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Cover: WPA Crew at the Ward Site (Courtesy of the W. S. Webb Museum of Anthropology).

PREFACE

Since its creation in 1966, the Kentucky Heritage Council has taken the lead in preserving and protecting Kentucky's cultural resources. To accomplish its legislative charge, the Heritage Council maintains three program areas: Site Development, Site Identification, and Site Protection and Archaeology. Site Development administers the state and federal Main Street programs, providing technical assistance in downtown revitalization to communities throughout the state. It also runs the Certified Local Government, Investment Tax Credit, and Restoration Grants-in-Aid programs.

The Site Identification staff maintains the inventory of historic buildings and is responsible for working with a Review Board, composed of professional historians, historic architects, archaeologists, and others interested in historic preservation, to nominate sites to the National Register of Historic Places. This program also is actively working to promote rural preservation and to protect Civil War sites.

The Site Protection and Archaeology Program staff works with a variety of federal and state agencies, local governments, and individuals to assist in their compliance with Section 106 of the National Historic Preservation Act of 1966 and to ensure that potential impacts to significant cultural resources are adequately addressed prior to the implementation of federally funded or licensed projects. They also are responsible for administering the Heritage Council's archaeological programs, which include the agency's state and federal archaeological grants; organizing this conference, including the editing and publication of selected papers; and the dissemination of educational materials, such as the Kentucky Before Boone poster. On occasion, the Site Protection and Archaeology Program staff undertakes field and research projects, such as emergency data recovery at threatened sites.

The Site Protection Program Manager also is the Director of the Kentucky Archaeological Survey, which is jointly administered by the Kentucky Heritage Council and the University of Kentucky Department of Anthropology. Its mission is to provide a service to other state agencies, to work with private landowners to protect archaeological sites, and to educate the public about Kentucky's rich archaeological heritage.

This volume contains papers presented at the Seventeenth Annual Kentucky Heritage Council Archaeological Conference. The conference was held at Western Kentucky University, in Bowling Green, Kentucky on March 26-27, 2000. Dr. Darlene Applegate was in charge of conference details and local arrangements for this conference. Her efforts are greatly appreciated. Heritage Council staff that assisted with conference proceedings included Site Protection Program Manager Thomas N. Sanders, as well as Staff Archaeologist Charles D. Hockensmith.

I would like to thank everyone who has participated in the Heritage Council archaeological conferences. Without your support, these conferences would not have been as successful as they have been.

David Pollack
Site Protection Program Manager
Kentucky Heritage Council

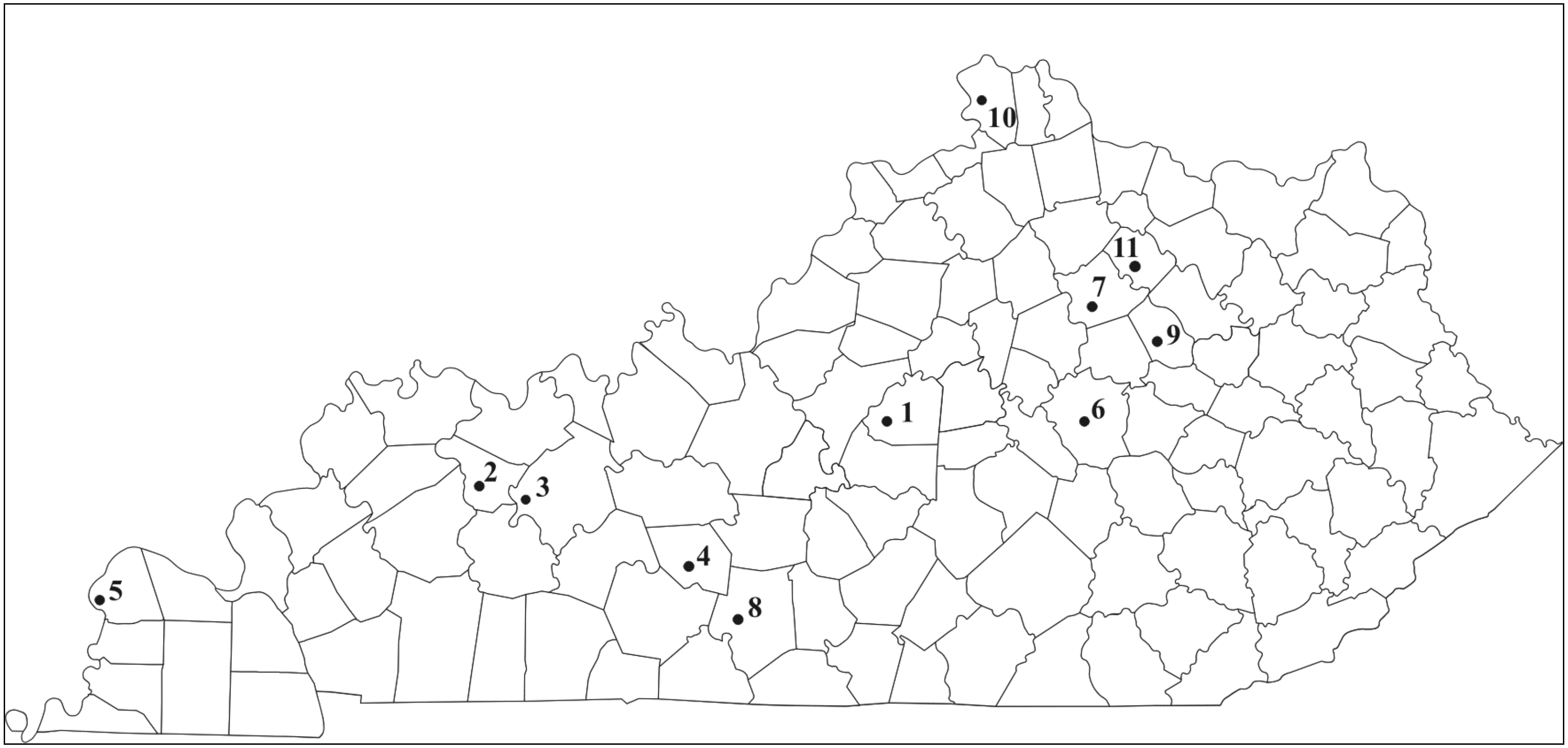

Figure 1. Location of Major Sites and Project Areas in this volume: 1, Upper Rolling Fork and Beech Fork Drainages; 2, Cypress Creek Drainage; 3, Indian Knoll, Ward, and Barrett; 4, Short Cave; 5, Wickcliffe Mound; 6, Broaddus; 7, McConnell's Homestead; 8, Bell's Tavern; 9, 15Mm137; 10, Maplewood; 11, Neal-Rice.

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PALEOINDIAN POINTS FROM THE UPPER ROLLING FORK AND BEECH FORK DRAINAGE BASINS IN CENTRAL KENTUCKY

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ABSTRACT

Relatively few Paleoindian points have been reported from the upper Rolling Fork and Beech Fork drainage basins in central Kentucky. Recent work with farmers and private collectors in this area, however, indicated that the paucity of Paleoindian points is primarily due to a lack of professional investigations. A survey of artifact collections in the study area documented more than 50 Paleoindian points. These include 20 fluted Early and Middle Paleoindian (Clovis, Gainey, and Cumberland), and 32 unfluted Late Paleoindian (Quad, Beaver Lake, Dalton, and Hardaway) varieties. This paper focuses on the distribution of Paleoindian points in the study area, the procurement and use of local vs. extralocal cherts, variability within recognized types, and changes in lithic technologies.

INTRODUCTION

The southeast portion of the continental United States is crucial to understanding early human colonization and occupation of the New World. Large numbers of Paleoindian artifacts have been recovered from this region. The diversity of projectile points, especially during Late Paleoindian times, is so large that the region appears to have been a center of technological and social innovations. Several areas contain evidence of continuous habitation, making the Southeast an ideal laboratory for examining the cultural and technological adaptations associated with the transition from late Pleistocene to early Holocene climatic conditions.

Whether one accepts a founding pre-Clovis migration or not, it is traditionally believed that Early Paleoindians were the first to settle eastern North America. This appears to be well supported by large numbers of Paleoindian points compared to very sparse and contentious evidence for earlier tools. Groups entering the continental United States from the north or northwest would have encountered major river valleys (e.g., the Missouri, Mississippi, Platte, and Arkansas) that offered favorable transportation arteries to the south and east (Anderson 1996:36). Once the Mississippi River was reached, the

Ohio, Tennessee, and Cumberland Rivers provided easy access to more remote regions in the Southeast. These river valleys were rich in food resources as well as localized deposits of high-quality cherts from which stone tools were fashioned. Based on previous surveys of private and institutional collections, fluted points tend to be concentrated along these three rivers in the western and central portions of Kentucky and Tennessee (Anderson 1996:35-36; Rolingson 1964; Rolingson and Schwartz 1966). However, these studies, particularly those based primarily on private collections, may be biased by collector strategies (i.e., collecting on large alluvial terraces). Surveys of collections in upland regions and in the headwater reaches of smaller rivers and streams might reveal a more dispersed and wide ranging settlement pattern than previously thought.

This paper consists of an inventory and analysis of Paleoindian artifacts collected from sites in the upper reaches of the Rolling Fork and Beech Fork river basins in central Kentucky. Relatively few professional investigations have been conducted in these drainage basins, and investigations of Paleoindian sites have been especially rare. Only three Paleoindian sites had been previously recorded in these drainage basins (Ray 2003). This paucity of Paleoindian sites was primarily due to a lack of professional archaeological investigations in Marion and Washington counties, rather than an absence of these early prehistoric sites. The purpose of the survey was to determine relative densities of Paleoindian point types and sites through a survey of private artifact collections. Other research topics that are addressed include changes in the procurement and use of local versus extralocal chert resources, and changes in lithic technologies.

STUDY AREA

The study area is located in the headwater regions of the Rolling Fork and Beech Fork rivers, which occur primarily in Marion and Washington counties, respectively (Figure 1). Portions of these drainage basins, however, extend into neighboring Boyle, Casey, and Nelson counties.

The upper Rolling Fork River valley is located along Muldraugh Hill, which separates the Outer Bluegrass Region on the north and east sides from the Mississippian Plateaus Region on the south and west sides. The highly dissected portion of Muldraugh Hill comprises the western section of the Knobs Region. The upper Beech Fork River valley, on the other hand, is located on the southwest side of the Outer Bluegrass Region just north of the Knobs. This study area is especially diverse in plant and animal resources as well as chert resources (Pollack 1990:7-8; Ray 1998a:11-28, 2000a:97-104).

The Rolling Fork and Beech Fork drainage basins comprise the southern half of the Salt River principal drainage basin and management area (Pollack 1990). The Rolling Fork and Beech Fork rivers join in western Nelson County near Boston, Kentucky. The Rolling Fork River continues northwest until it joins the Salt River near Pitts Point in western Bullitt County. The Salt River then joins the Ohio River a short distance downstream at West Point.

