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To the Graduate Council:

I am submitting herewith a thesis written by Alexander Craib entitled "Dalton Mobility in the Tennessee River Valley: An Assessment of Raw Material Use and Tool Curation." 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.

David G. Anderson, Major Professor

We have read this thesis and recommend its acceptance:

Timothy E. Baumann, Jefferson Chapman

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

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

Dalton Mobility in the Tennessee River Valley: An Assessment of Raw Material Use and Tool Curation

A Thesis Presented for the

Master of Arts

Degree

The University of Tennessee, Knoxville

Alexander Craib

December 2016

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Lastly, and by no means least, I would like to express my eternal love and gratitude to my family: Donald, Margaret, and Susan. You all have always supported my love of playing with rocks in the dirt, thank you for putting up with me all these years.

ABSTRACT

Previous research in the Southeast has demonstrated that Dalton groups underwent a process of settling in to the landscape. This has been demonstrated through the identification of raw materials used for the production of Dalton hafted bifaces. A preference for locally available raw materials has been noted in previous studies, a departure from Clovis groups who routinely made use of non-local cherts. This trend has been well established outside of the Tennessee River Valley; however, little research has been done concerning the settling in of Dalton groups in this region. In order to test the hypothesis that Dalton groups in the Lower and Central Tennessee River Valley were also settling in, 187 Dalton points were analyzed for raw material type and amount of curation. All analyzed samples were originally collected by avocational archaeologists and subsequently donated to the McClung Museum of Natural and Cultural History. The collections used (Ernest J. Sims, Smeltzer, Cambron/Hulse) all possess exceptional spatial data with site-specific locational information. Results of this study are consistent with the trends previously identified, demonstrating that Dalton groups in the Lower and Central Tennessee River Valley were settling in.

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CHAPTER ONE INTRODUCTION AND STATEMENT OF RESEARCH PROBLEM

This study examines Dalton settlement strategy and lithic raw material procurement in the Lower and Central Tennessee River Valley. Characterized by their unique hafted, lanceolate biface, Dalton groups were hunter-gatherers who occupied a wide geographic area in the Eastern Woodlands and Midwest during the terminal Pleistocene-early Holocene transition between 10,500-9,900 ^{14}C B.P. or 12,500-11,900 cal yr B.P., with many sites examined (Goodyear 1982)(Figure 1). Dalton occupation of the Lower and Central Tennessee River Valley (LCTRV; see Figure 2) has been well-documented (Cambron and Hulse 1960a, 1960b; Lewis and Kneberg 1958; Norton and Broster 1992; Sherwood 2004; Walker 1998; Walker and Detwiler 2001), however little research has been done to better understand how local Dalton groups were moving across the landscape and exploiting locally available lithic raw materials. This study aims to supplement the existing data set and contribute to a better understanding of Dalton mobility and lithic material use in the Tennessee River Valley.

Previous research on Dalton settlement outside the LCRTV has demonstrated a preference for orienting territorial ranges around locally available, high quality raw materials (Daniel 2001; Gillam 1996; Koldehoff and Loebel 2009; McNutt 2008; Tune 2016; Walthall and Koldehoff 1998). Evidence for long distance procurement of lithic materials by Dalton groups is almost non-existent, the notable exception being Sloan point exchange in the Central Mississippi River Valley, which involved the transport of Crescent Quarries Burlington Chert hundreds of kilometers from its source up and down the river (Morse 1975a, 1975b, 1997, 1977a, 1997b; Walthall and Koldehoff 1998). The prevailing hypothesis based on research outside the LCTRV, is that Dalton preference for locally available raw materials represents a 'settling in' to the landscape (Anderson 1990; Anderson et al. 1990, 2015; Morse 1997; Morse et al. 1996; Morse and Morse 1983). That is to say, Dalton groups, in contrast to previous Paleoindian populations, are more intensively exploiting locally available resources while demonstrating a more constricted territorial range (Miller 2014). Raw material distributions of Dalton points, the amount

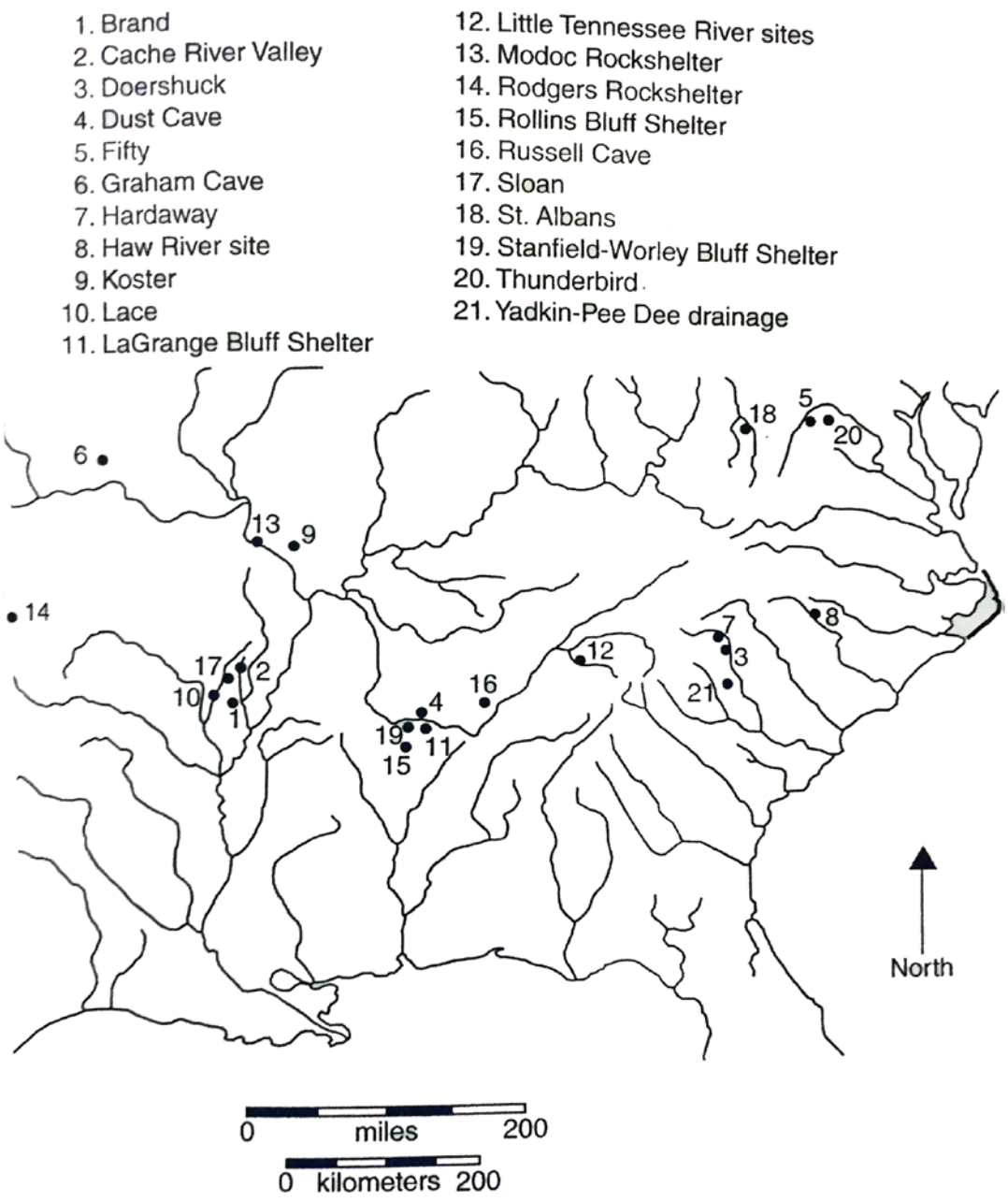


Figure 1 - Major Dalton Sites in the Southeast, (Adapted from Hollenbach 2009: Fig 1.2)

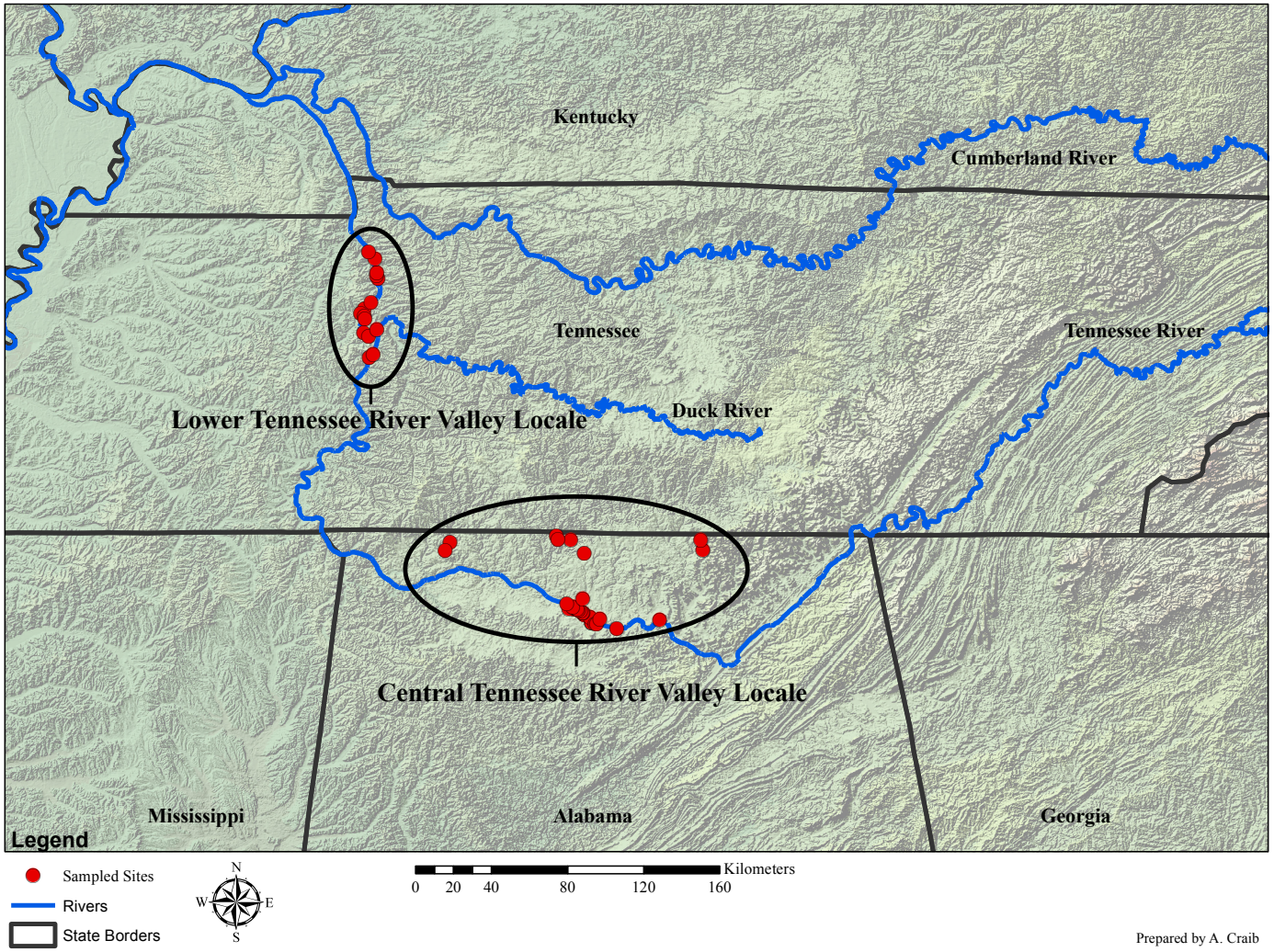


Figure 2 - Dalton Component Sites Sampled for this Study. Note the two distinct locales. Map prepared by A. Craib using data derived from data sets available on http://mrdata.usgs.gov/geology/state/ in ArcGIS.

