303	5303	95	charcoal	Bense 1983:Vol. 1, p. 5.163
			DIC-2802	7468	5518	85	charcoal	

Eva projectile points indicate the occurrence of a number of other Eva components throughout the middle and western Tennessee region (Alexander 1982; Faulkner and McCollough 1973; Lindstrom 1981; Morse and Morse 1964; Smith 1979). These are part of the Eva horizon but are attributable to no presently defined phases.

In rudimentary form, the Eva horizon at this stage of analysis includes a series of components, most of which are poorly documented, which exhibit a relatively distinctive multistage projectile point style and which are distributed over a considerable portion of the Middle South. Such a large scale and coarsely conceived concept is of little immediate utility. It is important, however, to work towards well defined large scale integrative units such as the horizon. Understanding of past hunter-gatherers is limited in a direct way by the focus and scope of research interests and investigations. If only artifacts from individual sites are studied, or those from a few closely spaced and similar sites, approaches and methodologies for interpreting and understanding past cultural (social, political, economic) organizations of larger magnitude than bands or lineages (as represented by archaeological phases) will not be developed.

The Cave Spring Complex: Eva Horizon Along the Central Duck

As used here, a phase is not a series of components which "look alike" artifactually, statistically, or as assemblages. Such isomorphic components may indeed be attributable to the same phase, but they do not represent the entire polythetic set. An archaeological phase includes a variety of site types, assemblages and artifact types which are

attributable to the operation of a single group in the past, perhaps one or more related bands or lineages. The phase is a polythetic set of components, roughly congruous to Clarke's (1968) archaeological culture or cultural assemblage. It is important, however, to emphasize that there need be very little "overlap" in the component assemblages attributed to the same phase. As indicated, we can expect some components of a given phase to exhibit very little functional similarity to other components in the same phase. We must, nevertheless, recover some diagnostic trait, feature, or artifact in order to be able to assign limited activity components to their appropriate cultural assemblage or phase.

The Eva horizon components in the CDRB should eventually be included in a new phase or within the Eva Phase of the Lower Tennessee valley region. The other CDRB Eva assemblages are as yet unanalyzed or not reported so a systematic comparison of these components is not yet possible. If, in pending studies, the CDRB Eva assemblages are shown to differ in a stylistically significant manner from the Eva phase assemblages of Lewis and Kneberg (1959), then definition of a Cave Spring phase will be appropriate. Until we have conducted an actual comparison between the existing Eva phase and the CDRB Eva components it is appropriate to consider Cave Spring and nearby Eva components as a complex or putative phase. This follows the usage of complex by Coe (1964), Wood (1961) and Wormington (1957). Definition of the Cave Spring complex is intended as an intermediate step in the refinement of the extant Eva phase or in the definition of a new phase of the Eva horizon for the CDRB, whichever the case may be.

The Cave Spring complex includes the Eva occupation(s) at the Cave Spring site, dated to between 7,300 and 6,500 radiocarbon years ago; the Eva components at the Ervin site (40MU174) dated to 6,645±185 (Hofman 1983); Eva components at the Bench (40MU433) and Cedar Creek (49MU432) sites (Amick and Hofman 1981); Eva components in several rockshelters in the CDRB (Entorf 1981) and upland limited activity sites (e.g. Smith 1981:130) as well as isolated Eva point finds. A variety of site types are represented.

At Ervin a discrete Eva horizon shell filled pit (dated to 6,645 RCYBP) represents part of a shell midden site at which a wide variety of domestic, processing, maintenance, and social activities are indicated. Ervin may have served as a residential camp during one or more seasons of the annual cycle. The Cave Spring site component may represent a repeatedly utilized hunting-processing camp as discussed above. Limited activity sites which served as hunting or collecting camps or perhaps temporary stopover sites may be represented by Eva components in several small rockshelters along the Duck River and its tributaries. Hunting stands or other limited activity sites may be represented by isolated finds of Eva points and upland sites with Eva points and only limited lithic debris. Such sites are often multicomponent (e.g. Smith 1981). Other site types which can be predicted, but more problematical to observe archaeologically, are collecting stations and sites where primarily perishable remains would have been lost or discarded. Likewise chipping stations and quarries or workshops are generally difficult to attribute to specific archaeological phases because the primary manufacture and reduction debris often reflects little sensitive

stylistic information, as compared to finished artifacts. But such site types were important during most periods, regardless of their assignability to particular complexes. Caches also can be expected, but discovery of even non-perishable caches is problematical and usually accidental.