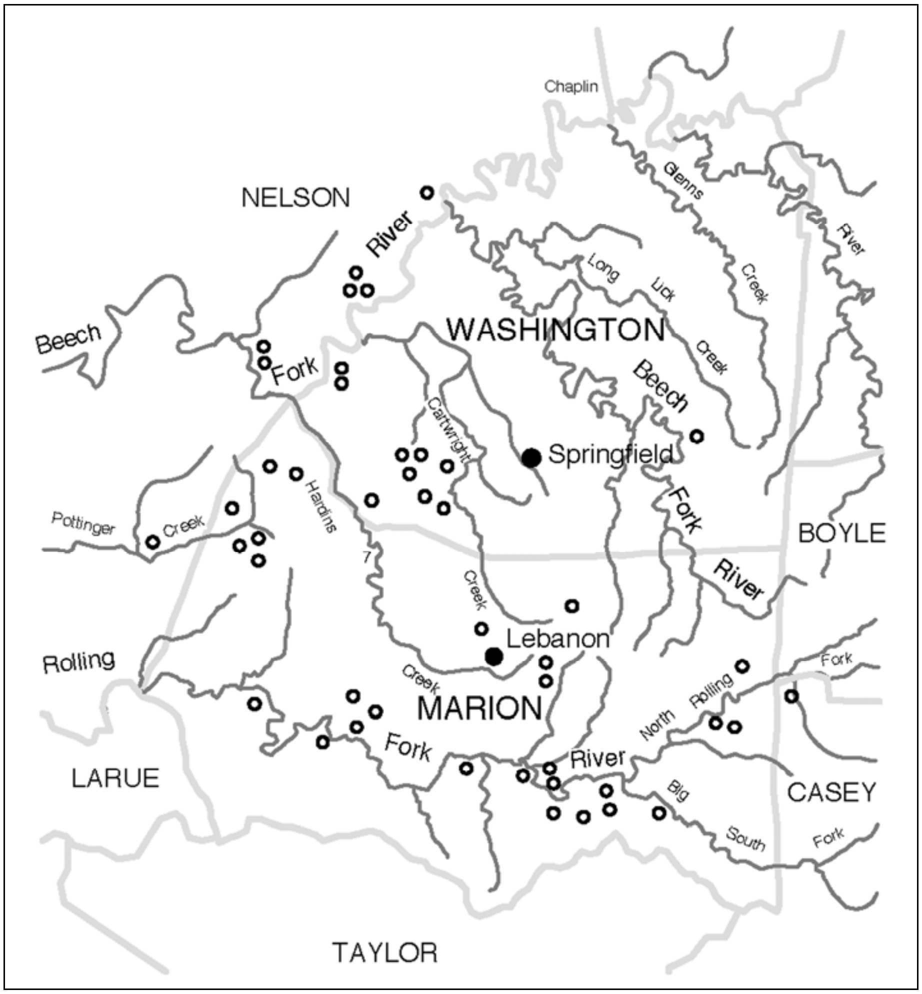

Figure 1. Distribution of Paleoindian Sites in the Study Area.

The headwater areas of the Rolling Fork and Beech Fork rivers have incised deeply into Paleozoic strata since early Pleistocene times. The higher elevations of the Rolling Fork drainage basin (i.e., the Muldraugh Hill Escarpment and outlying knobs) are composed of Mississippian-age formations. The Muldraugh member of the Borden formation is the principal chert-bearing unit in the Mississippian system (Ray 1998a, 2000a). The Harrodsburg formation also produces chert but much of it is undesirable as a chipped-stone resource.

The lower elevations in the Rolling Fork River valley are composed of several Devonian and Ordovician formations. Of these, the Boyle (Devonian) formation produces important quantities of chert (Ray 1998a, 2000a). The Gilbert member of the Ashlock formation (Ordovician) also contains chert but in minor quantities compared to the Muldraugh, Harrodsburg, and Boyle units.

The lower elevations of the Beech Fork drainage basin are composed primarily of Ordovician-age formations, whereas the higher elevations are composed of Silurian and Devonian-aged formations. The Brassfield (Silurian) formation is the principal chert-bearing unit in Washington County; however, small quantities of Muldraugh chert, Boyle chert, and Gilbert chert occur in northern Marion County at the heads of Hardins Creek, Cartwright Creek, and the Beech Fork River.

RESEARCH METHODS

The results of this survey are based on surface finds in twenty private collections. The vast majority of collections that were examined contained one or more Paleoindian points. Informants were asked many questions regarding purported Paleoindian artifacts in their collections. Foremost among these was who discovered the specimen and where it was found. If neither could be determined, those specimens were excluded from the study. Fortunately, a majority of Paleoindian specimens used in this study were still in the possession of the individuals who found them. Several specimens had been purchased but most had been purchased directly from the individuals who found them. Purchased specimens were carefully scrutinized for tell-tale signs of replicas such as popular exotic raw materials sold at knap ins (e.g., Burlington chert, Edwards chert, Knife River flint, obsidian), unpatinated flake scars, traces of foreign substances that mimic patinas, perfect or pristine condition (i.e., absence of nicks or other flaws), and relict slab saw facets.

Whenever possible, the sites where Paleoindian points were found were visited to record the exact location on a topographic map and to determine the condition of each site. Formal archaeological surveys of site locations, however, were beyond the scope of this project. The survey resulted in the documentation of 52 Paleoindian points and the recording of 36 Paleoindian sites.

Most of the sites reported here as Paleoindian are not single component. Based on diagnostic Archaic and/or Woodland artifacts that were observed in private collections from sites that yielded Paleoindian points, most sites are multicomponent. However, some of the Paleoindian sites located in remote upland areas might contain single component deposits. The number of Paleoindian sites and points in this survey are relatively small for meaningful statistical comparisons. Nevertheless, the numbers are considerably larger than anticipated, and there appear to be enough data to address general trends in settlement patterns, the selection and use of chert resources, and lithic technologies.

PALEOINDIAN SURVEY RESULTS

Paleoindian points in the study area are divided into two broad categories: fluted and unfluted. Fluted points are generally long, lanceolate, unnotched forms with distinctive flutes on both faces. They are generally affiliated with the Early Paleoindian (11,500-11,000 B.P.) and Middle Paleoindian (11,000-10,500 B.P.) periods. Fluted points are composed of three types: Clovis (Figure 2), Gainey (Figure 3), and Cumberland (Figure 4). Clovis points are Early Paleoindian in age, whereas Gainey and Cumberland points are generally considered to be Middle Paleoindian (Tankersley 1996:22-33).

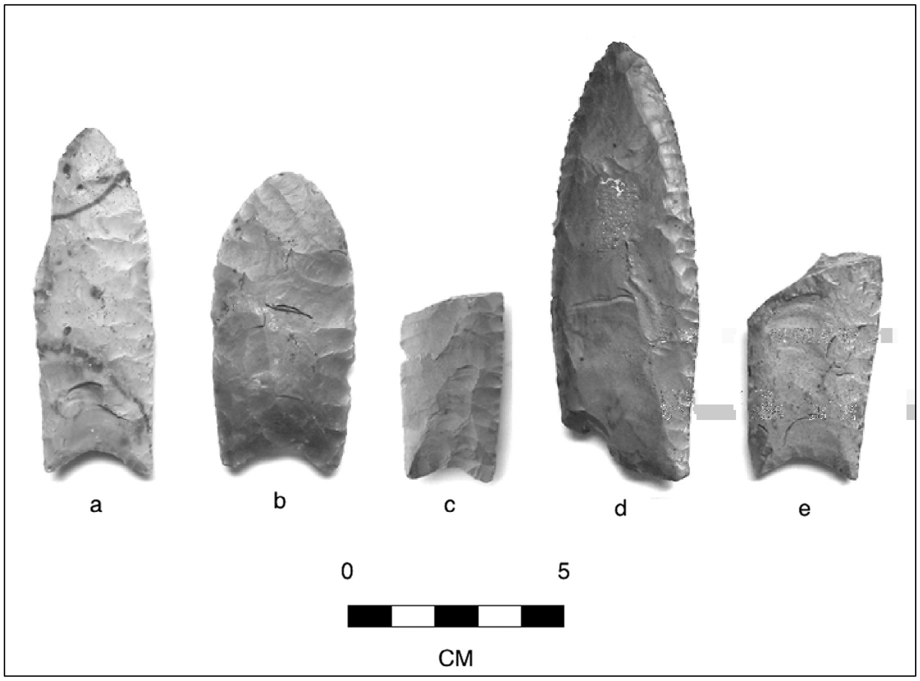

Figure 2. Clovis Points.

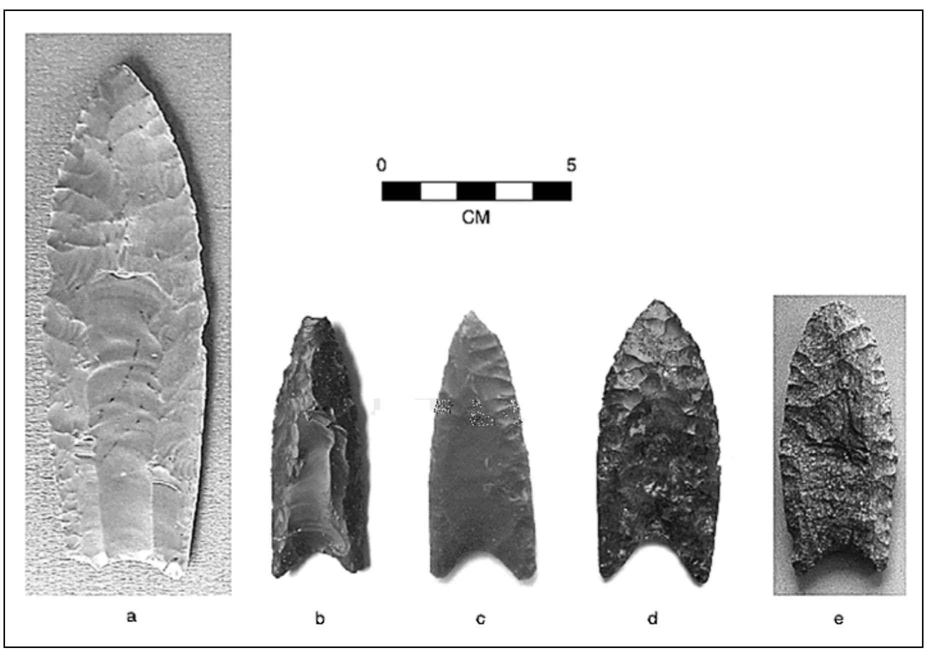

Figure 3. Gainey Points.