of curation in the form of utility indices, and comparisons between known Paleoindian and Dalton site locations have been used to document this trend (Gillam 1999; Koldehoff and Loebel 2009). The goal of this study is to test the hypothesis of Dalton 'settling in' on the LCTRV by looking at Dalton point raw material distribution and amount of curation. Both raw material availability and tool curation have long been associated with mobility studies (Anderson and Hanson 1998; Andrefsky 1994, 2007, 2008, 2009; Ballenger 2001; Bamforth 1986; Binford 1973, 1979, 1980; Bleed 1986; Chapman 1980; Daniel 2001; Futato 1983; Gillam 1996, 1999; Gramly 1980; Hoffman 1987; Kelly 1988; 1992; 2007; Koldehoff and Walthall 2004; Kuhn 1989, 1992, 1994; Kuhn and Miller 2015; Sassaman et al.1988; Shott 1986; Surovell 2009; Walthall and Holley 1997) and can provide insights into how Dalton groups were moving across the landscape and utilizing raw materials. The research presented explores the question "Do Dalton groups in this region also demonstrate a preference for locally available chert and thus represent another area in which Dalton groups are 'settling in'?"

An important component of this study is the use of well-documented avocational collections. Avocational archaeologists have been active in the LCTRV throughout modern times, as extensive agricultural use of the land has led to plowing of numerous sites, revealing a deep record of human occupation. A boom in avocational activity occurred with the inception of the Tennessee Valley Authority (TVA) and the subsequent public works projects that were conducted. Inundation of large swathes of riverine lowlands necessitated massive archaeological excavation projects (see Chapman 1973, 1977, 1980; Lewis and Kneberg 1958, 1961; Sullivan 1995). Since inundation, infrequent drawdowns of the reservoir levels have revealed numerous sites and artifacts that have been exposed through erosion, allowing for relatively easy collection by avocational and in some cases professional archaeologists. While the majority of those who engaged in these activities did not keep any records of their finds, several individuals were exemplary in their documentation practices. The Ernest J. Sims collection, the Charles C. Smeltzer collection, and the combined James Cambron/David Hulse collection, housed at the McClung Museum of Natural History at the University of Tennessee – Knoxville, all possess locational information of the sites and areas from which artifacts were collected, and were analyzed here. These three collections were

amassed from various TVA reservoirs in western Tennessee and northern Alabama, making up two distinct locales within the LCTRV that compose the study area for the current research: the Lower Tennessee River Valley (LTRV) locale in West Tennessee and the Central Tennessee River Valley (CTRV) locale in Northern Alabama. Because a large portion of the archaeological record in the LCTRV has become submerged, use of avocational surface collections becomes increasingly important in current research.

A total of 187 Dalton points from the three aforementioned collections were analyzed for this study. As described in Chapter Five, the analysis included the identification of raw material, recording of an array of attribute measurements related to morphology and use, utility indices, and from what site and which collection the artifact originated. These data, including measurements and photographs of each artifact are provided in Appendices 1 and 2.

The Dalton horizon occurs during the latter part of the Younger Dryas and slightly later, during the millennium before and just after the Pleistocene – early Holocene transition (Anderson et al. 2015; Goodyear 1984; Miller and Gingerich 2013a, 2013b). Dalton culture occurs during two distinct environmental and ecological settings, although it disappears soon after the onset of the Holocene, replaced by side and corner-notched assemblages across Eastern North America (Sherwood et al. 2004). Chapter 2 provides an overview of local conditions in the LCTRV during this period of major ecological and environmental change. Because the artifacts analyzed were not observed in their original, buried context, is important to understand what the landscape was like at the end of the Younger Dryas.

Both settlement and mobility have long been essential components for understanding cultural adaptations to ongoing changes in both the ecological and social environment. Related to settlement and mobility are the concepts of curated and expedient tool use, as well as tool morphology. Chapter 3 reviews concepts of settlement and mobility as they are relevant to this study including the 'collector vs. forager' continuum (Binford 1980), lithic tool utility (Kuhn 1992, 1994), morphology (Bleed 1986), and the concept of curated and expedient tool technologies (Binford 1979, 1980).

These concepts will inform analyses used to test the hypothesis that Dalton groups in the LCTRV were becoming increasingly settled into the landscape.

Chapter 4 examines the current state of Dalton research in the southeast, covering geographic distribution, temporal placement, subsistence practices, tool-kit organization and hypothesized settlement patterns of this culture. Several settlement models have been proposed for Dalton settlement outside of the LCTRV that are examined for their implications for Dalton settlement in the LCTRV. A primary emphasis of the current study is to examine how raw material use and the role of Dalton point curation can be used to better understand the relationship between tool-use, material type, and settlement mobility.

A history of the collections used in this study, in addition to a discussion on the differing documentation practices for each will be presented in Chapter 5. Further discussion will take place on the methods used in this study, particularly how identification of chert varieties was conducted. Chert identification is important for mobility studies because lithic material outcrops are static locations on the landscape and distributions of raw materials can be used as a proxy for movement of peoples. Raw material usage and utility indices (Kuhn 1992, 1994) are used to infer Dalton mobility in this region. The hypothetical settlement models presented in Chapter 3 will be reviewed, and a new hypothetical model will be constructed that incorporates the data from the LCTRV. Primary data collected during this study, including measurements and photographs of the artifacts examined, and summary data from the statistical analyses are presented in the Appendices.

CHAPTER TWO ENVIRONMENTAL AND GEOLOGIC SETTING

The Central and Lower Tennessee River Valley is a physiographically diverse region (see Figure 3). The headwaters of the Tennessee River lie in the Valley and Ridge region of east Tennessee. It winds southwest into the Tennessee River Gorge around the Cumberland Plateau and into northern Alabama. The river continues to flow west through a region composed mostly of low uplands before turning almost due north. As it approaches Tennessee, the river enters the Western Valley. This area is characterized by rolling hills and stream valleys. The most characteristic aspect of the modern Tennessee River is undoubtedly the tremendous amount of modern damming activities that have occurred throughout its course by the Tennessee Valley Authority. TVA established a series of nine dams during the 20th century that produced corresponding reservoirs, resulting in the inundation of massive swathes of land reshaping the entire Tennessee River Valley. The riverine landscape to transitional Paleoindian-Early Archaic hunter-gatherers in the region was thus markedly different from todays. While much of the landscape has undergone tremendous amounts of physical transformation, the underlying geology has not undergone such transformative processes.

A brief description of the climate, flora, and fauna of the LTCRV during the Pleistocene-Holocene transition is provided to create a backdrop for understanding the environment that local Dalton groups exploited. Following this discussion is an overview of the geologic history of the study area, as well as an overview of chert varieties that were accessible during Dalton times. The description of chert varieties is meant to demonstrate broad, regional characteristics that allow for better identification of source locations. The descriptions represent well-documented and identified varieties as well as more general characteristic found in each of the study locales. The point is not to describe each variation of chert present within the LCTRV, but rather to point out distinct varieties and general, locale-specific characteristics.

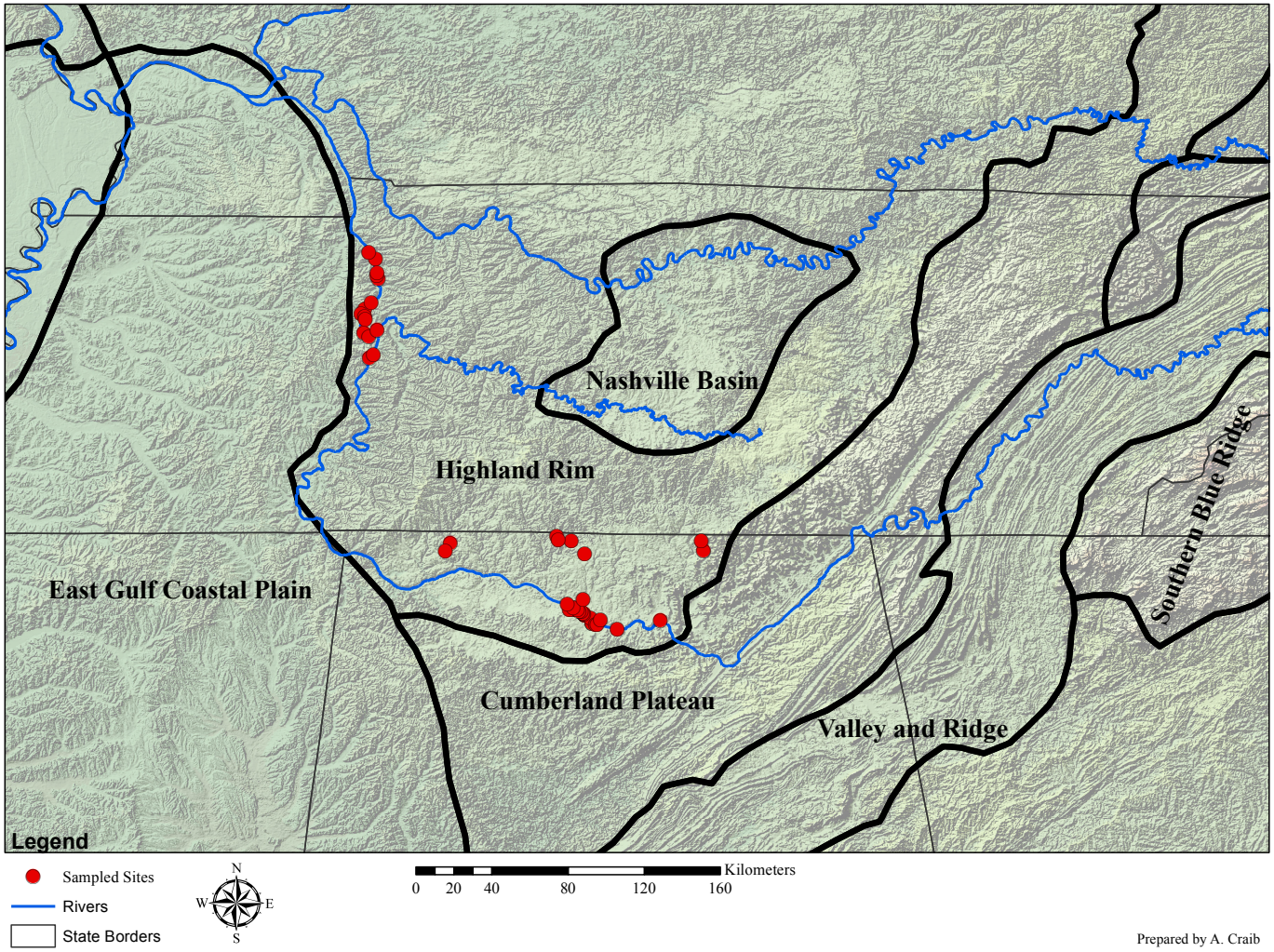


Figure 3 - Physiographic Zones of the Study Area. Map prepared by A. Craib using data derived from data sets available on http://mrdata.usgs.gov/geology/state/ in ArcGIS.