Ongoing studies of surface, rockshelter, shell midden, and buried alluvial sites in the CDRB which contain Eva horizon materials should enable a detailed comprehensive statement about the component variability within the Cave Spring complex in the future. When component assemblages have been studied in terms of functional, seasonal, technological, organizational, and situational variation, it will be feasible to analyze component assemblage variability within the framework of modeling the overall adaptive structure of the prehistoric hunters and gathers responsible for the complex. This will represent one more step toward the integration of the archaeological record in the Middle South for the study of past behavioral systems.

CHAPTER IX

OVERVIEW AND PERSPECTIVE

A Middle Archaic component at the Cave Spring site, located by the Duck River in middle Tennessee, has provided the focus for this study. The portion of the site investigated consisted of a concentration of chipped stone, gravel and charred botanical remains buried in mid-Holocene terrace sediments. A series of three radiocarbon dates based on the charred wood and nutshell fragments associated with the stone materials indicates that occupations of the site occurred between 6500 and 7300 radiocarbon years before present.

The site's occupants apparently processed and consumed hickory nuts and deer meat at the site, both of which represent first line or key foods during the Archaic period. The actual importance of these items to the prehistoric diet during the occupations at Cave Spring is difficult to assess because of poor preservation. Only very dense, decay resistant deer elements, specifically molars and an astragalus, were recovered in identifiable condition.

The variety of chipped stone artifacts is quite limited and consists primarily of discarded projectile point-knives, relatively few flake tools serviceable for various cutting and scraping activities, a few drills and preforms, and a large quantity of flake debris primarily from late stage manufacture and maintenance or recycling of bifacial artifacts. These remains are compatible with expectations about an assemblage that would result from the activities of hunters at a temporary camp. There is no evidence for permanent site furniture, no

specialized vegetable food processing tools, or subterranean storage facilities.

Bearing in mind the small excavation area, these factors may indicate that food storage is not an important factor in the interpretation of recovered plant remains from the site. Several species in addition to hickory, which provide edible fruit in the Fall, are represented at Cave Spring. These include hackberry, persimmon and honey locust. Only wood charcoal, rather than seeds, from these three species was recovered, however, so botanical evidence for a Fall occupation is tenuous.

Cave Spring represents only one of several site types in the CDRB representing the Eva horizon and the Cave Spring complex, which includes the Eva components within the CDRB. These components include lithic workshops, hunting stands, hunting-collecting-processing camps, habitation sites, rockshelters and isolated occurrences of lost or discarded artifacts (Amick and Hofman 1981; Entorf 1981; Hall 1983; Hofman 1983; Klippel and Turner 1981; Smith 1981). Considerable variability can be expected among these components in assemblage composition and overall "appearance." The formal, functional and frequency variations in artifact samples from Cave Spring complex components is expected to be substantial. The complex is not viewed as a series of components which look alike in terms of relative artifact and debris frequencies. Rather, the components represent limited segments and/or palimpsests of the overall variety of remains which resulted from the annual range of activities engaged in by mid-Holocene hunter-gatherers in the CDRB.

Primary concerns of this study have included evaluation of the integrity of buried cultural materials at Cave Spring, and to illustrate the critical nature of such information for realistic integrative studies of the archaeological record. The key first step toward investigation of component assemblages, intrasite and intersite comparisons and regional settlement-subsistence systems is to develop accurate interpretations of each component or site.