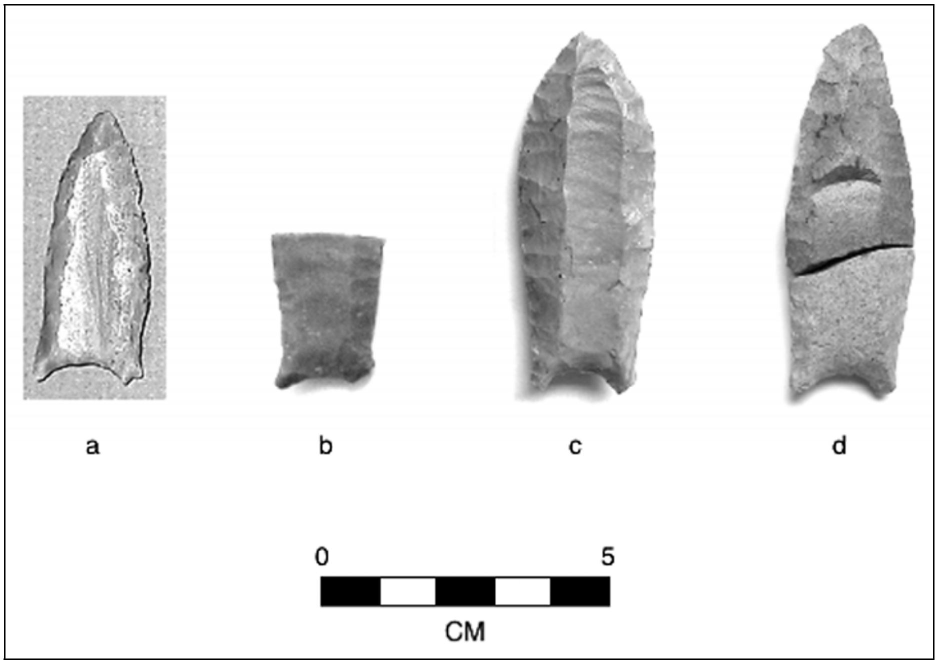

Figure 4. Cumberland Points.

Unfluted points are generally smaller than fluted points. Most exhibit long, narrow basal thinning scars on one or both faces instead of flutes. Unfluted points are affiliated with the Late Paleoindian period (10,500-10,000 B.P.). They appear to be separable into at least four types: Quad (Figure 5), Beaver Lake (Figure 5), Dalton (Figure 6), and Hardaway (Figure 7).

Of the 52 Paleoindian points that are included in this survey, 20 are fluted points/preforms that date to the Early Paleoindian and Middle Paleoindian periods and 32 are unfluted points that date to the Late Paleoindian period. The larger number of unfluted points may be an indicator of a greater population density during Late Paleoindian times. Fluted points include five Clovis, seven Gainey, six Cumberland, and two failed preforms. Unfluted points include two Quads, nine Beaver Lakes, 14 Daltons, and seven Hardaways.

SETTLEMENT PATTERNS

Table 1 compares the location of Early and Middle Paleoindian sites (fluted points) and Late Paleoindian sites (unfluted points) in relation to drainage basin, landform, and distance to a 5th Order stream. The sample totals in Table 1 differ from the total number of fluted and unfluted Paleoindian points in the survey for two reasons. First, two specimens (one fluted point and one unfluted point) have county-wide provenience only and, therefore, could not be associated with specific site data such as landform and distance to permanent water. Second, five sites produced multiple unfluted points (n=14). For these sites, only one unfluted point from each of the five sites was included in Table 1. Therefore, nine unfluted points are excluded from the table.

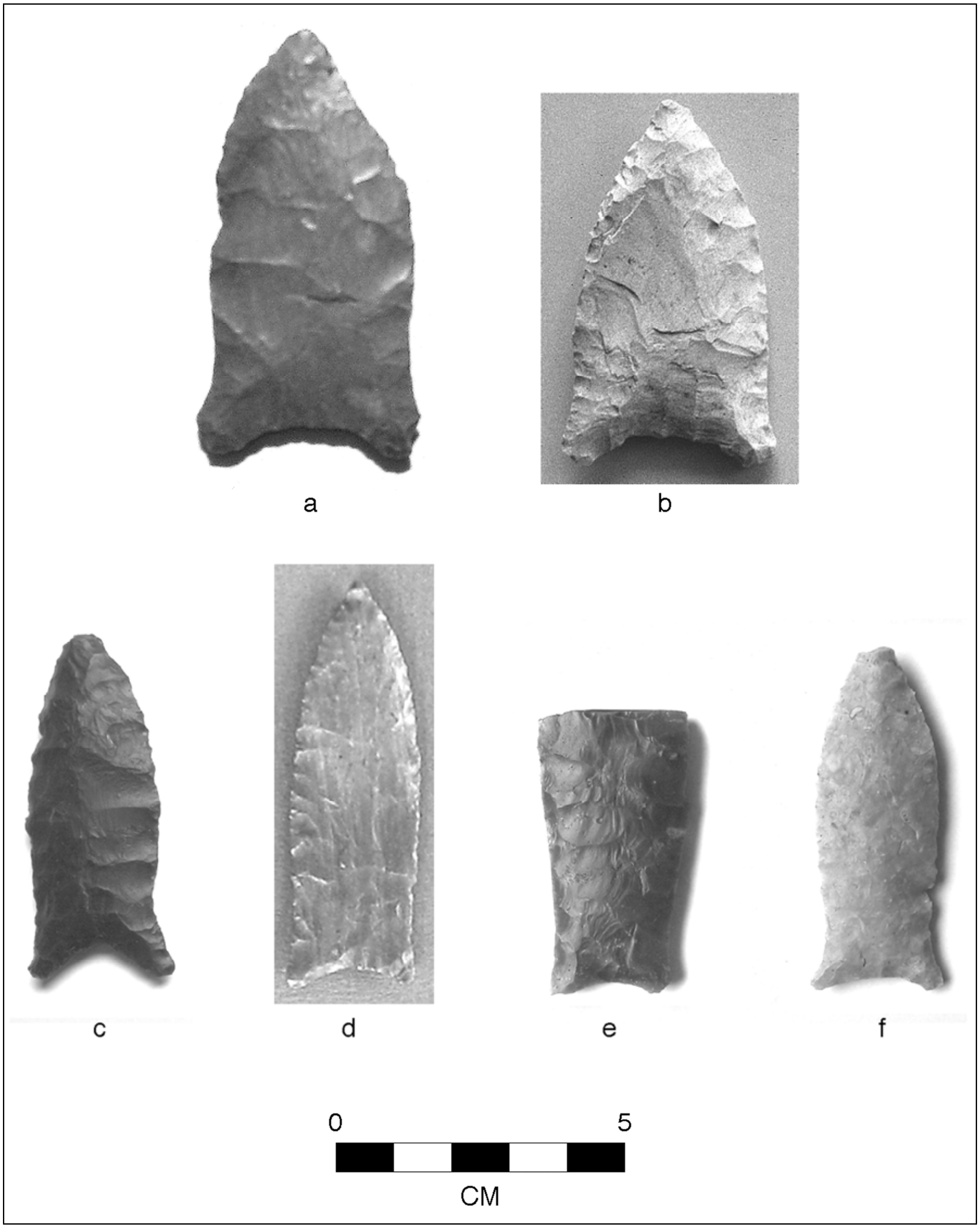

Figure 5. Quad (a, b) and Beaver Lake (c-f) Points.

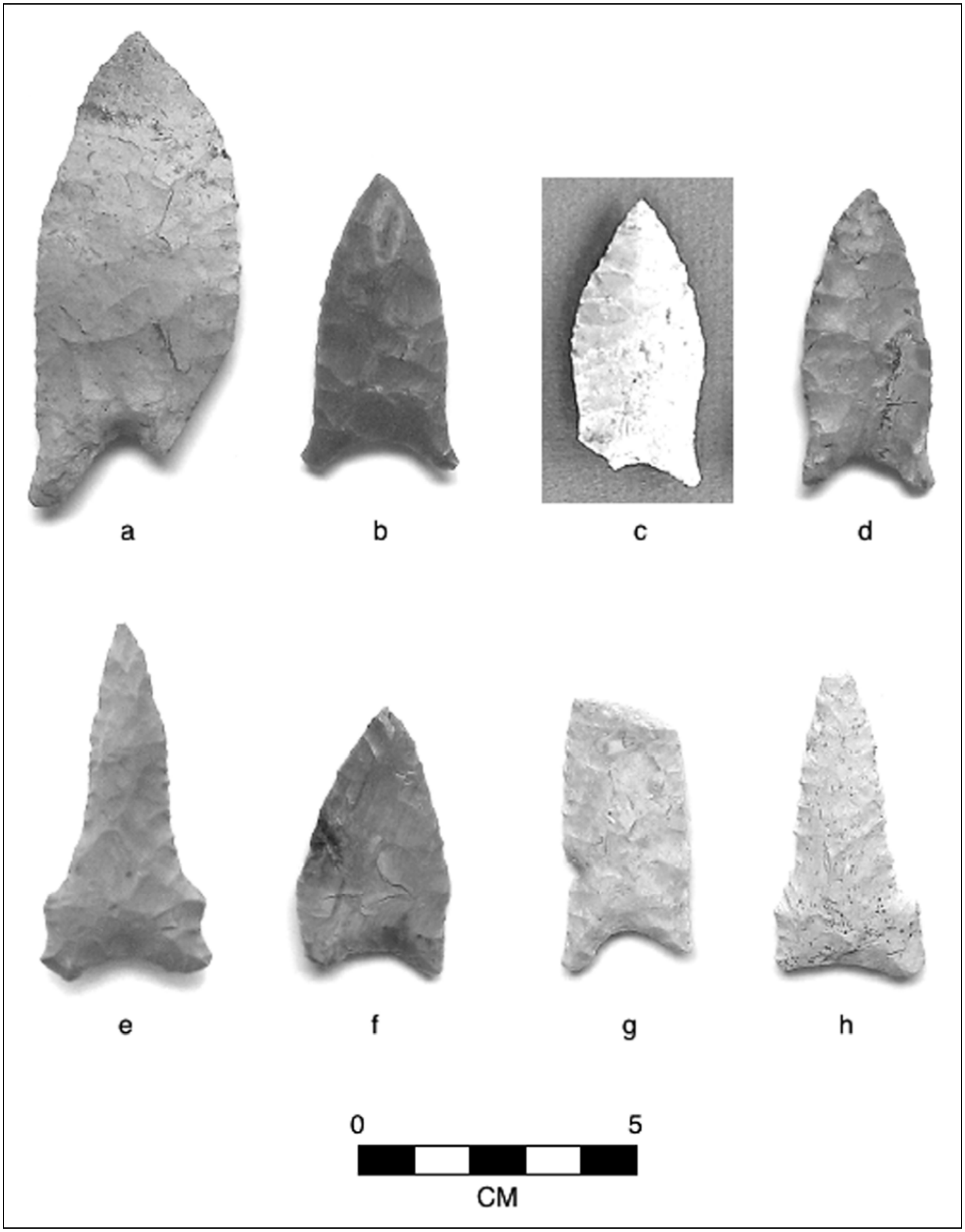

Figure 6. Dalton Points.