Paleoenvironment

The Dalton complex (10,500-9,900 ^{14C} yr B.P. or 12,500-11,900 cal yr BP) dates to a climatic period of tremendous change and variability. The rapid onset of the Younger Dryas at ca. 10,900 ^{14C} yr B.P. marked a dramatic change in climate that may have resulted in a social reorganization in response to the changing environment. The Younger Dryas is generally characterized as a return to colder and wetter conditions; however, oscillations to a warmer and drier climate were common throughout the region (Meeks and Anderson 2012). Vegetation changes were widespread during this time, with the development of warm mixed forests, predominately oak and hickory, occurring throughout the Southeast (Williams et al. 2004). This period also marked the culmination of the megafauna extinction events that began during the late Pleistocene, resulting in the extinctions of some 30 genera (Anderson and Sassaman 2012:40). The extinction of the megafauna had a tremendous impact on subsistence strategies. While Clovis people may have exploited megafauna, the faunal remains from post-Clovis strata at Dust Cave reveal a generalized foraging approach was in place (Hollenbach 2009; Sherwood et al. 2004; Walker 1998; Walker et al. 2001). The Younger Dryas period also was a time of dramatic restructuring or reorganization of human populations in the region. With the decline in Clovis populations during this time, a period of regionalization occurred that resulted in the creation of numerous sub-regional cultural groups, one of which would become Dalton (Anderson 1990,1995, 2001; Meeks and Anderson 2012; Morse 1997; Morse et al. 1996), a post-Clovis manifestation that would extend over a much greater area than many of the immediate post-Clovis subregional groups. This regionalization could be attributed to restricted ranges of prey animals, an increased tethering to lithic sources, a decreased need to maintain social relations with other groups, or a combination of these and other factors.

Geology and Chert Resources in the Central and Lower Tennessee River Valley

The Central and Lower Tennessee River Valley is adjacent to almost continuous outcrops of high-quality chert raw materials, particularly the Ft. Payne and St. Louis

formations (Figure 4). The dynamic geologic history of the region has produced several geologic units that bear cherts demonstrating a wide breadth of inter- and intra- outcrop variability. Due to the amount of diversity, the visual identification of different geologically aged cherts has been proven to be difficult (Parish 2009; Parish and Durham 2015). Basic characteristics, however, can be used to assign a general procurement locale.

Parish (2009, 2015) has looked intensively at chert provenance in the LCTRV by extensively sampling both Ft. Payne and St. Louis formation cherts. Samples were subjected to Visible Near-Infrared Reflectance Spectroscopy (VNIR) to source each to their geologic and geographic origin. This research has led to a vastly improved understanding of the variability and variation present within and between chert outcrops in the LCTRV region. The current study makes use of characteristics identified in each of the previously mentioned studies, but does not attempt to identify specific sources for each chert variety identified. Instead, visual identification is used to determine general geologic and geographic origin.

The following is a brief description of regional characteristics as well as distinct chert varieties found within the study area. The descriptions of the cherts that follow contain the macroscopic characteristics that were used for identification. The majority of the cherts identified in the study sample are attributed to Mississippian Period deposits (see Figure 5), an epoch characterized by shallow seas, shifting currents, and migrating shorelines (Miller 1974:30). For the sake of brevity, the following discussion will focus on those layers and formations that contain chert. For a stratigraphic sequence of the geologic units in the study area see Figure 6. Identification of cherts to a general locale is critical to understanding which chert resources Dalton groups were accessing as well as how far away from these static locations groups were ranging.

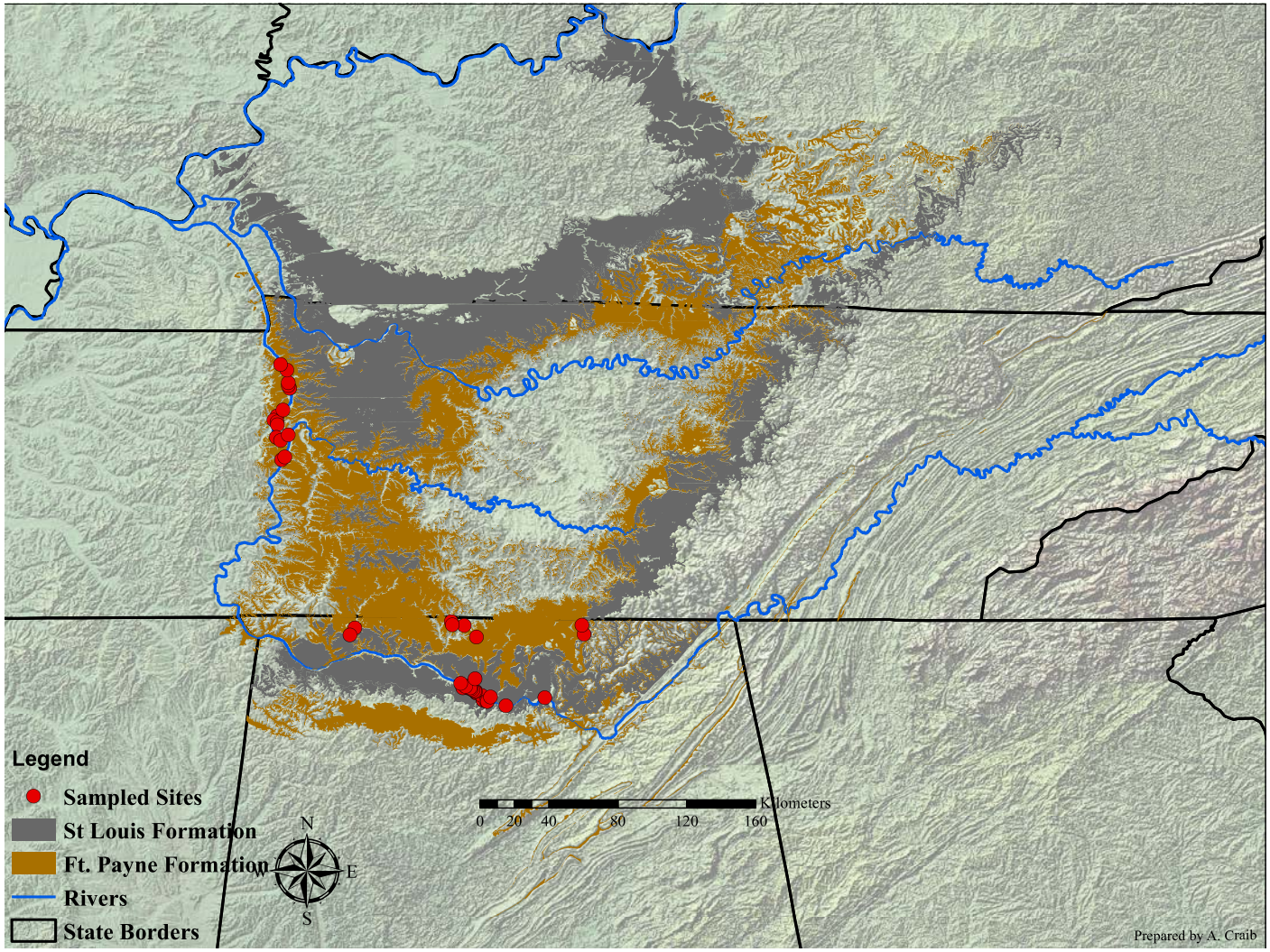


Figure 4 - Geographic Distribution of the St. Louis and Ft. Payne Formations. Map prepared by A. Craib using data derived from data sets available on http://mrdata.usgs.gov/geology/state/ in ArcGIS.

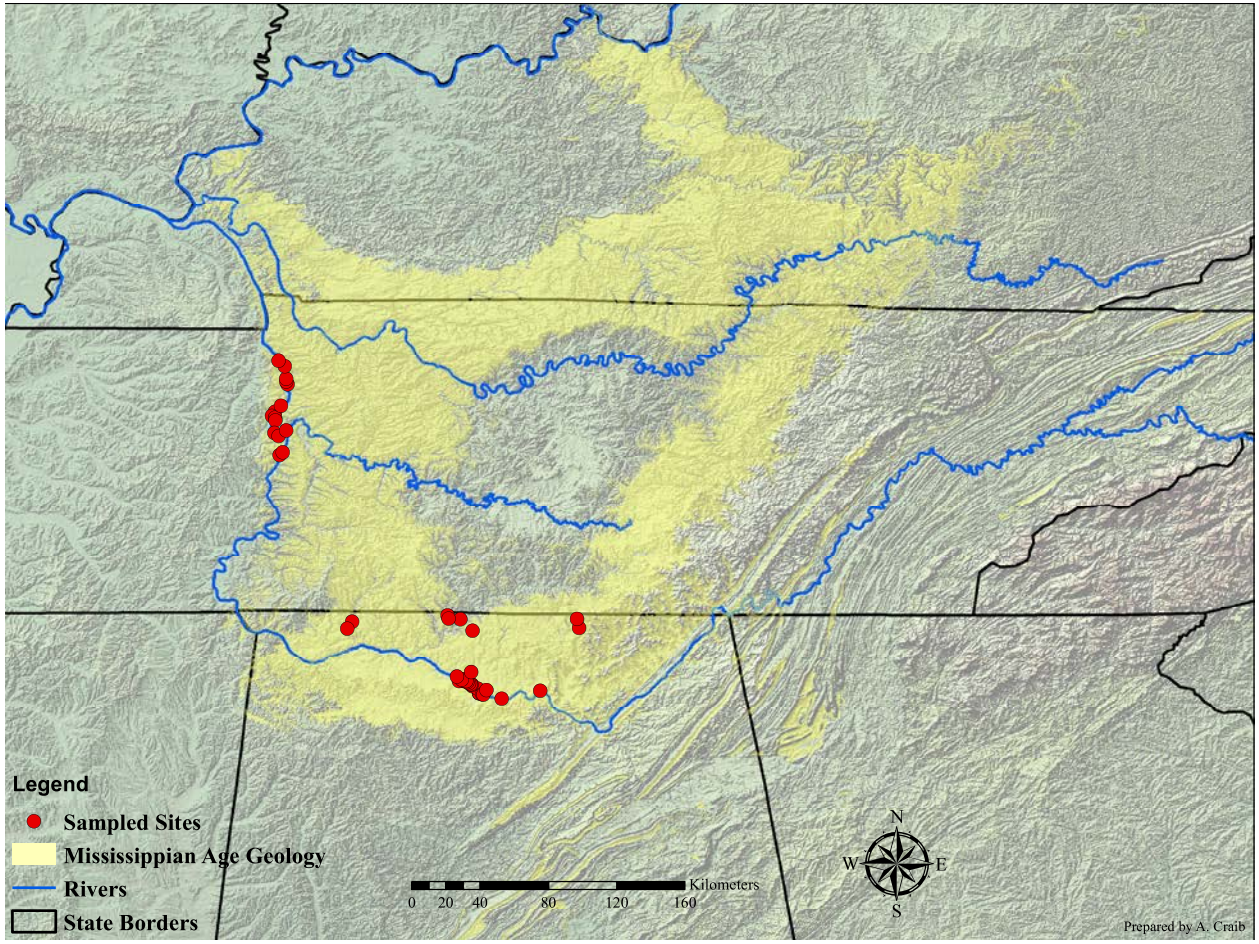


Figure 5 - Mississippian Aged Geology. Map prepared by A. Craib using data derived from data sets available on http://mrdata.usgs.gov/geology/state/ in ArcGIS.