A second emphasis has been directed toward the ultimate problem of interassemblage comparison, but more specifically toward the definition of chipped stone artifact types which can serve in evaluation of cultural relationships between components as well as in defining assemblage functional variability. The actual importance of these contextual and typological studies becomes apparent in the broader context of mid-Holocene man-land relationships and in the study of group organization and intergroup relationships.

The Cave Spring site artifacts were recovered from an alluvial terrace environment which provided the contextual stage for investigation of the collection's integrity. Two problems, determining the number of depositional surfaces and whether the materials were waterlain or humanly deposited, were approached through an analysis of river gravel and by refitting chipped stone pieces. These problems are confronted by archaeologists worldwide and the procedures used here should be appropriate for many other alluvial site studies.

Analysis of the river gravel included investigation of the vertical and horizontal distributions, breakage and color. Study of the gravel indicated that it had probably been deposited on a single surface with

some gravel subsequently dispersed vertically due to natural processes. The frequency of reddened, broken gravel associated with the chipped stone is significantly higher than that found in natural gravel deposits nearby. This difference was interpreted to reflect the use of gravel at the site for heating or stone boiling activities.

Refitting of chipped stone artifacts allowed evaluation of the interpretation based on river gravel that materials were originally deposited on a single surface. Conjoinable pieces derived from single chipping episodes were vertically dispersed by natural processes through about 50 cm of sediment. The vertical distribution of chipped stone coincided with the distribution of gravel and exhibited a single peak density. These observations show that the cultural materials had good horizontal integrity and were originally deposited on a single surface.

Analysis of the projectile point-knife sample provided one means of approaching the problem of how many occupations had occurred on that surface and whether more than one cultural group was represented. A consideration of chipped stone artifact typology from a systemic perspective led to the development of a multistage type concept. This concept provides for the inclusion of projectile point-knives exhibiting significant morphological and functional variability within the same cultural-temporal or multistage type. An Eva biface reduction system was proposed which allows us to realistically view the formal variation in "Eva" and "Morrow Mountain" projectile point-knives from Cave Spring as the end products of various actions performed by the same cultural group. An argument has been presented based on the variation in selected attributes that, when viewed collectively in the Middle

Tennessee region, specimens from these two traditionally recognized "types" actually exhibit a continuum of variation reflecting the particular sequence of activities in which each artifact was used and the individual circumstances of its manufacture, use, maintenance, and discard. The primary conclusion of the typological study is that the Morrow Mountain type, as recognized in the western and middle Tennessee region, may simply be part of the Eva biface system and not a distinct type directly comparable to the Morrow Mountain type of the southern Appalachian region.

Continued studies of archaeological materials with emphasis on accurately defining the context of deposition and determining the extent of post-depositional disturbances will provide an important base for investigation of prehistoric activities attributable to specific groups and for more realistic interassemblage comparisons. Development of the multistage type concept for investigation of Archaic biface reduction systems should eventually enhance study of component interrelationships and aid interpretation of functional, stylistic, and situational variability in these chipped stone artifacts. These various contextual and typological inquiries should facilitate improved integration of the archaeological record toward studies of past human behavior.

Preliminary survey and testing at Cave Spring has enabled the documentation of a significant buried Eva Horizon component of high contextual integrity. Additional investigation at this site could provide information on intrasite patterning of artifacts, features, and debris which is pertinent to analyses of prehistoric activity loci and discard locations. Cave Spring appears to have been a limited activity,

but probably repeatedly used, occupation surface. More importantly, the buried stratum appears to be relatively intact and can provide fairly high resolution information for studies of assemblage content and spatial associations.

The gravel and refitting analyses with the Cave Spring collection made possible reasonable interpretation of assemblage context and integrity for the site's buried Eva component. Appraisal of projectile point-knife variability at Cave Spring from the perspective of systematic chipped stone tool reduction, provides a basis for reconsideration of Eva Horizon intercomponent comparative studies. Confrontation of such mundane matters as assemblage context and "cultural assignment" are essential steps in the study of every artifact assemblage or aggregate. Otherwise, realistic appraisals cannot be made concerning the appropriateness of our collections for use in specific analytical contexts.

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VITA

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