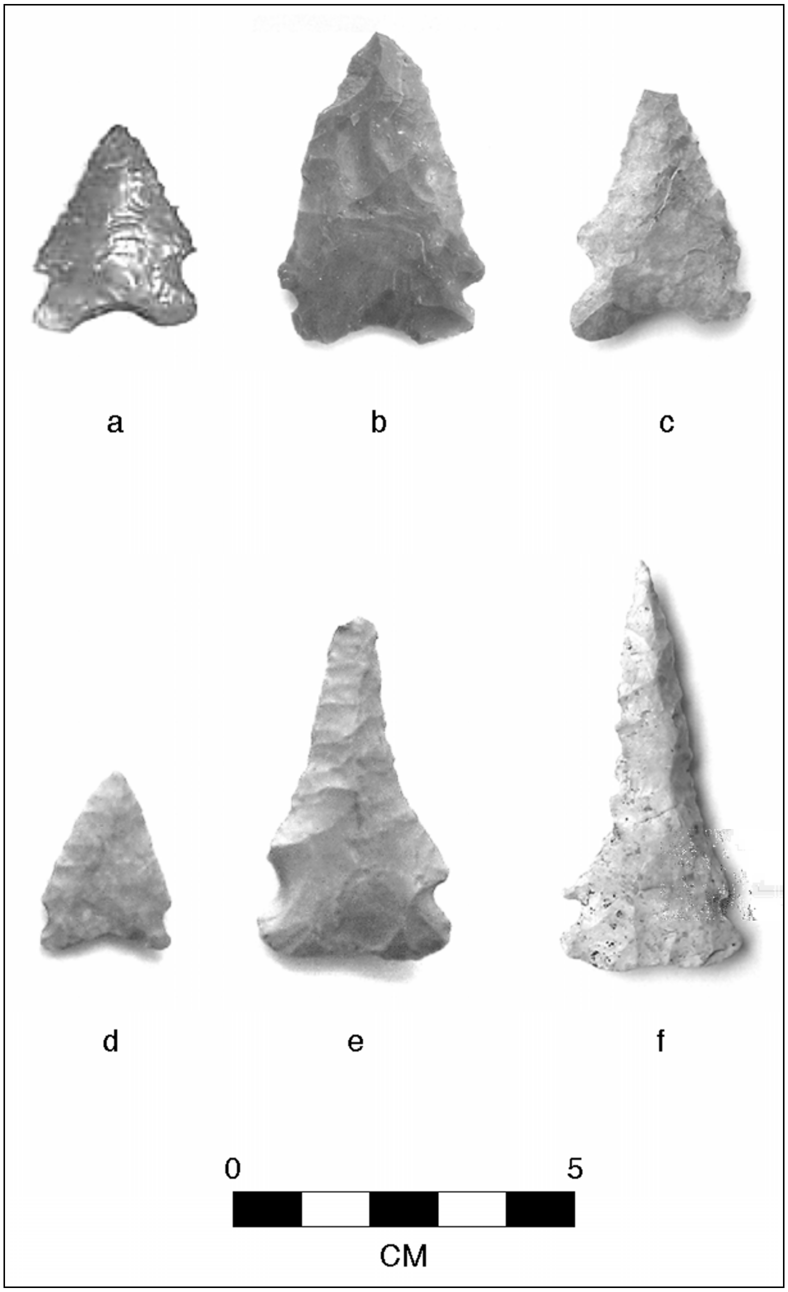

Figure 7. Hardaway Points.

As indicated in Table 1, a slightly higher number of unfluted points were collected from sites in the Beech Fork drainage basin, whereas the majority of fluted points were recovered from sites in the Rolling Fork drainage basin. One fluted point was recovered from a site on the divide separating the Rolling Fork and Beech Fork drainage basins. Sample sizes, however, are relatively small and any differences between drainage basins that contain fluted and unfluted points may be due to sampling error or collector bias.

Table 1. Paleoindian Sites in Relation to Geographic Features.

	Early and Middle Paleoindian Sites (Fluted Points)		Paleoindian Sites (Unfluted Points)		Total	
	Number	Percent	Number	Percent	Number	Percent
Drainage Basin						
Rolling Fork	12	60.0	11	47.8	23	53.5
Beech Fork	7	35.0	12	52.2	19	44.2
Rolling Fork-Beech Fork	1	5.0	--	--	1	2.3
Landform						
Divide Summit	1	5.3	1	4.8	2	5.0
Ridge Summit/Slope	10	52.6	12	57.1	22	55.0
Strath Terrace	4	21.1	4	19.0	8	20.0
T-2 Terrace	3	15.8	3	14.3	6	15.0
T-1 Terrace	1	5.3	1	4.8	2	5.0
Distance to 5th Order Stream						
≤1 km	11	57.9	16	72.7	27	65.9
>1 km	8	42.1	6	27.3	14	34.1

There appears to be little or no difference in the selection of site location by landform during Paleoindian times. The majority of fluted and unfluted points were found in upland locations (i.e., ridge summits/slopes or divide summits). The remaining fluted and unfluted points were found on high strath terraces or lower alluvial terraces.

Strath terraces in the upper Rolling Fork River valley are T-3 or T-4 terrace remnants that are 12 m or more in height. They are old and often degraded (eroded) landforms that were formed in Pleistocene times with no significant aggradation (alluvial burial) since human entry into the New World (Ray 1999:62). T-2 terraces in the upper Rolling Fork River valley typically stand 6-8 m above base flow. These terraces also appear to have been formed during late Pleistocene times prior to the arrival of humans (Ray 1999:61-62, 67). Similar high Pleistocene-age terraces (suite 1 and 2 terraces) with limited aggradation were reported in the middle Salt River valley (Collins and Norville 1980:253-254). The same processes of terrace formation that occurred in the upper portion of the Rolling Fork and the middle portion of the Salt Fork probably occurred in the upper Beech Fork River valley.

Paleoindian occupation of the lowest (T-1) terraces in the project area appears to be rare. Investigations in the upper Rolling Fork and middle Salt Fork valleys also suggest a Pleistocene age with limited alluvial aggradation for this terrace (Collins and Norville 1980; Ray 1999); however, these interpretations must be considered preliminary until more extensive geomorphological work involving deep coring and trenching can be conducted. The presence of few Paleoindian points on T-1 terraces in the study area does not mean that Paleoindians did not use these terraces. If T-1 terraces were actively aggrading during terminal Pleistocene and/or early Holocene times, Paleoindian deposits may be too deeply buried to be brought to the surface by plow agriculture. Deeply buried

Paleoindian and Early Archaic deposits have been found in the lower Tennessee River valley (J. Chapman 1975, 1977), in the Duck River valley in central Tennessee (Brakenridge 1984), and in the lower Pomme de Terre and Sac River valleys in southwest Missouri (Brakenridge 1981; Hajic et al. 1998, 2000; Haynes 1985; Kay 1982, Ray 1998b, 2000c). If deep Paleoindian deposits are present in the study area, they probably occur at stream confluences, in alluvial fans, and in the downstream reaches of the Rolling Fork and Beech Fork rivers.

Settlement patterns of Early and Middle Paleoindians are not well understood. Paleoindians generally are thought to have concentrated their activities along major river valleys (Anderson 1996). Although the Salt River and its major southern tributaries (i.e., Rolling Fork and Beech Fork) are not considered major river systems, the Salt River basin does flow directly into the Ohio River. Presumably, Early and Middle Paleoindians made their first entries into Washington and Marion counties by traversing up the Beech Fork and Rolling Fork river valleys. Tankersley (1996:37) states that Paleoindian sites occur over a wide area, but that they are concentrated in specific topographic settings and microenvironments, such as terraces near the confluence of major streams and their tributaries, margins of bogs and ponds, saline springs, major game trails, and sources of high-quality chert.

The findings from Marion and Washington counties indicate that Paleoindian sites are located in a much more diverse and widespread pattern. The Rolling Fork and Beech Fork Paleoindian data were compared to the above models by measuring the distance between Paleoindian sites and permanent streams. For this study, permanent streams are defined as 5th Order or larger. The data indicate that a majority of fluted points and unfluted points were collected from sites located within 1 km of 5th Order streams (Table 1). This may reflect collector bias in that a higher percentage of terraces than uplands are tilled; however, tobacco patches in central Kentucky are often located in upland settings. The most unexpected aspect of the data in Table 1 is that a higher percentage of fluted points were found at distances greater than 1 km than unfluted points. This suggests that groups that were making fluted points had already expanded into, and were utilizing, intermittent tributary valleys and upland areas of the upper Rolling Fork and Beech Fork river valleys during Early and Middle Paleoindian times. This implies very rapid colonization of all environments and regions of Kentucky by the earliest Paleoindian immigrants, or that Early Paleoindians may not have been the first immigrants into Kentucky and that they succeeded an earlier pre-Clovis or pre-Paleoindian presence.

CHERT SELECTION AND USE

The sample totals in Tables 2-6 also differ from the total number of fluted and unfluted Paleoindian points in the survey. Two fluted points and two unfluted points were not available for raw material analysis and five fluted points and two unfluted points were not available for morphometric measurements. As mentioned above, these sample populations are small, especially for the comparison of individual point types. As a result, attribute observations and comparisons may not be statistically significant, and any conclusions should be considered tentative until more data can be collected. General

Table 2. Paleoindian Points by Chert Type

	Local Cherts						Nonlocal/Exotic Cherts						Total	
	Muldraugh		Brassfield		Gilbert		St. Louis		Upper Mercer		Unidentified			
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Fluted Points														
Clovis	--	--	--	--	--	--	3	60.0	--	--	2	40.0	5	27.8
Gainey	--	--	--	--	--	--	4	57.1	1	14.3	2	28.6	7	38.9
Cumberland	--	--	--	--	--	--	2	50.0	--	--	2	50.0	4	22.2
Preform	--	--	--	--	--	--	1	50.0	--	--	1	50.0	2	11.1
Total	--	--	--	--	--	--	10	55.6	1	5.6	7	38.9	18	100.0
Unfluted Points														
Quad	1	50.0	--	--	--	--	1	50.0	--	--	--	--	2	6.7
Beaver Lake	3	33.3	1	11.1	--	--	3	33.3	--	--	2	22.2	9	30.0
Dalton	3	25.0	3	25.0	1	8.3	4	33.3	--	--	1	8.3	12	40.0
Hardaway	3	42.9	2	28.6	--	--	2	28.6	--	--	--	--	7	23.3
Total	10	33.3	6	20.0	1	3.3	10	33.3	--	--	3	10.0	30	100.0

Table 3. Metric Data for Early and Middle Paleoindian Points.

Specimen No.	Point Type	Site Number	Inter-Flute Thick.	Max. Blade Width	Basal Width	Length of Basal Grinding	Length (Complete)	Max. Thick.	Depth of Basal Concavity	Max. Flute Length Obv.	Max. Flute Width Obv.	Max. Flute Length Rev.	Max. Flute Length Rev.
1	Clovis	15MN100	5.5	27.5	25.1	30.6	78.8	9.3	5.5	25.6	13.8	15.9	13.1
2	Clovis	n/a	6.4	32.9	26.8	none	67.2	8.7	4.8	31.6	10.9+	25.1	19.6
26	Clovis	15MN105	4.9	ind	20.2	29.8	ind	ind	3.8	22.1	8.6	16.8	9.3
34	Clovis	15MN108	6.4	33.6	ind	36.2	97.7*	8.7	2.3*	39.2	16.2	33.9	13.1
35	Clovis	15MN109	5.8	ind	23.5	34.2	ind	ind	4.5	35.5	12.9	30.8	16.2
3	Gainey	15WS30	6.3	31.9	27.6	31.2	71.1	7.8	11.0	44.2	18.3	35.5	18.9
13	Gainey	15MN101	7.0	40.6	28.0*	58.5	126.0*	9.9	5.2*	68.8	18.3	45.8	17.3
19	Gainey	15MN342	5.9	30.7	24.4	33.4	70.4	8.5	6.5	28.8	16.8	20.6	19.0
28	Gainey	15MN106	6.0	25.9	29.2	33.2	68.9	6.7	7.4	44.2	14.1	45.2	15.6
41	Gainey	15WS37	4.8	22.4	22.0	24.2	61.9*	6.0	6.1	32.1	10.0	30.4	ind
47	Gainey	15CS18											
48	Gainey	15MN359											
5	Cumberland	15WS31	6.5	21.9	18.8	28.8	61.2	8.1	4.0	42.6	10.0	33.6	11.4
14	Cumberland	15WS35	6.5	19.3	19.4	19.7	48.0	7.5	4.0	39.0	11.3	38.1	10.5
29	Cumberland	15MN317	4.1	ind	18.0*	26.7	ind	ind	2.5*	ind	ind	ind	ind
33	Cumberland	15MN107	8.1	23.5	18.3	19.2	60.6	8.9	4.3	51.1	9.6	46.7	9.3
49	Cumberland	15MN113											
50	Cumberland	15MN114											
45	Fluted Preform	15MN59	n/a	ind	ind	none	ind	ind	ind	n/a	16.2	12.4	11.9
46	Fluted Preform	15MN112	n/a	ind	ind		ind						
Mean Values	Clovis		5.8	31.3	23.9	32.7	81.2	8.5	4.2	30.8	12.9	24.5	14.3
	Gainey		6.0	30.3	26.2	36.1	79.7	7.8	7.2	43.6	15.5	35.5	17.7
	Cumberland		6.3	21.6	18.6	23.6	56.6	8.2	3.7	44.2	10.3	39.5	10.4

Notes: * = extrapolated; n/a = not applicable; ind = indeterminate.