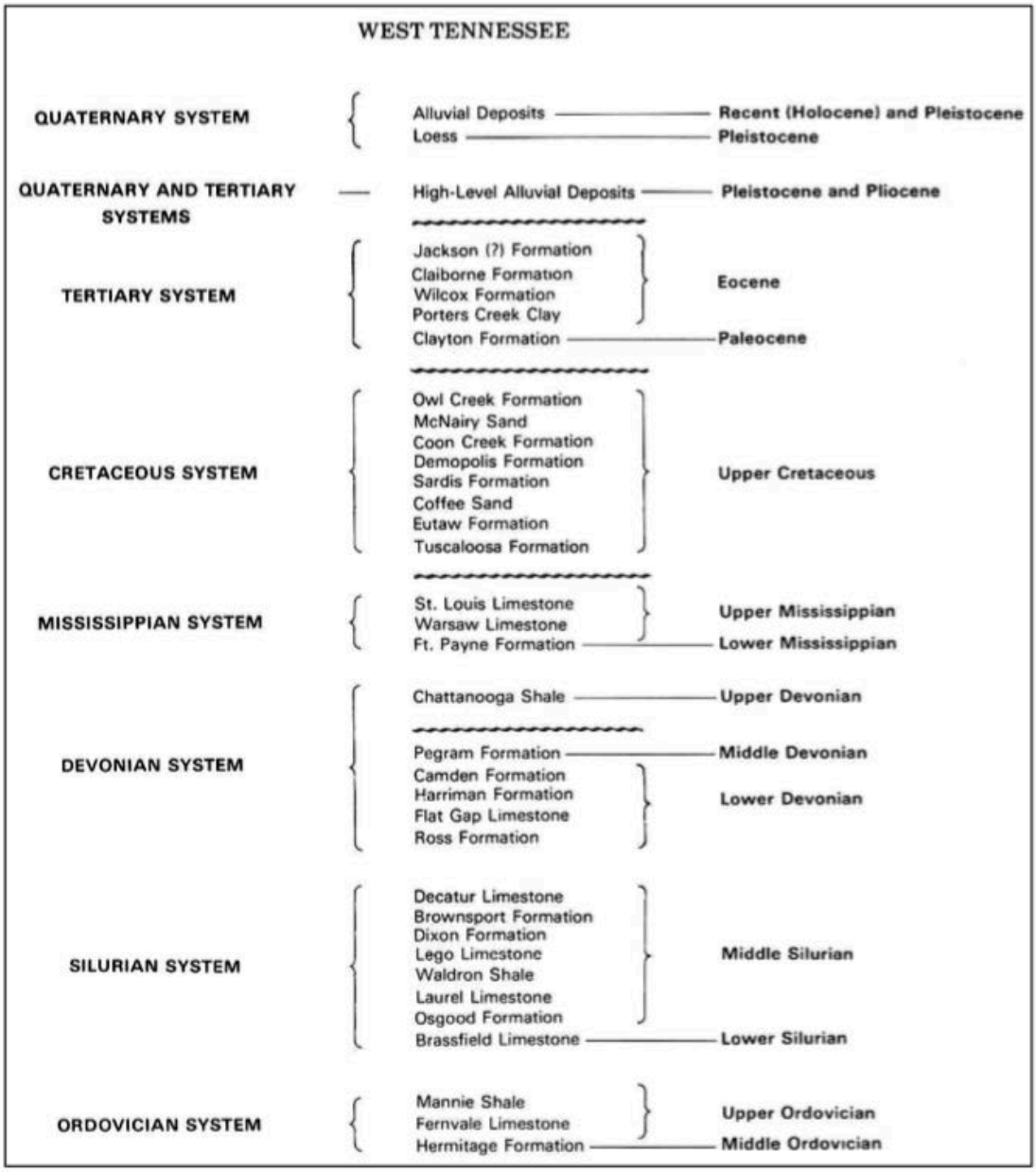


Figure 6 - Geologic Formations of West Tennessee by System (Miller 197

Ft. Payne

Within the greater Mississippian Formation, a large area of silty, limy sediments accumulated, eventually to be replaced in part by silica, which formed the Ft. Payne formation. This formation is characterized by high-quality, bedded and disseminated chert, and represents the oldest chert bearing formation within the Mississippian Period geology (Miller 1974:30-31). The Ft. Payne formation is ubiquitous throughout the study area (see Figure 4 for Ft. Payne formation distribution). As previously discussed, a great variety both inter- and intra-outcrop variability exists within the Ft. Payne cherts (Amick 1984; Barry 2004; Futato 1983; Parish 2009); however there are discernible characteristics that can be attributed to general locations on the landscape, as described below (see Figure 9 for an example of macroscopic variability in Ft. Payne cherts).

Lithic resource surveys in the Wheeler Lake reservoir and surrounding areas have identified numerous varieties of Ft. Payne cherts. The most recognizable to identify macroscopically is the Blue-Gray variety. Current research has shown that the blue-gray variety outcrops across a broad geographic area (Parish and Durham 2015:75). Outcrops of Blue-Gray Ft. Payne have been located in the Pickwick Lake area along the Tennessee River in northwest Alabama (Futato 1983:120). This chert is a dark gray, almost blue hue with a fine texture and a medium luster (Figure 7). The most common macromineral inclusions for this variety are pyrite and calcite with *Crinoidea* fossils being the most common macrofossil (Parish and Durham 2015:77-78). The next most recognizable Ft. Payne variety in the Central Tennessee River Valley is a tan fossiliferous variety. The color of this chert varies from a cream color to light brown with numerous *Crinoidea* fossils present. It also has a fine texture, medium luster and occasional thin gray banding. Outcrops of this chert have been identified in the Yellow Creek drainage of northeast Mississippi (Futato 1983:120).

Figure 7 - Blue-Gray Ft. Payne Chert from Limestone County, Alabama. Sample from Personal Reference Collection.

.

Ft. Payne varieties in the Lower Tennessee River Valley also demonstrate a high degree of variability between outcrops (Figure 8). Two distinct varieties of Ft. Payne chert have been identified by recent research; a solid, blocky, brown variety that is found bedded, often in the soil matrix, and another that lies at the top of the formation and is much lighter in color and more porous in texture (Parish 2009:32). While dark brown is the base color, a tremendous amount of variation in color is present with some outcrops producing solid colors while others yield chert with multiple bands of lighter brown. Luster of this material is medium and the texture is fine.

The variation in color has created problems for visual differentiation of Ft. Payne and the macroscopically similar, but geologically distinct Dover chert. The identification of fossils is one method of differentiating Dover varieties from other Mississippian aged cherts such as Ft. Payne. Dover varieties have an abundance of *fenestrate bryozoan* fossils that range in color from light blue to white and typically occur in linear bands (Parish 2009:46). For additional discussion about this ongoing issue, see Parish (2009) and Parish and Durham (2015). Due to the amount of macroscopic similarities, identification of Ft. Payne versus Dover chert was established by the presence or absence of *bryozoan* fossils.

A third variety of Ft. Payne was identified within the sample - Horse Creek, or Pitkin chert. It is a unique variety of Ft. Payne chert that exhibits a tri-colored patterning, often in the shape of a bulls-eye (See Figure 9 for an example of non-thermally altered Horse Creek chert). The centers of the nodules are typically red or pink, surrounded by tan or caramel, and a dark gray or black exterior (Futato 1983:120). This chert outcrops within the vicinity of Savannah, Tennessee. Sometimes nodules of Pitkin chert have been recovered from Tuscaloosa gravels in northeast Mississippi.

Figure 8 - Ft. Payne Varieties of Tennessee. None are of a specified variety, rather they are shown to demonstrate the variability of Ft. Payne cherts.

Figure 9 - Example of Non-Thermally Altered Horse Creek Chert. Point ID SI-14-7

St. Louis Formation

The St. Louis formation overlays the Warsaw Limestone and is often divided into Upper and Lower units (see Figure 4 for distribution). Cherts from each of these units exhibit very different macroscopic characteristics. Upper St. Louis cherts are typically porous in texture, however on the whole it is denser and darker (Parish 2009:34). Lower St. Louis cherts commonly occur in large nodules that have been described as 'cannonballs', are fine to medium texture, and dark gray or blue-black color. The St. Louis formation extends throughout the Central and Lower Tennessee River Valley, however its use during the transitional Paleoindian-Early Archaic period appears to be minimal (Futato 1983). While the cannonball nodules are the most widely documented of the lower St. Louis cherts, recent research has suggested that Dover chert should be included in this formation (Parish 2009).

Dover chert is well documented throughout prehistory in the Lower Tennessee River Valley (Gramly 1992). Dover chert has historically been linked to a series of quarry sites located in Stewart County, Tennessee, making this particular variety of chert invaluable for understanding procurement and mobility strategies as it only outcrops in a single, geographically restricted area. This variety of chert is found predominately as large nodules embedded in soil or eroding out of limestone bluffs (Parish 2009:46-48). The two different contexts produce two distinct varieties (Figure 10). Chert recovered from the soil matrix is predominately light brown, with bands of caramel or light tan, and is medium grained (Figure 10:B-D). Chert from the limestone matrix is fine grained and dark black in color (Parish 2009:48)(Figure 10:A). *Fenestrate bryozoan* fossils are the most common macrofossils found, however, it should be noted that most Dover chert does not have visible fossil inclusions (Parish and Durham 2015:78).

Figure 10 - Dover Chert Varieties. (Clockwise) A - limestone matrix; B-D - soil matrix. Samples from Personal Reference Collection.

Ste. Genevieve Formation

The Ste. Genevieve formation overlays the St. Louis limestone formation but is not widely present in the study area. Cherts from this formation are rare in the Lower and Central Tennessee River Valley and represent a very small amount of the analyzed sample. Ste. Genevieve cherts typically have a shiny luster and are yellowish gray in color (Parish 2009:35).