Table 4. Attribute Data for Early and Middle Paleoindian Points.

Specimen No.	Point Type	Site Number	Chert Type	Heat Treated	Basal Grinding	Blade Resharp.	Fracture Type	Beveled	Serrated	Basal Thinning	Basal Retouch	Composite Flutes	Guide Flutes
1	Clovis	15MN100	St. Louis-lg	no	light	limited/end	n/a	no	no	no	no	1 face	no
2	Clovis	n/a	St. Louis-rb	no	none	multiple/end	n/a	no	no	no	no	1 face	na
26	Clovis	15MN105	St. Louis-lg	no	moderate	indeterminate	recent	no	no	no	no	2 faces	na
34	Clovis	15MN108	Unidentified	no	moderate	limited/end	n/a	no	no	no	no	no	no
35	Clovis	15MN109	Unidentified	no	moderate	indeterminate	transverse	no	no	no	no	yes	?
3	Gainey	15WS30	Upper Mercer	no	moderate	multiple/end	n/a	no	no	no	no	2 faces	na
13	Gainey	15MN101	St. Louis-bg	no	moderate	no	n/a	no	no	no	no	2 faces	2 faces
19	Gainey	15MN342	Unidentified	no	moderate	limited/end	n/a	no	no	no	no	1 face	na
28	Gainey	15MN106	St. Louis-bg	no	moderate	multiple/end	n/a	no	no	no	no	2 faces	na
41	Gainey	15WS37	St. Louis-rb	no	moderate	multiple/end	impact	no	no	no	no	yes	2 faces
47	Gainey	15CS18	Unidentified			multiple/end	n/a	no	no	no			
48	Gainey	15MN359	St. Louis-bg			indeterminate	transverse						
5	Cumberland	15WS31	Unidentified	no	light	multiple/end	transverse	no	no	no	yes	no	no
14	Cumberland	15WS35	St. Louis-bg	no	light	multiple/end	n/a	no	no	no	yes	no	no
29	Cumberland	15MN317	St. Louis-rb	no	light	indeterminate	transverse	no	no	no	yes	no	no
33	Cumberland	15MN107	Unidentified	no	light	multiple/end	n/a	no	no	no	yes	no	no
49	Cumberland	15MN113											
50	Cumberland	15MN114											
45	Fluted Preform	15MN59	St. Louis-bg	no	none	n/a	reverse hinge	no	no	no	no	ind	na
46	Fluted Preform	15MN112	Unidentified				transverse	no	no	no			

Notes: n/a = not applicable; na = not apparent; bg = blue-gray variety; lg = light gray variety; rb = reddish-brown variety.

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Table 5. Metric Data for Late Paleoindian Points.

Spec. No.	Point Type	Site No.	Max. Length of Thin. Scars	Max. Blade Width	Basal Width	Length of Basal Grinding	Length (Complete)	Max. Thick.	Depth of Basal Concavity	Max. Flute Length Obv.	Max. Flute Width Obv.	Max. Flute Length Rev.	Max. Flute Length Rev.
15	Quad	15NE88	18.5	36.1	38.8	34.9	74.9	7.4	6.1	22.6	10.5	n/a	n/a
21	Quad	15WS36	18.9	33.3	36.9	23.3	63.6	7.7	5.4				
4	Beaver Lake (f)	15WS31	5.5	ind	25.1	36.3	ind	ind	5.1				
16	Beaver Lake	15MN355	9.4	23.2	23.4	24.9	73.2	5.7	3.6				
23	Beaver Lake (f)	15MN104	7.3	ind	26.5	ind	ind	ind	4.9				
24	Beaver Lake (f)	15MN104	12.0	ind	22.2	ind	ind	ind	3.8				
36	Beaver Lake	15MN110	9.8	23.4	24.8	26.5	56.5	6.5	5.7				
37	Beaver Lake (f)	15WS35	ind	ind	33.1	ind	ind	ind	8.4				
38	Beaver Lake (f)	15WS35	ind	ind	28.9	ind	ind	ind	5.8				
42	Beaver Lake	15WS34	4.5	ind	21.4	24.2	ind	ind	2.9				
43	Beaver Lake	15MN111	5.8	21.1	22.6	none	58.5	6.8	2.9				
8	Dalton	n/a	9.0	23.5	24.1	21.4	51.6	7.0	5.8				
9	Dalton	15MN28	11.0	25.1	25.2*	17.7	47.9*	6.4	5.3*				
11	Dalton	15WS33	8.0	22.7	ind	23.1	ind	5.8	7.5*				
30	Dalton	15MN317	8.1	18.0	30.2*	13.6	62.5	7.3	4.7	16.5	10.6		
39	Dalton (f)	15MN329	9.2	ind	29.6	16.9	ind	ind	5.0				
51	Dalton	15MN32											
52	Dalton	15NE34											
12	Dalton-Colbert	15WS34	7.1	17.5	26.2	14.4	ind	7.4	2.9				
18	Dalton-Colbert	15NE88	12.2	19.2	31.2	3.8	ind	6.6	2.0				
6	Dalton-like	15WS32	7.0	22.4	26.7	20.6	50.6	6.7	5.4				
7	Dalton-like	15MN115	10.0	35.3	ind	none	82.6*	8.5	14.8*				
17	Dalton-like	15NE89	9.4	24.1	ind	21.2	49.8*	6.2	4.2				
20	Dalton-like	15MN102	14.5	29.8	30.7	24.0	56.1	6.1	5.8				
22	Dalton-like	15MN103	13.8	24.4	21.7	21.9	46.4	5.6	2.7				
10	Hardaway	15MN317	10.0	24.0	24.9	10.0	30.2	5.4	ind				
25	Hardaway	15MN310	n/a	13.0	29.1	14.1	ind	7.8	4.1	13.5	11.0	11.5	11.9
27	Hardaway	n/a	n/a	15.3	26.4*	15.0	ind	5.8	4.2*	17.9	14.1	11.7	12.7
31	Hardaway	15MN317	8.5	18.7	18.8	7.4	26.0	3.9	3.3				
32	Hardaway	15MN317	11.6	26.6	28.1	14.8	ind	8.3	2.0	18.9	14.4		
40	Hardaway	15MN317	n/a	29.1	25.7	none	44.3	5.1	3.0	22.4	13.1		
44	Hardaway	15WS34	10.5	24.1	26.2	8.9	57.1	6.7	1.7				
Mean Values	Quad		18.7	34.7	37.9	29.1	69.3	7.6	5.8				
	Beaver Lake		7.8	22.6	25.3	30.5	62.7	6.3	4.8				
	Dalton		9.6	23.8	28.0	17.7	57.3	6.8	5.8				
	Hardaway		10.2	21.5	25.6	11.7	39.4	6.1	3.1	18.2	13.2	11.6	12.3

Notes: f = stem fragment (classification probable); * = extrapolated; n/a = not applicable; ind = indeterminate

Table 6. Attribute Data for Late Paleoindian Points.

Specimen No.	Point Type	Site Number	Chert Type	Heat Treated	Basal Grinding	Blade Resharp.	Fracture Type	Beveled	Serrated	Basal Thinning
15	Quad	15NE88	St. Louis-bg	no	light	limited/end	n/a	no	no	yes
21	Quad	15WS36	Muldraugh	no	light	multiple/end	n/a	no	no	yes
4	Beaver Lake (f)	15WS31	Unidentified	no	light	indeterminate	transverse	ind	ind	yes
16	Beaver Lake	15MN355	St. Louis-rb	no	light	limited/end	n/a	no	no	yes
23	Beaver Lake (f)	15MN104	Muldraugh	no	light	indeterminate	transverse	ind	ind	yes
24	Beaver Lake (f)	15MN104	Muldraugh	no	moderate	indeterminate	transverse	ind	ind	yes
36	Beaver Lake	15MN110	St. Louis-bg	no	light	limited/end	n/a	no	no	yes
37	Beaver Lake (f)	15WS35	Muldraugh	no	light	indeterminate	transverse	ind	ind	ind
38	Beaver Lake (f)	15WS35	Unidentified	no	moderate	indeterminate	transverse	ind	ind	ind
42	Beaver Lake	15WS34	St. Louis-bg	no	moderate	indeterminate	transverse	no	no	yes
43	Beaver Lake	15MN111	Brassfield	no	none	limited/end	n/a	no	no	yes
8	Dalton	n/a	Gilbert	no	light	limited/end	n/a	no	no	yes
9	Dalton	15MN28	St. Louis-bg	no	light	multiple/sides	n/a	slight left	no	yes
11	Dalton	15WS33	Brassfield	no	light	indeterminate	transverse	no	no	yes
30	Dalton	15MN317	Muldraugh	no	light	multiple/sides	n/a	slight left	no	yes
39	Dalton (f)	15MN329	Muldraugh	no	light	indeterminate	transverse	ind	ind	yes
51	Dalton	15MN32								
52	Dalton	15NE34								
12	Dalton-Colbert	15WS34	Brassfield	no	light	multiple/sides	transverse	no	yes	yes
18	Dalton-Colbert	15NE88	St. Louis-bg	no	moderate	multiple/sides	transverse	slight left	no	yes
6	Dalton-like	15WS32	St. Louis-bg	no	light	multiple/end	n/a	no	no	yes
7	Dalton-like	15MN115	Muldraugh	no	ear only	limited/end	n/a	no	no	yes
17	Dalton-like	15NE89	Brassfield	no	light	multiple/end	n/a	no	no	yes
20	Dalton-like	15MN102	St. Louis-bg	no	light	multiple/end	n/a	no	no	yes
22	Dalton-like	15MN103	Unidentified	no	light	multiple/sides	n/a	no	no	yes
10	Hardaway	15MN317	St. Louis-bg	no	light	multiple/sides	n/a	no	yes	yes
25	Hardaway	15MN310	Muldraugh	no	moderate	multiple/sides	transverse	slight left	no	no
27	Hardaway	n/a	Muldraugh	no	light	multiple/sides	transverse	slight left	no	no
31	Hardaway	15MN317	Brassfield	no	light	multiple/sides	n/a	no	no	yes
32	Hardaway	15MN317	Muldraugh	no	moderate	multiple/sides	transverse	no	no	yes
40	Hardaway	15MN317	St. Louis-bg	no	none	multiple/sides	n/a	slight left	no	no
44	Hardaway	15WS34	Brassfield	no	moderate	multiple/end	n/a	no	no	yes

Notes: f = stem fragment (classification probable); n/a = not applicable; ind = indeterminate; bg = blue-gray variety; rb = reddish-brown variety.

comparisons are made between fluted and unfluted points first, followed by apparent distinctions among individual point types.

Before proceeding to the chert use analyses, a distinction is made regarding local, nonlocal, and exotic resources (Ray 1998a:21-22). A local resource refers to raw material that is located within approximately 10 km of a site. A nonlocal resource is located more than 10 km and less than 100 km from a site. An exotic resource is located 100 km or more from a site. Based on these definitions, Gilbert chert, Brassfield chert, Boyle chert, Muldraugh chert, and Harrodsburg chert are all local resources to the project area. St. Louis chert, on the other hand, is nonlocal or exotic to the study area depending on where the raw material was procured. If procured from areas around Sonora or Louisville (approximately 80-100 km), it would be nonlocal. If procured from more distant sources (e.g., in the Bowling Green, Hopkinsville, Harrison County, or Carter County areas), it would be exotic.

In this paper, St. Louis chert is an undifferentiated classification that includes indistinguishable dark gray chert deposits that occur in the upper portion of the St. Louis formation and the lower portion of the overlying Ste. Genevieve formation. This high-quality chert occurs in western and west-central Kentucky and southern Indiana. Various local place names have been used to refer to this chert, including Hopkinsville chert, Sonora chert, Wyandotte chert, and Harrison County chert. Very similar, if not indistinguishable, chert also occurs in Carter County and surrounding areas in northeastern Kentucky. This colorful chert, which has been referred to informally as Paoli and Carter Cave, derives from the Slade (or Neuman) formation, an apparent lateral equivalent of the St. Louis formation (Sable and Dever 1990). Geochemical analyses may some day help differentiate these regional look-alike cherts. However, the full range of look-alike cherts from the above formations have not been fully sampled and documented by archaeologists and petrochemists. Also, because geochemical analyses are expensive and destroy or alter sample specimens, it is an impractical approach for the analysis of artifacts in private collections. For these reasons, all of the look-alike cherts from the St. Louis, Ste. Genevieve, and Slade formations are referred to in this paper as Undifferentiated St. Louis chert.

Fluted Points

All 18 fluted point specimens in this study appear to have been manufactured from cherts that are either nonlocal or exotic (Table 2). Seven points were made from unidentified cherts. These cherts do not resemble any known varieties of the five local chert types and are presumed to represent nonlocal or exotic cherts.

Undifferentiated St. Louis chert appears to have been the extralocal raw material of choice. More than half (55.6 percent) of the fluted point specimens were manufactured from Undifferentiated St. Louis chert. Undifferentiated St. Louis chert is perhaps the highest quality chert resource in Kentucky. It is fine-grained with relatively few internal flaws and often occurs in large, round, cannonball-like nodules suitable for the manufacture of large lanceolate points.

At least three varieties of Undifferentiated St. Louis chert are recognized in the fluted points from the study area. Five were manufactured from the Blue-Gray variety, three were knapped from the Reddish Brown variety, and two were made from the Light Gray variety (Ray 1998a). High-quality chert from the St. Louis, Ste. Genevieve, and Slade formations is well known as a favorite of Paleoindian knappers in other parts of Kentucky (Gramly et al. 2000; Sanders 1988, 1990; Tankersley 1989, 1990).

The remaining fluted point, a Gainey (Figure 3d), was manufactured from exotic Upper Mercer chert. It is bluish black with light bluish gray mottles, which is the distinctive color pattern of Upper Mercer chert. It is fine grained, lustrous, and nonfossiliferous. Upper Mercer chert is located in east-central Ohio, approximately 400 km to the northeast of the study area.

Of nearly 600 fluted points from Indiana, Kentucky, and Ohio that were studied by Tankersley (1990:263-266), 82 percent were identified as made from Wyandotte/ Hopkinsville (i.e., Undifferentiated St. Louis) chert and Upper Mercer chert. Clovis points identified as made from Hopkinsville chert were found in central Indiana and southern Ohio; Clovis points identified as knapped from Wyandotte chert were found in southern and northern Ohio; and Clovis points identified as made from Upper Mercer chert were found in northern Kentucky, western and southern Indiana, and western New York (Tankersley 1990:Figure 10).

The exotic raw materials in Tankersley’s study, as well as the exotic cherts noted in this study, indicate significant movements by Early and Middle Paleoindian groups (Tankersley 1989, 1996:24). In Paleoindian times, exotic raw materials were imported into an area in one of two ways: (1) direct procurement and curation or (2) indirect exchange.

Foraging mobility of Paleoindian hunter-gatherers has been discussed at length by several researchers (Anderson 1995; Anderson and Sassaman 1996; Morse 1971; Schiffer 1975; Walthall 1998). Late Pleistocene hunter-gatherers may have been highly mobile foragers following an annual round, and they may have carried highly curated task-specific tool kits. Band ranges/distances routinely traversed by Early/Middle Paleoindians have been postulated to be 150–300 km or more (Goodyear 1989:5; Haynes 1982:392; Meltzer 1989:11; Simons et al. 1984:267). On the other hand, trade between neighboring groups may have played a larger role in the movement of exotic raw materials than generally believed. Evidence for Early/Middle Paleoindian long-distance exchange of high-quality raw materials has been presented in a number of studies (Anderson 1995; Hayden 1982; Hester and Grady 1972; Tankersley 1989, 1991).

It is very difficult, however, to determine the exact mode by which exotic chert artifacts arrived in the project area. Archaeologists have debated this problem for several decades. As Meltzer (1989:30) stated, “the unfortunate bottom line is that there do not seem to be clear cut rules for sorting direct from indirect acquisition in any deterministic fashion.” It appears impossible, therefore, to conclusively demonstrate which form of acquisition (i.e., direct or indirect) is represented by the exotic chert artifacts found in the upper Rolling Fork and Beech Fork drainage basins. Indeed, it is probable that both forms of acquisition are represented.

It is important to stress, however, that multiple chert types occur in the study area. Three cherts (Brassfield, Boyle, and Muldraugh) occur in relatively abundant quantities (especially in the Rolling Fork basin) and are medium to high-quality cherts. Therefore, there was no need to import cherts into the chert-rich study area.

Two fluted artifacts from the project area that were made from nonlocal/exotic cherts suggest at least some extralocal chert may have arrived via exchange. Both are fluted point production failures. One failed preform is composed of Undifferentiated St. Louis chert that was fluted at Site 15Mn59. The other failed preform was knapped from an unidentified chert at Site 15Mn112. Because these preform failures were broken during manufacture in Marion County, they cannot represent finished curated tools that were made in west-central Kentucky or elsewhere and carried to Marion County on a seasonal round. It was transported to the site, however, as a preform.

Preforms of Undifferentiated St. Louis chert generally were made and fluted at large workshop sites like the Adams site in Christian County (Sanders 1988, 1990) and at smaller workshops like the Joe Priddy site in Hardin County (Haag 2004; Stackelbeck et al. 1996). Such sites may have been staging areas for the distribution of this high-quality chert to neighboring areas. It would seem impractical to transport preforms considerable distances into chert-rich areas only to risk failure during fluting, unless it helped serve other purposes unrelated to raw material procurement (e.g., exchange of goods to strengthen socio-political ties). Paleoindian aggregation, possibly for communal hunts, resource and information exchange, and/or to increase group solidarity, has been proposed for late Pleistocene/early Holocene hunter-gatherers in the Plains, Midwest, and Southeast (Anderson and Hanson 1988; Bamforth 1985, 1988, 1991; Walthall 1998; Walthall and Koldehoff 1998).

The concerted use of Undifferentiated St. Louis chert may have been greater during Early and Middle Paleoindian times than during any other period of Kentucky prehistory. This preference was indicated by Tankersley's (1990:263-266) tri-state study. The use of nonlocal Undifferentiated St. Louis chert during post-Paleoindian periods in the upper Rolling Fork River valley was relatively minor (<10 percent), except during Early Woodland and Middle Woodland times when it comprised approximately 20-27 percent of diagnostic artifacts (Ray 1998a:Table 7, 2000a:Table 2).

None of the 18 fluted points in this study had been heat treated. Intentional heat treatment of chert to improve knapping quality apparently was not a technology that was used during Early and Middle Paleoindian times (Morrow 1996:98; Ray 1998c:255). Early and Middle Paleoindian knappers selected only the highest quality raw materials that needed no heat treatment to improve knapping quality. A preference for high-quality cryptocrystalline material by Paleoindian knappers is well documented (Goodyear 1989;

Haynes 1980, 1982; Meltzer 1985; Ray 1998c; Smith 1990; Tankersley 1989, 1990, 1991).

Unfluted Points

Late Paleoindian points indicate a shift to the use of locally available chert resources (Table 2). This shift is apparent in at least three of the four Late Paleoindian point types (i.e., Beaver Lake, Dalton, and Hardaway) that yielded seven or more specimens. All but 3 of 30 unfluted points could be identified as to chert type.

Nearly 60 percent of the Late Paleoindian points were manufactured from local cherts. These include ten (33.3 percent) made from Muldraugh chert, six (20 percent) made from Brassfield chert, and one (3.3 percent) knapped from Gilbert chert. Muldraugh and Brassfield cherts exhibit fair to good knapping qualities and occur in relatively large quantities. Muldraugh chert is the most abundant chert type in the Rolling Fork River valley and adjacent areas. It is common in residual deposits along the Muldraugh Hills Escarpment and on the flanks of knobs, and it dominates the gravel deposits in the Rolling Fork River (Ray 1998a:26-27, 2000a:100). Brassfield chert is the most common chert type in the western portion of Washington County and many portions of the Beech Fork drainage basin. Where the Brassfield formation crops out, chert is usually abundant as residual deposits. Gilbert chert is the least common of all the local chert resources.

Ten or one-third of the unfluted points were manufactured from nonlocal/exotic Undifferentiated St. Louis chert. Nine of these points were made from the Blue Gray variety and one was made from the Reddish Brown variety. As a nonlocal/exotic resource, Undifferentiated St. Louis chert still comprises a significant percentage of Late Paleoindian points, but it does not approach that for Early and Middle Paleoindian points. It appears that although connections to Undifferentiated St. Louis chert were maintained, a greater effort was made to utilize local cherts during Late Paleoindian times. Reasons for the change to a greater reliance on local resources are unclear, but it may relate to increasing population and/or permanent residency in the upper reaches of the Rolling Fork and Beech Fork drainage basins during Late Paleoindian times.