Bangor Formation

The Bangor Formation extends through much of the Central Tennessee River Valley but does not appear further downstream in the Lower Tennessee River Valley. Bangor cherts tend to have numerous crinoid fossils and range in color from gray to black. Sometimes tan calcareous inclusions are present within the chert. The most distinguishable variety is referred to as Blue Green Bangor chert. This variety is unique in that is very homogenous in its color which range from a light green blue to a dark blue gray (Futato 1983:119-120).

Tuscaloosa Formation

Many of the streams and tributaries to the Tennessee River contain a variety of chert gravels. Most of these gravels are from the Tuscaloosa Gravel Formation dating to the Cretaceous Period (Miller 1974:49). Tuscaloosa gravels generally are bright white or tan, occur in nodules of varying sizes, and the dominant fossils are *brachiopods*.

Exotic Cherts

Burlington chert was the focus of heavy exploitation by Dalton groups outside of the LCTRV in the CMV (Walthall and Koldehoff 1998). Generally grouped with the underlying Keokuk formation, the Burlington-Keokuk limestone formation is widespread throughout Missouri, Illinois, and Iowa. Cherts from these limestone deposits are typically white to light gray, fossiliferous, and of good knapping quality (Walthall and Koldehoff 1998:263). Burlington chert can be heat treated to improve knapping quality and the color of the material, although there is a paucity of analysis on heat treatment of Dalton points (see Anderson 1979).

CHAPTER THREE HUNTER-GATHERER MOBILITY AND ORGANIZATION OF LITHIC TECHNOLOGY

Hunter-gatherer mobility and its relationship with lithic technological organization have historically been studied in terms of environmental and temporal change (Beardsley1956; Binford 1980; Kelly 1992, 20013; Murdock 1967). While this study looks at a single temporal horizon, the terminal Pleistocene/initial Holocene Dalton culture of the Midsouth, the concepts of mobility and technological organization discussed in the literature are still applicable to the research questions examined here. Expectations for Dalton mobility and curation strategy in the LCTRV based on the presented theory will be further discussed in Chapter Four.

Hunter-Gatherer Mobility

The concept of mobility has long been identified as a distinguishing characteristic of hunter-gatherers (Kelly 2013). At its core, mobility refers to the frequency and amount of movement that a group undergoes. Mobility can best be conceptualized as a continuum, highlighted by those theoretical groups occupying the extremes. At the most mobile extreme of the spectrum are nomads. Truly nomadic groups move fluidly over the landscape without stopping, exploiting resources as they encounter them. At the other end of the continuum are fully sedentary groups who are permanently attached to specific places on the landscape. There are no known ethnographic examples for groups exhibiting either of these characteristics, rather groups tended to shift along the continuum based on environmental and cultural factors. Because all human groups move to some degree, regardless of position on the continuum, mobility is a quantifiable conception that can be measured by number of moves, average distance moved, etc. (Kelly 1992, 2013).

Prior to the conception of mobility as a continuum, hunter-gatherers were divided into four classes; *free-wandering groups*, who had no territorial boundaries; *restricted-wandering groups*, who were constricted within territorial boundaries; *center-based wondering groups*, practiced seasonal returns to a central occupation site; and *semi-*

permanent sedentary groups, who occupied sites for several years prior to relocation (Beardsley 1956). These conceptual groups were later modified by Murdock (1967), who recognized four forms of mobility fully nomadic, semi-nomadic, semi-sedentary, or fully sedentary. Both conceptions are analytically useful, but do not capture the dynamic nature of hunter-gatherer mobility (Kelly 1992:44). Kelly (1992:44) argues that while mobility is to some extent shaped by environmental conditions, it is a property of individuals who act with their own agency; note some individuals may move around more than others and in different ways. Children, the elderly, men, women, the healthy and sick, all would have differing mobility patterns according to environmental, cultural, and seasonal factors.

Binford (1980) moved away from using discrete groupings to classify mobility, instead describing two idealized settlement systems, foragers and collectors, conceptual frameworks that can be used to better understand the circumstances under which archaeological sites were formed (Kelly 1992:45). Binford (1980), based largely on ethnographic data derived from the Nunamiut of north-central Alaska and the San of southwestern Africa, established two systems, *residential mobility* and *logistical mobility*. The two systems are associated with idealized types of hunter-gatherers, foragers and collectors respectively.

Foragers, associated with *residential mobility*, exercise seasonal residential moves amongst a series of resources patches. This practice is associated with largely undifferentiated or homogeneous areas of resources, i.e. tropical rainforests or equatorial settings (Binford 1980:5). Foragers typically do not store food and resources are procured on an encounter basis. Group size and the length of stay at a residence are variable based on the availability and density of resources in the area. Binford (1980:7) emphasizes that residences are not always relocated based on the previous geographic location, but rather that resource proximity was the mitigating factor. Foragers tend to "map onto" the landscape through preferential exploitation of resources, opting to move their residences based on availability and location of resource patches (Binford 1980:7). Residential mobility produces two types of archaeological sites, a residential base that acted as a locus for everyday activities and the location, where specific procurement tasks were

carried out. When resources are severely limited, extreme cases of tethering can occur, or what Binford (1980:7) calls *tethered nomadism*.

In contrast to the "mapping on" strategy of foragers, collectors practice *logistical mobility*, wherein specially organized task groups procure specific resources. Logistical mobility is practiced in regions where distributions of resources are patchy and often widely dispersed (Binford 1980:10). Rather than move residential base camps from one resource to another far-flung location, specially organized task groups travel to procure additional, necessary resources. These groups differ from foragers in that they are not procuring resources on an encounter basis, but rather they set out to collect specific resources. Collectors are further differentiated from foragers by their use of food storage. Logistically mobile collectors, like residentially mobile foragers, make use of residential base camps and locations; however, Binford (1980:11-12) identifies three additional site types derived from the specific and specialized resource procurement strategy. These additional sites are the field camp, the station, and the cache. Field camps are temporary sites where a task group maintains itself while out on logistical forays away from the base settlement. Field camps will often exhibit greater variability due to the specific nature of resource extraction for collectors (Binford 1980:10). The station is a special purpose site where task groups would engage in information gathering, either on resources or other hunter-gatherers in the area, i.e. ambush locations, hunting stands, or lookout points. Caches act as field storage areas whereby small groups can outfit much larger groups with resources. Because small groups are tasked with procuring resources for a much larger group from significant distances, caches might have acted both as stimulus for residential moves or as a staging area for successive trips (Binford 1980:12).

Tool Curation

While stone tools cannot provide a comprehensive understanding of mobility, it can provide a better understanding about how lithic technology was organized in terms of adaptive strategies. Nelson (1991:57) views technological organization as the "study of the selection and integration of strategies for making, using, transporting, and discarding tools and the materials needed for their manufacture and maintenance." The study of technological organization is a dynamic range of behaviors that incorporates both social

and economic factors as well as environmental conditions. Lithic tool organization can be seen as interplay between hierarchies of interrelated variables. Environmental conditions set the stage upon which social and economic strategies are formed, affecting the technological strategies employed, which would in turn be reflected by artifact forms and distributions (Figure 11).

Technological organization is traditionally discussed in terms of two dichotomous strategies: curation and expediency. First introduced by Binford (1973:242), a curated technology focuses on careful rejuvenation of tools and transportation of these artifacts. Curated technologies also exhibit a direct relationship with the anticipated performance for different activities. Defined more succinctly, curation is a "strategy of caring for tools and toolkits that can include advanced manufacture, transport, reshaping, and caching or storage" (Nelson 1991:62). An additional characteristic of a curation strategy is the preparation of raw materials in anticipation of a period of want, whether that is want for material, time, or production facilities (Nelson 1991:62-63).

The transportation costs of highly mobile hunter-gatherer toolkits should be minimized as much as possible. Curated technologies allow for relatively sturdy, maintainable, and multi-functional tools to be readily accessible (Bleed 1986; Kuhn 1994). By minimizing the number of tools by carrying multi-purpose tools and emphasizing certain tool forms the overall weight of the tool kit can be significantly reduced. It should be noted that several scholars have argued against mobility as the primary factor for adopting a curation strategy (Bamforth 1986; Kelly 1988), instead suggesting that access to static lithic procurement areas in relation to access to other necessary resources instead shapes the technological organization of hunter-gatherers.

In contrast to a curation strategy, expedient strategies emphasize a minimal amount of technological effort in the production of tools. Expedient strategies anticipate abundant lithic material and known requirements for tools used at specific locations (Nelson 1991:64). Expediency occurs when raw materials are abundant and easily accessible, as well as when sedentism increases and mobility decreases. Particular emphasis is placed on tool forms that optimize manufacturing time and tool function, with little to no concern placed on transportation costs. Because of this, expedient tool

Figure 11 - Hierarchy of Variables Dictating Technological Organization. Adapted from Nelson (1991:Figure 2)

kits will have a higher prevalence of single function tools with the physical weight of the tool not dictating tool form (Bleed 1986; Kelly 1988; Kuhn 1994).

While the study of technological organization can provide a small measure of mobility, it does not provide a comprehensive picture. Because curation and expedient strategies represent idealized extremes on a continuum, additional lines of evidence are required when discussing hunter-gatherer mobility, particularly during the transitional Pleistocene-Holocene when groups were beginning to settle in to the landscape.

Distributions of raw material types have often been used as a means to infer mobility and group ranges in the early Southeast (Anderson et al. 2010, 2015; Anderson and Hanson 1988; Ballenger 2001; Daniel 2001; Gillam 1996, 1999; Goodyear 1989; Jennings 2008; Sassaman et al. 1988; Walthall and Koldehoff 1998). Because lithic outcrops are static locations on the landscape (Goodyear 1989) and stone tools are typically found well away from procurement locations, the distance from source can be used as a basic measure of mobility. While sourcing to specific outcrops was not conducted for this study, the identification of chert to a local or extra-local source provides data that can be used in an analogous manner. As previously discussed, curation strategies are employed to ensure ample raw material is accessible for the manufacture of tools as groups are moving across the landscape, with a direct correlation existing between high levels of mobility and curation.

Binford (1979) has argued that tool portability is directly related to residential mobility, and that portable toolkits will exhibit higher ratios of tool production debris to tool maintenance debris. Residentially mobile groups would be expected to replace tools when they no longer served a function, opting to carry less material and fewer tools as their higher levels of mobility would call for decreased transportation costs. Logistically mobile groups, with a lower degree of overall mobility, would be expected to carry or cache a larger inventory of tools and tool making materials. Kuhn (1989) sees resharpening and reworking activities as a means to increase and maintain the utility of curated implements, rather than a characteristic of either logistical or residential mobility. Because logistical mobility strategies select for efficient tools, curation would ensure that said tools would be relied upon to perform when necessary. As the tool becomes

reworked, it's reliability decreases and is discarded. Kuhn (1989:43) sees tool discard as evidence for increased husbanding of technology instead of an indicator of expedient tool use.

Like Binford's (1980) forager-collector continuum, expedient-curation strategies can best be visualized as idealized extremes on a spectrum. It should be noted that the two strategies are not mutually exclusive and can be used in conjunction with each other. An example of this would be the use of bifacial cores. As flakes are removed from the core, expedient tools are produced. Once the core has been thinned and reduced in size, it can be formed into a projectile point or hafted knife that would in turn be re-sharpened until it was either discarded or repurposed into another tool.

Tool Utility Indices

To better quantify the amount of curation a tool undergoes over the course of its life, Kuhn (1989, 1994) devised a model of artifact discard and replacement that incorporates the concepts of tool curation. Kuhn's model was later be revised by Ballenger (1998, 2001), who looked specifically at Dalton tool curation, ultimately forming the foundation for the model used in this study. This model, henceforth to be referred to as Utility indices, uses the terms Residual and Expended utility to formulate an index of residentially mobile and logistically mobile hunter-gatherers (see Figure 12 for measurement locations). This model helped guide the collection of measurements from the sample examined here.

Residual utility is the amount of material remaining to be used on a tool and is expressed as:

Residual Utility: Blade Width x Blade Length

The Goodyear/Morse (Goodyear 1974; Morse 1971b) approach to classifying stages of use on Dalton points essentially identified Residual utility. Expended utility is all the material that has been used and removed through curation and is expressed as:

Expended Utility: Base Width / Blade Width (at 30mm)

Blade width was taken at 30mm to ensure that a standard placement for measurement was used. This was to ensure that unintended biases were not created as a result of natural morphological variation in the analyzed sample. The amount of utility remaining in a tool at time of discard can reflect the mobility strategy employed, as well as raw material availability. Residentially mobile foragers would be expected to replace tools upon exhaustion, reflecting the limitations on the number of backup tools that can be carried. Tools used by residentially mobile foragers should possess higher degrees of Expended utility. Logistically mobile foragers would be expected to replace tools using a fear of failure scenario, suggesting that higher amounts of utility would remain on discarded tools. The implications of this strategy would be lower degrees of Expended utility present on tools used by logistically mobile foragers.

The concepts of mobility and tool curation discussed above have typically focused on cultural change over time or between culturally distinct groups. The current study aims to focus this approach by looking at how mobility and tool curation strategies were employed by Dalton groups in the LCTRV. Lithic raw material use will be used as a proxy for mobility, while curation of Dalton points will be analyzed using expended and residual utility indices.

Figure 12 - Measurements Required to Calculate Utility Indices. Gray Area Represents Expended Utility.

CHAPTER FOUR THE DALTON HORIZON

Dalton hafted bifaces have been found throughout the Southeast, the prairie-woodland transition directly west of the Mississippi River, and parts of the Midwest. The Dalton horizon, based on lithic tool typology, stratigraphic, and radiocarbon evidence has been dated to the terminal Pleistocene-early Holocene transition, approximately 10,500-9,900 ^{14}C yr B.P. (Goodyear 1982; Sherwood et al. 2004). A brief overview of the Paleoindian sequence in the Southeast will follow to provide a framework within wich the Dalton horizon can be understood. Dalton groups throughout the region, and within the CTRV, were accessing a wide range of faunal and floral resources (McMillan and Klippel 1981; Parmalee 1962; Walker 1998; Walker et al. 2001). A particular emphasis of Dalton research has focused on the concepts of settlement and mobility, particularly in relation to the organization of the Dalton tool-kit. A review of geographic distribution, chronology, subsistence and settlement, and tool-kit organization and their relationship with mobility concepts previously discussed will be presented in this chapter. This review will provide a basic foundation for understanding the Dalton horizon, establishing a framework through which Dalton mobility and tool curation in the LCTRV can be better understood.

Geographic Distribution

The Dalton Horizon, first identified in Missouri by Chapman (1948), has been widely documented throughout the Eastern United States, with several local variations manifesting outside of what has been argued is the core region of Dalton habitation. The densest concentrations of Dalton sites and artifacts can be found in northeast Arkansas and southeast Missouri, an area that has come to be known as the Dalton homeland (Anderson and Sassaman 2012; Meeks and Anderson 2012; Morse 1969, 1971a, 1973; Morse and Morse 1983; Redfield 1971; Walthall and Koldehoff 1998). Dalton materials have been identified outside of this region in Illinois (Gramly and Funk 1991), Kentucky, Tennessee (Lewis and Kneberg 1958; McNutt et al. 2008; Norton and Broster 1992), North Carolina (Coe 1964; Daniel 1998), South Carolina (Goodyear 1998), Georgia, Alabama (Cambron and Hulse 1960a, 1960b; Sherwood et al. 2004), and Mississippi (Brain 1970). There are several coeval projectile point types outside of this core region

that have been interpreted as being Dalton variants. These include the Hi-Lo cluster of the Great Lakes, Suwanee/Simpson points of Florida, Hardaway points from North Carolina, Meserve points from the Plains, and San Patrice points from Louisiana and Texas (Cambron and Hulse 1964; Justice 1989).

A notable Dalton variant in eastern Tennessee is the Candy Creek type (Roberts 1977). Originally believed to be an Early Woodland variety, examination of numerous continuous and discrete traits demonstrated that Candy Creek is in fact a variant of the Dalton projectile point with distinct morphological differences between groups on either side of the Appalachian Mountains (Roberts 1977). Identification of this variant further demonstrates that while there is a generalized definition of what a Dalton point is, a number of sub-regional variations exist, suggesting that differences likely existed between these geographically dispersed Dalton groups.

Chronology

Goodyear (1982) provides a summary of the contexts and a review of the dates associated with Dalton components in the Southeast, suggesting that the Dalton Horizon should be placed between 10,500-9,900 ^{14}C yr B.P. (12,500-11,900 cal yr BP) (Goodyear 1982:391), although this range has been subject to some scrutiny in light of recent research (see Anderson et al. 2015; Miller and Gingerich 2013a, 2013b). A brief overview of the Paleoindian period in the Mid-south will follow to provide an understanding of the sequence that preceded the onset of the Dalton Horizon.

The Early Paleoindian Period (>13,250 cal yr BP) is not well defined in this region (Anderson et al. 2015:30). No known diagnostic artifacts definitively identify the presence of Early Paleoindian assemblages in the region. Several sites, however, have yielded bifacial forms that may have remained unrecognized as Early Paleoindian due to morphological similarities to later forms, low occurrence rates, or lack of securely dated, stratigraphically controlled contexts (Anderson et al. 2015:30).

The Middle Paleoindian Period (ca. 13,250-12,850 cal yr BP) demonstrates widespread evidence for human occupation of the Southeast in the form of Clovis fluted points. While Clovis assemblages in the Southeast are not well dated, they are assumed

to span from around or before 13,250 cal yr BP until the onset of the Younger Dryas (ca. 12,850 cal yr BP) (Anderson et al. 2015:30). Research into raw material use by Clovis groups, specifically in Florida, the Midsouth, and the South Atlantic Slope, demonstrates that Clovis groups occupied large (100-300km) but not unbounded ranges (Anderson et al 2015). Evidence for increasing regionalization begins to be identified during this period.

The Late Paleoindian Period (ca. 12,850-11,700 cal yr BP) roughly corresponds with the Younger Dryas climatic episode and is characterized by great cultural and climatic change (Anderson et al. 2015:31). The regionalization trends initially identified in the Middle Paleoindian Period were fully realized by the Late Paleoindian. This is evident through the diversification of morphology in bifaces in sub-regional areas over time (Anderson et al. 2015:32). One of these sub-regional morphological variants eventually would become known as Dalton and spread throughout the Southeast.

Originating from mixed contexts within caves and rockshelters, the earliest recorded Dalton associated dates come from contexts that are questionable at best. The first explicit Dalton associated date, from Graham Cave, Missouri, was a mixed sample of charcoal and bone from a hearth feature on the original cave floor, yielding a date of 9,700 ± 500 ^{14}C B.P. (Crane and Griffin 1956:667). While the hearth feature itself was not directly associated with Dalton materials, other hearth features on this stratigraphic level contained "lanceolate projectile points" (Crane and Griffin 1956:667), that have been widely interpreted as Dalton or Meserve, as well as a number of basal and side-notched projectile points. Additional dates from a charcoal lens associated with what can be described loosely as Dalton-esque tools produced dates of 9290 ± 300 ^{14}C B.P. and 9470 ± 400 ^{14}C B.P. (Crane and Griffin 1968:84-85). The loose association of Dalton cultural remains with the dated materials calls into question the date ranges provided, however, this issue would persist until better stratigraphic controls were established during excavations.

The issue of stratigraphic control presented itself again in the Stanfield-Worley excavations (DeJarnette et al. 1962), which produced some of the most widely cited Dalton aged dates. Charcoal fragments collected from vertical columns were used to provide rough age ranges for different strata. A sterile aeolian sediment layer, allowing

for general dating of this specific stratum to be more robust than the loose affiliations of the Graham Cave dates, capped the Dalton component of the site, Zone D. The dates of 9640 ± 450 ^{14}C B.P. and 8920 ± 400 ^{14}C B.P. (Crane and Griffin 1964:9; see also DeJarnette et al. 1962) should still be taken with some hesitance, as the deposits in Zone D contained primarily Big Sandy side-notched points.

Regardless of stratigraphic control, the dates from Graham Cave and Stanfield-Worley provided an age range for Dalton of 10,000-8,000 ^{14}C BP. Archaeologists accepted this time span until more secure, and better-associated dates were produced. The first in this new wave of better dates came from Rodgers Shelter in Missouri. Taken from hearths located in the deepest stratum (Stratum 1), these features were protected from post-depositional taphonomic processes (Ahler and McMillan 1976). Samples of charcoal from three of these hearth features have produced dates of 10,530 ± 650 ^{14}C BP and 10,200 ± 330 ^{14}C BP (Ahler and McMillan 1976:Figure 8.2). Subsequently published dates with secure contexts have further solidified Goodyear's (1982) time frame of 10,500-9,900 ^{14}C yr B.P.

Recent excavations at several sites throughout the Southeast have produced Dalton associated materials from excavations that exercised a significantly increased amount of stratigraphic control (see Anderson et al. 2015; Miller and Gingerich 2013a, 2013b for recent summaries on Paleonidian/Early Archaic dates). These tightly controlled excavations have further supported Goodyear's (1982) age range. The Big Eddy site, an open-air site located adjacent to the Sac River in southwest Missouri, has produced seven radiocarbon dates associated with Dalton materials (Lopinot 1998). Excavations at Dust Cave, located on the south bank of the Tennessee River in Lauderdale County, Alabama produced well-stratified cultural deposits that could be securely associated with Dalton materials (Sherwood 2004). Dalton components produced eighteen radiocarbon dates. The secure excavation context from which the dated materials were extracted further supports Goodyear's (1982) temporal placement of the Dalton Horizon.

The Dalton materials analyzed for this study were not recovered from contexts that produced datable materials, but given their morphological resemblance to dated

forms, Goodyear's (1982) time range of 10,500-9,900 ^{14}C yr B.P. will be assumed for this study (for a discussion on Paleoindian dates in the Southeast, see Miller and Gingerich 2013a, 2013b).