The remaining three unfluted points were unidentified as to chert type. These unidentified cherts probably represent nonlocal or exotic raw materials. If unidentified and Undifferentiated St. Louis cherts are combined, then 43.3 percent of the Late Paleoindian points were manufactured from nonlocal or exotic raw materials.

None of the 30 Late Paleoindian points exhibited evidence of heat treatment. Heat treatment appears to have developed during Early-Middle Archaic times when knappers began to focus on local cherts, often of inferior knapping quality (Ray 1998a, 1998c).

LITHIC TECHNOLOGY

The complex process of manufacturing Paleoindian tools changed considerably during the approximately 1,500 years that comprise the Paleoindian stage. These changing technologies resulted in the appearance of different forms of Paleoindian points. The multiple point types that occur in Middle Paleoindian and Late Paleoindian times presumably represent distinct, but contemporaneous social groups. Morphometric analyses and other technological attributes on fluted points from the upper Rolling Fork and Beech Fork drainage basins support a distinction between Clovis, Gainey, and Cumberland points. Distinctions between the four Late Paleoindian point types, however, are less clear.

Fluted Points

Fluting technology, which apparently was developed approximately 11,500 years ago during the Early Paleoindian period, spread quickly across the continent. This process involved the removal of large elongated flakes from one or both faces of the stem, presumably to facilitate hafting. Fluting is the primary distinction between points made during Early and Middle Paleoindian times and those made during Late Paleoindian times. Occasionally, however, some Late Paleoindian points, such as Quad, Dalton, and Hardaway, do exhibit central, channel-like flake scars on one or both faces that could be interpreted as small flutes. These flutes never approach the long and wide channel flutes of Middle Paleoindian points. Some, however, compare favorably with flutes on Clovis points.

Morphometric data (Table 3) and other technological attributes (Table 4) on fluted points from the upper Rolling Fork and Beech Fork drainage basins help differentiate Clovis, Gainey, and Cumberland points. Maximum flute lengths of Gainey and Cumberland points (obverse and reverse faces) are similar to one another but are 11-15 mm longer on average than those on Clovis points (Table 3). Flutes on the reverse face are generally several millimeters shorter than on the obverse face of all three point types. Presumably, fluting the reverse face was more difficult than the obverse face due to difficulty in reestablishing a suitable platform.

The ratio of maximum flute length to maximum flute width of Clovis and Gainey points is approximately 2:1, compared to 4:1 for Cumberland points. Thus, flutes on Cumberland points are narrower than those on Clovis and Gainey points. Clovis and Gainey points often exhibit multiple fluting on one or both faces, whereas single flutes usually are present on Cumberland points. Although not always present, guide flutes appear to be restricted to Gainey points. There appears to be little or no difference in interflute thickness on the three fluted point types from the project area.

Gainey points have the deepest basal concavities, which are nearly twice that of Cumberland and Clovis points. An attribute noted only on the Cumberland points is the presence of small bifacial retouch flake scars along the basal concavity (Table 4). They are short (<6 mm) pressure flakes that override the proximal end of each channel flute.

Similar small lateral retouch flake scars sometimes override channel flutes along the blade, which suggests that they probably represent final retouch along the basal and lateral margins prior to hafting. Basal retouch was present on all four Cumberland points. Gramly et al. (2000:35) noted similar fine flaking in the basal concavities of 10 Cumberland points from Lewis County, Kentucky. Fine marginal and basal retouch is an attribute that Cumberland points share with Folsom points (Bell 1958:26; Frison and Bradley 1980:49) and Folsom-like Sedgwick points (Bell 1958:Plate 13; Ray 2000b:49).

All of the fluted points exhibited light to moderate grinding except one Clovis point. The length of grinding along the haft element presumably demarcates that portion of the point inserted and/or bound to a foreshaft. Although there is some variability within and overlap between individual point types, it appears that grinding extended to a greater extent along the lateral margin of Gainey and Clovis points than on Cumberland points.

There appears to be little, if any, difference in maximum thickness among the three fluted point types. Averaged thicknesses of all three types range between 7.8 mm and 8.5 mm. Maximum blade width and basal width of Gainey and Clovis points are similar, whereas both attributes are considerably less for Cumberland points. Tankersley (1990:Table 8) compared metric data for several hundred Clovis and Cumberland points. Basal width, maximum blade width, and maximum flute length all correspond favorably with the morphometric data on Clovis and Cumberland points from the project area. Tankersley's mean total length for Clovis (67.5 mm) and Cumberland (71.7 mm), however, are greater than for those points studied here. Rolingson's (1964:Table 8) morphometric data for Cumberland points also compares favorably with the Cumberland data from the upper Rolling Fork and Beech Fork drainage basins. The only notable differences are greater total length and flute length for Cumberland points in Rolingson's survey. Ten Cumberland points from Lewis County also are considerably longer than those from the study area (Gramly et al. 2000:35).

The reasons for the size discrepancy of Cumberland points from Marion, Nelson, and Washington counties are unclear. A larger sample of Cumberland points from the study area needs to be measured to determine if the noted size differences are real or due to sampling error.

Blade resharpening/maintenance is evident on all but one of the fluted points. Resharpening, however, was confined to the distal portion of the blade, and it varied from limited retouch to multiple episodes of blade rejuvenation. Lateral resharpening flake scars truncated the channel flutes on all three complete Cumberland points. Beveling and serrations are blade resharpening attributes completely absent from all of the fluted point types. One or two specimens of each fluted point type exhibited short bevel retouch on distal ends that resembled scraper-like recycling modifications. Gramly et al. (2000:35) also noted a short beveled area on one Cumberland point.

One Clovis point, one Gainey point, and two Cumberland points exhibited old fractures apparently made during use. The fractures on both Cumberland points and the

Clovis point were transverse snap fractures, whereas the Gainey point exhibited hinge fractures on both faces emanating from the distal end. Both types of breaks reflect impact fractures. These fracture types and lack of resharpening along blade edges indicate the fluted points were used as projectile points.

The above morphometric differences may reflect a change in fluting technology that first appeared during the Middle Paleoindian period. The primary technological shift appears to have been from one of direct percussion to one involving indirect percussion (Morrow 1995:175-176, 1997:4-6). The reduction sequence for Middle Paleoindian points (especially Gainey) appears to differ from Clovis in several important respects (Morrow 1997:8-12; Morrow and Morrow 2000). First, Gainey points are typically fluted during later stages of biface reduction when the preform is not much thicker than the finished point. Second, isolated fluting platforms are usually set low to the center plane of the biface. Third, the distal ends of Gainey points are often blunt and occasionally ground, suggesting that the rounded ends were placed on a hard surface such as a wooden anvil. Fourth, the basal concavities on Gainey preforms are typically much deeper than those on Clovis preforms, which on most preforms would inhibit flute removal by direct percussion. The latter two attributes imply that Gainey points were fluted by indirect percussion as opposed to direct freehand percussion probably used by Clovis knappers (Morrow 1996; Morrow and Morrow 2000:16). Indirect percussion with a punch allows for more accurate placement of the percussor on small nipple platforms and control over the angle of applied force. These advantages appear to have enabled more precise execution of flute removal, resulting in longer and more standardized flutes on Gainey (and probably Cumberland) points than on Clovis points.

Different technological attributes on Gainey and Cumberland points suggest there were additional innovations and specialization during the Middle Paleoindian period that resulted in the development of at least two distinct indirect fluting technologies. Technological differences between Gainey points and Cumberland points pertain to fluting techniques, basal retouch, and overall shape.

Gainey points generally have multiple flutes on one or both faces. Some of the multiple flutes on Gainey points are much shorter than the primary flute. Gainey points also often exhibit guide flutes (Ellis and Payne 1995:465; Morrow and Morrow 1999:68; Ray 2000b:49-51; Simons et al. 1984:268; Witthoft 1952). Guide flutes, located on either side of the channel flute, can be difficult to identify since they may be partially or entirely obscured on some faces by the large channel flute and/or lateral thinning subsequent to fluting. Ostensibly, guide flutes served as guides to the subsequent channel flute; however, the removal of guide flutes may have functioned primarily to isolate a striking platform in the middle of the basal concavity and that a secondary result was the formation of a ridge between the two scars that would guide the main channel flute (Ray 2000b:50). Whatever the main purpose, guide flutes are usually narrower, shorter, and not as thick as the channel flutes. The basal concavity of Gainey points are the deepest of all Midwestern Middle Paleoindian points, averaging nearly twice that of Cumberland points. There is very little retouch along the basal margin of Gainey points other than occasional basal thinning.

In contrast, the fluting technology applied to Cumberland points has been compared to that applied to Folsom points (Justice 1987:25; Roosa and Deller 1982:6-8). Flutes on Cumberland points generally extend the full length of each face to the distal end. Flutes on Cumberland points are relatively wide compared to blade width, comprising approximately one-half or more of the face of the blade. Also like Folsom points, Cumberland points usually exhibit single flutes per face and they do not exhibit guide flutes. They also often exhibit uniform, short lateral flake scars along blade margins like Folsom points (Frison and Bradley 1980:49). Subsequent to fluting, the basal concavity of Cumberland points is finely retouched by pressure flaking on both faces, which is another attribute of Folsom points (Bell 1958:Plate 13). These attributes strongly suggest that the fluting technology of Cumberland points is more closely allied to Folsom than to Gainey. One distinct difference between Cumberland and Folsom, however, is thickness. This may relate to access and use of different raw materials (e.g., obsidian and other glass-like materials used by Folsom knappers vs. lesser-quality cherts used by Cumberland knappers) and/or to different technologies developed for specialized hunting (e.g., Folsom bison hunting vs. Cumberland caribou hunting).

Another attribute that differentiates Cumberland from Gainey is the shape of the stem and base. The stems on Cumberland points are incurvate which produces distinctive ears (or fish-tail shape) generally not seen on Gainey points. As noted above, the depth of the basal cavity on Cumberland points is usually much less than that on Gainey points.

Unfluted Points

Radical changes in lithic technology occurred at the beginning of the Late Paleoindian period at approximately 10,500 B.P. A few of the technological changes include: (1) a reduction in the overall size of Late Paleoindian points (i.e., shorter and narrower), (2) the appearance of notched forms, (3) resharpening along the lateral margins of the blade as well as at the distal ends, and (4) a general abandonment of fluting.

Perhaps the greatest technological change was the disappearance of fluting and the appearance of basal thinning. Although some Late Paleoindian points do exhibit broad basal flake scars that could be classified as flutes, they probably were not produced by the specialized indirect method used during Middle Paleoindian times. Instead, channel flutes were replaced by the removal of one or more relatively thin and short percussion or pressure flakes from the basal concavity. The small flutes evident on a relatively small percentage of Late Paleoindian points could be interpreted as the decline and eventual disappearance of fluting technology, much as the short flutes on Clovis points could be interpreted as the beginning of fluting technology.

Most Late Paleoindian points are thinned along the basal concavity. Of the 30 Late Paleoindian points that were examined, all but three Hardaway points exhibited basal thinning. Thinning scars may be present on one or both faces. The maximum length of basal thinning scars on most Late Paleoindian points is less than 12 mm (Table 5). Some, however, approach 20 mm in length.