Subsistence

Dust Cave, located in northern Alabama, provides excellent evidence for a Dalton subsistence strategy. Although the only evidence for Dalton occupation of this site comes in the form of two Dalton-like points, the temporal period is consistent with Dalton occupation of the area. Analysis of the faunal assemblage by Walker (1998) reveals a heavy reliance on aquatic resources and a particular focus on avian species. Aquatic species accounted for 62% of the faunal assemblage while terrestrial species made up the other 38%. Avian species, both aquatic and terrestrial, account for a remarkable 69% of the faunal remains found, suggesting that Dalton people were not specialized deer hunters, but instead opportunistic and generalized foragers. Mammals made up only 19% of the assemblage, with white tail deer, cottontail rabbits, gray squirrel, raccoons, muskrat, and voles being the most commonly represented species. Dalton people were also harvesting local fish species, particularly catfish, golden redhorse, suckers, and drum. These resources represented 9% of the assemblage. Reptiles, specifically snake and turtle, were rare, making up just 2% of the assemblage. The faunal assemblage from Dust Cave illustrates that Dalton people, at least at this location, practiced a generalized subsistence strategy with particular emphasis placed on aquatic resources.

Paleoethnobotanical studies in the region, particularly Hollenbach (2009), have demonstrated that Dalton groups were not solely focused on faunal resources, but also procuring floral resources as a component of their diet. Analyzing the botanical remains from four different rockshelters (Dust Cave, La Grange, Stanfield Worley, and Rollins) in the Central Tennessee River Valley of Northern Alabama, Hollenbach demonstrated that plants played a vital role in the diet of late Paleoindian-Early Archaic people. The most common botanical remains found across the four sites were hickory, acorn, black walnut, hazelnut, grape, persimmon, sumac, hackberry, amaranth, knotweed, pokeweed, bedstraw, and chenopodium (Hollenbach 2009:210).

The Rodgers Shelter provides additional evidence that Dalton people practiced a generalized subsistence strategy making use of a wide range of faunal resources (McMillan and Klippel 1981). Hunting was a primary focus during the Dalton occupation at this site based on the remains of both large and small mammals. The most common species present were white tail deer, rabbit, and raccoon, with turtle, squirrel, and turkey also being identified. While the faunal assemblage at Rodgers Shelter does not show a high dependence on aquatic or avian resources, it does demonstrate that Dalton people made use of the resources around them and did not focus on a specific species.

Recent research by Moore (2016) further suggests that Late Paleoindian-Early Archaic hunter-gatherers were practicing a generalized hunting strategy. Protein and microwear analysis on hafted bifaces from the Flamingo Bay site (38AK469) on the South Atlantic Slope in South Carolina revealed that hunters were targeting a wide variety of prey animals. Protein residues from bovids, ungulates, turkey, and gallinaceious fowl were identified on late Paleoindian and Early Archaic projectile points. While this research was conducted outside of the study area, it provides supplementary evidence that Dalton subsistence was diverse and generalized.

Dalton Settlement and Mobility

Initial investigations into Dalton settlement strategy and mobility began in 1961 with the initiation of a survey by James Ford and Alden Redfield along the lower Mississippi River, predominately in Arkansas, where they visited and recorded roughly 400 sites (Ford 1961; Redfield 1971). The data recovered, primarily from surface collections during this survey, provided the foundation for the earliest Dalton settlement models. The early discussion on Dalton settlement was dominated by a series of articles penned by Morse (1971a, 1973, 1975a, 1975b, 1977) and Schiffer (1975a, 1975b). Their lively debate concerning inter- versus intra- drainage settlement orientation will be briefly summarized. Gillam (1996) tested both the Morse and Schiffer Models using GIS based analyses, revealing a third possible model. Additional research concerning Dalton

period settlement and subsequent Early Archaic settlement throughout the Southeast has been widely discussed (Anderson and Hansen 1988; Daniel 1998; Chapman 1977).

The first Dalton settlement model for the southeast was proposed by Morse (1971a) and was based on survey data predominately from the L'Anguille Basin in northeastern Arkansas, an area of approximately 5,000 square miles with 250 recorded Dalton component sites (Ford 1961; Morse 1971a; Redfield 1971; see Anderson 1989 for a subsequent survey of the basin). The model asserts that each Dalton band was made up of two main types of camps, base settlements and hunting/butchering camps, as well as numerous smaller, limited activity sites such as quarries, resource extraction locations and other specialized, possibly ritual sites; cemeteries were subsequently identified with the discovery and excavation of the Sloan site in 1974 (Morse 1975a, 1997a). Morse (1971a; 1977) argued that local topography would have forced band ranges to focus on individual river drainages, rather than cross-cutting several due to the presence of swamps along the boundaries of these drainages prohibiting efficient travel. Individual river drainages would have had a centrally located base settlement and hundreds of satellite camps associated with it. Morse (1977) argues that these river drainage based ranges would have included both upland resources, crucial for the procurement of lithic raw materials, and lowland riverine resources that were more than capable of supporting even a large band.

Base camps, like the Lace Place (Redfield and Moselage 1970), would incorporate most or all of the members of a band and would be occupied for part or most of the year. These sites were placed on the landscape in order to maximize resource accessibility and to ensure the comfort of the occupants from the surrounding environment. Base camps represent the most archaeological visible yet most rare of the two occupation site types and would be characterized by tool manufacturing, intensive processing of floral and faunal resources, and other activities associated with the whole kin group. Base camps could either be a single site that was permanently inhabited or a series of sites that were spread across the band's territory. Hunting/butchering camps would be dispersed throughout a band's range and would be small and numerous with little evidence for hide processing, woodworking, or intense lithic tool manufacture,

although sites like the Brand site have a tremendous amount of material culture for what has been interpreted as a limited activity site (Goodyear 1974). In contrast to Goodyear's (1974) interpretation of the function of the Brand site, Schiffer (1975) has argued that it was likely a base camp due to the diversity and density of tools. Hunting/butchering sites should be characterized by the presence of hunting and processing tools, as well as limited debitage.

Schiffer (1975) offered an alternative model that allows for a greater deal of seasonal mobility with ranges that crosscut, rather than focus on the major river drainages. He claims that band ranges would be hexagonal in shape in contrast to the banana shaped territories used by Morse's (1977) model. Schiffer asserts that crosscutting drainages would be the only means to provide sufficient resources to support a band. Schiffer's (1975) model suggests that greater seasonal mobility would have been used; bands would have fissioned during the late spring through early winter in order to harvest floral resources by moving the location of base camps to increase mobility. Increased residential mobility would help to account for the non-uniform distribution of floral resources. Early winter through spring would have seen a more sedentary occupation period with base camps located near river drainages to take advantage of riverine resources, specifically migratory birds, fish, aquatic turtles, and to focus on the hunting of deer. These sites should be more visible archaeologically and characterized by the same criteria laid out by Morse (1971a, 1977). Schiffer's model claims that hunting/butchering camps would be so ephemeral on the landscape that no archaeological visibility is expected.

In testing the validity of the Morse and Schiffer models, Gillam (1996) incorporated site locational data from the Arkansas Archeological Survey database into a GIS based analysis that revealed a very different mitigating factor for site location. Gillam's (1996) analysis demonstrated that Dalton sites tended to be clustered within 25 km of the chert rich Crowley's Ridge, which acted as the primary source for raw materials (Gillam 1996:281). Rather than focusing on the availability of floral and faunal resources, which were likely abundant and sporadically distributed throughout the lower Mississippi River Valley, Gillam recognized the importance of raw material availability

as the mitigating factor in site placement. Rather than restrict band ranges to individual drainages, Gillam's (1996) revised model views Dalton sites within 25 km as existing within a 'core cultural area,' or staging area. He further hypothesizes that Dalton groups were 'mapping on' to resources in the area, specifically lithic raw materials (Gillam 1996:281)

Daniel (1998) further reinforced the idea that Dalton groups were mapping onto specific lithic raw materials within their ranges. Looking at raw material distributions on the coastal plain, Daniel (1998) demonstrated that Dalton aged tools were predominately manufactured on locally available Uwharrie ryholite, rather than the more distant but better quality Allendale chert. Rather than organize along river drainages, of which there are many in the region, Early Archaic Dalton groups were instead organizing themselves in relation to accessible lithic raw material sources.

Recent research by Tune (2016) has demonstrated that Dalton tool stone use in the Tennessee River Valley was largely restricted to locally available, high quality lithic raw materials. This is in contrast to the preceding Clovis and Cumberland Paleoindian technological traditions, a trend that was also noted by Gillam (1996). Using the 2013 updated Tennessee state data derived from PIDBA, this research looked at raw material use by Clovis, Cumberland, and Dalton peoples. The results of this analysis demonstrated that while Clovis knappers made equal use of locally available Ft. Payne and St. Louis formation cherts, use of non-local cherts was also documented; 8% of the analyzed Clovis materials (Tune 2016). Conversely, Cumberland and subsequently Dalton knappers relied on locally available Ft. Payne and St. Louis Formation cherts, with non-local cherts only comprised 2% of the Cumberland sample and 4% of the Dalton sample. Tune (2016) also noted that Dalton points, unlike Clovis and Cumberland hafted bifaces, had no correlation between length:width and broken:unbroken, further demonstrating that Dalton points were much more intensively reworked than preceding technological traditions. The trends identified by Tune (2016) are reflected in the results of the current study, and will be discussed further in Chapter Five.

Anderson (2013) remarks further on raw material use by Clovis groups in the Southeast. Extensive use of non-local, high quality cherts has been interpreted as characteristic of high mobility. Clovis preference for high quality raw materials has become a characteristic of the horizon (Anderson 2013:380), although use of locally available, lower quality materials has also been documented (see Anderson 2013:Table 16.1 for counts of material use by state, data derived from PIDBA). Anderson (2013) notes that while standardization of material identification could be increased, important generalizations about Clovis raw material use could be made. His conclusions support the notion that Dalton raw material use reflects an increased focus on locally available raw material, rather than a much broader use of materials that were available across the region.

White (2014) further reinforces the hypothesis of Dalton 'settling in' by demonstrating that these groups were transporting raw materials significantly shorter distances than preceding Clovis groups. His analysis of stone tools in the Midcontinent (Michigan, Illinois, Indiana, Ohio, and Kentucky), demonstrates that raw materials were transported over significantly greater distances in preceding cultural horizons. Dalton, conversely, transported materials over much shorter distances (White 2014:62).

Dalton Tool-kit Organization

For many archaeologists, the term “Dalton” conjures up images of hypertrophic, finely knapped, lanceolate shaped, flaked stone points. While these are undeniably emblematic of the Dalton toolkit, they are only one component of a diverse, and adaptive group of tools. For the most part, the Dalton toolkit is comprised of tool forms that are identical to those found in the previous fluted-point assemblages characteristic of the Paleoindian Period. The most distinctive components of the Dalton assemblage are the eponymous Dalton point and the adze. Many researchers have suggested that this assemblage represents a curated technology that illustrates a continuum of use and function (Goodyear 1974; Morse and Goodyear 1973; Ballenger 1998).