Although less than Gainey points, the depth of basal concavity on Late Paleoindian points does not appear to be significantly different from that on Clovis points and Cumberland points. Average basal concavity on Quad, Beaver Lake, and Dalton points range between 4.8 mm and 5.8 mm. Hardaway points exhibit the shallowest basal concavities of about 3 mm.

Of all the Late Paleoindian points, Quad points exhibit the greatest basal width because its ears usually expand or flare outward. Basal width of Beaver Lake, Dalton, and Hardaway points are similar. As with basal width, maximum blade width is greatest on Quad points. Average blade width is similar among Beaver Lake, Dalton, and Hardaway points. When basal width is compared to maximum blade width, basal width generally is equal to or greater on all four unfluted point types.

Unfluted points can be divided into two types based on the shape of their stems. Quad points and Beaver Lake points are lanceolate in shape with no distinction between the haft and blade elements other than where lateral grinding ends. Dalton and Hardaway, on the other hand, exhibit well-defined stems that have either incurvate sides (Dalton) or side or corner notches (Hardaway).

Blade resharpening on unfluted lanceolate points often differs from that on unfluted notched points (Table 6). Quad points and Beaver Lake points are resharpened only at the distal end, whereas Dalton and Hardaway points may be resharpened at the distal end or along the sides of the blade. Another apparent difference between lanceolate and notched Late Paleoindian points is the presence/absence of beveled and serrated blades. None of the Quad or Beaver Lake points in the survey had beveled blades, whereas three Dalton points and three Hardaway points exhibited beveled blades. When beveling is present, it is usually on the left side of the blade. One Hardaway point, however, was bifacially beveled into a drill-like form. Serrated blades were not common among the Late Paleoindian points. In fact, only one Dalton point (Colbert variety) had a serrated blade. The general lack of beveled and serrated blades on Dalton points from central Kentucky differs from Dalton points in the Ozarks region and other areas west of the Mississippi River, where they are typically serrated and beveled on the right side (C. Chapman 1975:96, 245; Morse 1997). Nearly half of the Late Paleoindian points in the survey had broken blades. All were transverse snap fractures, suggesting they were used primarily as projectile points.

In general, Quad and Beaver Lake points are similar in overall design. The only apparent differences appear to be that Quad points are shorter relative to width and they have a greater basal width due to ears that flare outward (Justice 1987:36). Quad and Beaver Lake points are the least well-known of the Late Paleoindian types. Neither type has been found and radiocarbon dated in good stratigraphic contexts in Kentucky (Tankersley 1996:33). Quad and/or Beaver Lake points have been reported in stratified contexts at Dust Cave in Alabama and at the Olive Branch site in southern Illinois. The best stratified deposits were found at Dust Cave. At this cave site, two Quad points, three Beaver Lake points, two Dalton points, and one Hardaway point were found together in the earliest deposits that were dated between 10,500 B.P. and 10,000 B.P. (Driskell 1996:326-329). However, no vertical separation was reported among the four Late Paleoindian types, all of which could be lumped into a Dalton Cluster (Justice 1987:35-43).

Gramly (2002:35, 71-75) tried to make a distinction between early and late Dalton Cluster artifacts from the Olive Branch site, even though he admits that, "Intensive bioturbation appears to have occurred, making it a challenge to document small changes in artifact form or frequency." Only one of seven dates (9,975 $\pm$ 125 B.P.) from the Olive Branch site appears to actually date the Late Paleoindian deposit (Gramly 2002:Table 4). Gramly's (2002:71-74) earlier "Sirkin" phase is comprised of Beaver Lake-like points that he refers to as "Olive Branch" points and "long-shanked" Dalton points. However, the specimens that he illustrates as representative of the early Sirkin phase (Gramly 2002:Figures 7 and 17) would fall comfortably within any large Dalton assemblage from Missouri or Arkansas (C. Chapman 1975; Kay 1982; Lopinot et al. 1998, 2000; Morse 1997; O'Brien and Wood 1998). Additionally, most of the specimens from the "Sirkin" phase exhibit serrated and/or beveled blades (Gramly 2002:Figure 17), which are not characteristics generally attributable to Beaver Lake points. Other Quad and Beaver Lake-like points from Olive Branch are illustrated by Gramly (2002:Figure 42 and Plate 80). All of these, however, could represent a wide range of variability within the Dalton type at the Olive Branch site, which appears to have been one of the most important Late Paleoindian sites in the midcontinent. It not only served as a habitation and intensive workshop area, but also probably as a focal point (staging area and/or rendezvous site) where various Dalton groups regularly crossed the Mississippi River and probably exchanged various raw materials.

A number of possibilities might account for the Quad and Beaver Lake types. First, they might indeed represent two separate lanceolate point types as currently defined by most Paleoindian point typologies. The morphometric data from this study generally support this notion, but the sample of each type was too small to make meaningful comparisons. The morphometric differences also might be due simply to range of variability and/or resharpening. Second, they may represent a range in variation within a single point type. This type may be temporally separate from earlier fluted points and technologically separate from contemporaneous Dalton and Hardaway points. Variation in a projectile point template between knappers of different but affiliated bands, especially across an entire state, could account for slightly broader and more pronounced ears on Quad points and a more pronounced stem constriction on Beaver Lake points. Part of this variation may be a result of resharpening. Multiple episodes of blade resharpening of Quad points below the original maximum blade width exaggerate the basal width as well as reduce the length to a short stubby appearance.

There is also considerable overlap between Quad and Beaver Lake points and unresharpened or slightly resharpened Dalton points. Thus, a third possibility is that Quad, Beaver Lake, and Dalton represent an even wider range of variation and/or resharpening within a single Dalton type. A considerable range of variation in what some investigators consider Quad, Beaver Lake, and Dalton appears to support a single Dalton type. Justice (1987:35-42) placed all three in a Dalton Cluster. Most of the points identified as Quad or Quad subtypes by Rolingson (1964:Figures 13-15, 17) more closely approximate the Beaver Lake (Figures 13 and 17) type and the Dalton type (Figures 14-15). The same is true of points from the Roach site that were identified as Quad (Rolingson 1964:Figure 43; Rolingson and Schwartz 1966:Figure 25a). These points illustrate a considerable range of variation in blade, stem, and base configuration, but most of these fall within the range of unresharpened or slightly resharpened Dalton points. One specimen from the Roach site (Rolingson 1964:Figure 43, lower left) has a classic Beaver Lake shape with a constricted (waisted) stem but exhibits a serrated blade generally attributed to Dalton points. Several similar serrated points were recovered from the Olive Branch site (Gramly 2002:Figure 17). Some Quad and Beaver Lake points may represent Dalton points that were strictly projectiles and were resharpened only on their distal ends. Such Dalton points would not exhibit a sharp break between the blade and the stem and they would not develop serrations along the blade.

Until the Quad and Beaver Lake types can be isolated in well-defined, undisturbed, stratified deposits (either in separate contexts, in a single context, or in association with a Dalton assemblage), the temporal and cultural placement of these two point types will remain uncertain. Splitters will classify them as separate types, and lumpers will combine them into a single type or cluster. Although they have been listed in this report as separate Late Paleoindian types, it appears to this investigator that Quad, Beaver Lake, and Dalton may represent a single type that exhibits considerable variability due to regional variation, individual or group idiosyncrasies, and/or maintenance techniques.

Notched Late Paleoindian points occur in a large variety that exhibits incurvate stems or faint shallow side notches (Dalton) and a small variety that has distinct side notches or corner notches (Hardaway). Besides the presence of notches, these Late Paleoindian points appear to be resharpened in a different manner than lanceolate Late Paleoindian points. Dalton and Hardaway points were resharpened along the entire length of the blade edges, which sometimes produced beveled and/or serrated blades.

Aside from similarities with Quad and Beaver Lake points, Dalton points in central Kentucky exhibit considerable variability. They include: (1) a typical Dalton type (e.g., Figure 6e) with a distinct blade-stem juncture, straight to slightly incurvate blade edges, and a moderately concave base, (2) a Colbert variety (e.g., Figure 6h) which has a relatively short stem and slightly concave base, and (3) a Dalton-like variety (e.g., Figure 6a-c) which exhibits no obvious blade-stem juncture and resembles Quad and Beaver Lake points.

Many of the points classified in this report as Dalton differ slightly from the classic Dalton points found in the Ozarks and areas west of the Mississippi River (C. Chapman 1948, 1975; Goodyear 1974; Morse 1997). Classic Dalton points generally have a deep concave, often bifurcated, base with slightly incurvate stem edges (C.

Chapman 1975:245). The blades of classic Dalton points are usually serrated. Even some unresharpened Dalton blades are serrated (C. Chapman 1975:Figures 4.17 to 5.5). Only one Dalton point from the Rolling Fork-Beech Fork sample was serrated. Blades on classic Dalton points that are repeatedly resharpened also are generally beveled, usually on the right side (C. Chapman 1975:245; Collins et al. 1983:Table 1; Morse 1997:20). Only three Dalton points from the Rolling Fork-Beech Fork sample were beveled, and the beveling on all three was on the left side. Another feature that occurs occasionally on classic Dalton points west of the Mississippi River is burination (Morse 1997:21-22). Explanations for these differences are unclear, but they may be related to slight variations on a general panregional theme.

Although there are some similarities between Hardaway and Dalton points, Hardaway appears to represent a separate, although contemporaneous, point type. First, Hardaway points exhibit distinct side or corner notches and shorter stems. Second, Hardaway points (unresharpened or sharpened) are usually considerably smaller than Dalton points. Third, Hardaway points often exhibit small broad flutes in the basal concavity, unlike most Dalton points. These differences appear to represent different technological approaches to manufacturing Late Paleoindian points.

Dalton and Hardaway points are sometimes found at the same site (e.g., 15Ws34). In large Late Paleoindian assemblages, however, one point type generally will dominate over the other. For example, Dalton points dominate the Late Paleoindian assemblage from the Roach site (Rolingson 1964:Figures 43-44; Rolingson and Schwartz 1966:Figure 25), whereas Hardaway points dominate the Late Paleoindian assemblage from the Morris site (Rolingson and Schwartz 1966:Figure 56).

As for Dalton points, considerable variability exists within the Hardaway type. All seven specimens from the Rolling Fork-Beech Fork area exhibit small side or corner notches placed low on the stem. The seven Hardaway specimens can be separated into large and small varieties. Large Hardaway points (e.g., Figure 7e-f) are longer than 50 mm and range in thickness from 6.7-8.3 mm, whereas small Hardaway points (e.g., Figure 7a-d) are less than 45 mm in length and range in thickness from 3.9-5.8 mm. The smaller specimens most closely resemble the small Hardaway Side-Notched variety described by Coe (1964:Figure 58). One of these (Figure 7d) is corner notched and could be classified as a St. Johns variety of San Patrice (Duffield 1963). At a minimum, the thin, small variety of Hardaway points is different technologically from Dalton points.

In conclusion, four Late Paleoindian point types generally are recognized in Kentucky. There are indications that one or more of the four types might simply represent a range of variability within a single point type or variability within a single widespread technological tradition. However, no clear determinations could be made based on the project data from central Kentucky. Such determinations are very difficult, especially when available data is from relatively small sample sizes and from scattered surface finds. Nevertheless, the data on thirty Late Paleoindian points presented here is considerable more than that documented previously for Marion, Washington, and surrounding counties in central Kentucky.

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