The Dalton point is the most collected, and arguably the most distinct tool in the Dalton toolkit. These bifacial, lanceolate shaped projectile points have been identified in a variety of sites and are often the piece of evidence indicating a Dalton occupation.

Researchers have identified several regional variations on the Dalton point, namely Colbert, Nuckolls, Hardaway, Greenbriar, and San Patrice, however there is a common form that all exhibit (Anderson and Sassaman 2012:56-57; Meltzer 2009:308; Morse 1997b; Roberts 1977; Wyckoff 1985). Goodyear (1974:19) defines Dalton points as bifacially worked artifacts with basal haft preparation and a pointed distal end. He goes on to describe four diagnostic characteristics that all Dalton point bases exhibit; (1) stem (proximal) edges are parallel to concave (2) ears on the basal corners are heavily ground through all stages of manufacture and typically flare outward but in some instances they are parallel to the point's axis, (3) a basal concavity is ground during the Preform stage to facilitate the removal of thinning flakes and is present through all subsequent stages, and (4) thinning is performed via the removal of flute-like flakes starting from the basal concavity and running along the axis of the point. Goodyear (1974:19) attributes variability in point body/blade morphology within a site's assemblage to the constant resharpening of these points, although it should be noted that this does not account for the regional variation.

Microwear analysis by Gaertner (1994) has revealed heavy polish around the ears and base of these points, particularly on the obverse and reverse faces. This evidence strongly supports the idea that Dalton points were hafted. The absence of ears on many late stage points also provides another piece of evidence supporting the idea of hafted Dalton points as ears are susceptible to damage and breakage when hafted. While fluting was used to thin the blades, it cannot be interpreted as a functional means to facilitate hafting. Morse (1997) suggests that Dalton points were used both as projectile points and as hafted knives and butchering tools.

Perhaps the most important addition to the Dalton toolkit was the adze. This tool type is indicative of woodworking and prior to its appearance in Dalton assemblages was unknown in North America. Morse and Goodyear (1973) contend that the Dalton adze is contemporaneous with the earliest previously known true adzes of the Lyngby culture in northern Europe. Dalton adzes were typically made from flat, elongated pebbles or cobbles with a preference for pieces that contained a cortex as this was used to facilitate hafting. Goodyear (1974:41) and Morse and Goodyear (1973) have noted that when no

cortex was present, heavy grinding and smoothing towards the butt/poll end was used to assist in hafting. Heavy polishing has been identified on several spent adzes recovered from the Brand site, which further emphasizes the importance of hafting and the rigorous use of these tools. The working bit of the adze is characterized by blade-like flake scars that run parallel to the axis of the tool, indicating that the working surface was continuously resharpened in an analogous manner as Dalton hafted bifaces. Use-wear analysis conducted by Gaertner (1994) revealed that Dalton adzes were used on both dry and charred wood, suggesting that wooden artifacts would have played a role in Dalton life. Gaertner (1994) goes on to suggest that Dalton adzes were used primarily for precision work rather than heavy-duty woodworking based on the relatively small size of the adzes she analyzed. While this observation is certainly relevant, it could be based on sampling bias. Adzes toward the end of their functional lives might very well have been used for much more detailed work, while those in the early stages of use might have been used for much heavier work. The presence of adzes in the Dalton assemblage represents a distinct evolution from the Paleoindian fluted-point toolkit towards one that was more broadly adapted to the changing environment in which Dalton people lived.

The presence of adzes, which are typically the heaviest tools in Dalton assemblages, strongly suggests that wood-working was an important part of life for Dalton people. Use-wear microanalysis by Gaertner (1994) has confirmed that adzes were used on dry or charred wood, suggesting that Dalton people were using their adzes to construct dugout canoes and possibly shelters (Anderson and Sassaman 2012). The presence of dugout canoes supports the hypothesis that Dalton groups were a riverine or aquatically adapted people. Further evidence supporting the presence of dugout canoes is the establishment of what Walthall and Koldehoff (1998) call the 'Cult of the Long Blade,' a pattern of social interaction that occurred during the Dalton period along a roughly 700km stretch of the Mississippi and Missouri Rivers. Dugout canoes would have facilitated rapid transit along this lengthy stretch of the Mississippi River in addition to allowing for more frequent contact amongst groups that were sparsely dispersed across the landscape.

While not nearly as distinct as the Dalton point and adze, numerous other flake stone tools were present in the Dalton tool kit. Amongst the most intriguing are the *pièces esquillés*, which were first identified in the Southeast at the Brand Site and are made from small pebbles, angular chert fragments and thick flakes produced from bipolar flaking (Goodyear 1974:61). These tools have been interpreted as wedges or slotting tools used for working bone, wood and antler, thus providing further evidence that Dalton people made use of these materials as tools. Side and end scrapers are common in the assemblage, suggesting that hide processing was of particular importance to Dalton people. Other tools present in Dalton toolkit are small gravers, mostly formed on flakes, abraders and a variety of cobble stone tools.

The Dalton toolkit retains many characteristics of earlier fluted-point and subsequent side/corner-notched assemblages. The presence of serrations on Dalton points and the evidence of extensive resharpening are characteristic of to this particular cultural horizon. The introduction of adzes into the assemblage is an obvious divergence from previous toolkits, suggesting an adaptation to a rapidly changing landscape and environment.

Dalton Point Utility/Resharpening

To better understand the diversity of bifacially flaked stone tools within the Dalton toolkit, it is important to understand the stages of manufacture that each underwent. The bifacially flaked stone tool component of the Dalton toolkit should be viewed as a continuum of use and function. Morse (1971b) established an early series of stages based on artifacts found in the Hawkins cache. This model emphasized production and reduction. Goodyear (1974:19-32) elaborated on this model and subsequently presented a fairly simple, five stage model of Dalton point manufacture.

The Preform Stage represents the initial shaping and flaking of lithic material into a recognizably lanceolate shape. Goodyear (1974:21-24) states that it is extremely difficult to ascertain if flake blanks were removed from a prepared core or specially struck from a portable biface due to the removal of any bulb of percussion through beveling of the edges and thinning of the body. The relative thinness and curved profile of Dalton points, however, suggests that they were made from specially removed flakes.

Bifacial percussion flaking was used to provide shape to the points. Basal thinning flakes were removed, producing flake scars that resemble earlier fluted point manufacturing techniques, however, Dalton points should not be considered morphologically fluted (Goodyear 1974). Once basal concavities were well-defined and basic retouch completed on the base, the artifact is considered to be a Complete Preform. Some specimens from the Brand Site show fine wear chipping on them, suggesting that points at this stage could have been used as knives or scrapers.

The Initial Stage sees the preliminary sharpening of the body edges and the application of body edge serrations. Dalton knappers applied these body serrations through shallow, unifacial, right-handed bevels. Points at this stage of manufacture exhibit convex body edges in relation to the axis and are quite thin from the removal of flakes in the previous stage, resulting in a very slight to non-existent body indentation. Basal and stem grinding are characteristic of the Initial Stage, suggesting that the points were most likely hafted at this point. Initial Stage Dalton Points can be viewed as the stereotypical Dalton point..

The Advanced Stage, more so than any of the previous stages, represents a continuum of activity and encompasses a much wider criterion for inclusion. Tools in this category have been resharpened at least once, and typically exhibit various degrees of resharpening and edge retouching. Over the course of this stage, points begin to develop a sharp indentation in their body through the application of bevels. Beveling is the application of pressure flakes to a blade edge in a unifacial manner. Bevels can be either right- or left- handed, depending on the region. The body exhibits noticeable to dramatic reduction and the separation between the body and shoulder is now clear. The Final Stage of point manufacture is characterized by the dramatically reduced shape of the body and an inferred change in function for the point. As resharpening progresses through the Advanced Stage, body width decreases significantly, resulting in a drill-like shape. It is this shape, and the absence of body serrations from extensive bifacial retouching that are indicative of a Final Stage Dalton point. The tips appear to have been purposefully removed in order to create a more rounded shape. Extensive modification to

the hafting area is also evident in these points, suggesting that an alternative style of hafting was utilized or that these points were implemented without a haft.

The stages of use-life developed by Morse (1971b) and Goodyear (1974) are a useful analytical tool for describing the morphological changes, but the discrete groups do not account for the continuous use and curation of these artifacts. The application of Ballenger's (1998, 2001) Dalton utility indices (expended and residual as discussed in Chapter Three) allows for the creation of a continuum of values exhibiting the amount of remaining material as well as the estimated material removed. These values can be used to better understand variation between Dalton lithic assemblages.

Expectations

Due to the content of the available data set, development of hypothetical settlement models for the LCTRV is problematic. The nature of surface collections does not allow for firm associations between diagnostic and non-diagnostic artifacts, creating difficulties in discussing complete settlement systems. Like the original Morse and Schiffer models, the data used for the current study is derived from surface collections, and thus, cannot inform on the complete settlement systems in place in the LCTRV during Dalton times. What remains, however, is a rich data set that can allow for a better understanding of what types of raw materials Dalton groups were procuring, how the tools made from these materials were curated and transported, and where on the landscape Dalton people were occupying. These independent lines of evidence provide important sources of data that can inform on Dalton settlement systems in the LCTRV.

Based on Daniel (1998), Gillam (1996), Koldehoff and Loebel (2009), and Tune (2016) the expectation is that Dalton groups in the Lower and Central Tennessee River Valley were mapping onto specific, locally available, accessible, high quality lithic raw material sources while undergoing a settling in process. This would be reflected in the archaeological record through the reliance and preference for locally available cherts. The expectation is that Dalton groups in each of the study locales will intensively exploit cherts that are locally available, thus representing a “mapping on” to the landscape. Because of this shift towards exploiting locally available raw material resources, an indication of decreased mobility should be present. This can be identified through the

application of utility indices to the studied samples. If Dalton groups are in fact accessing more local materials and decreasing overall mobility, then the amount of curation on their tools should also decrease. Based on the previously discussed theory, Dalton groups in the two study locales should be showing signs of decreased mobility and a preference for locally available raw materials.

CHAPTER FIVE MATERIALS, METHODS, DATA, ANALYSIS

Materials

While some professional archaeologists dismiss the research potential of avocational collections, the collections that are well documented and curated can provide valuable insight into how groups moved across and made use of the landscape. Avocational collections can also provide valuable supplementary evidence for regional-scale analyses particularly when there is a paucity of well-excavated sites.

The Ernest J. Sims Archaeological Collection was loaned to the McClung Museum by the Sims family in 2008. Sims collected a variety of artifacts throughout the Kentucky Lake region during the 1950's, 60's, and 70's, focusing his efforts primarily in Benton and Humphreys counties. The most common artifacts found in this collection are complete and broken hafted bifaces, large bifaces, unifacial tools, and groundstone tools. The Sims collection was accumulated from 51 unique locations, all of which were documented on USGS quadrangle topographic maps with artifacts spanning the Paleoindian through Proto-Historic periods. Sims was meticulous in the curation of his collection. All artifacts were catalogued by site, with specific locations highlighted on USGS Quadrant maps. Artifacts were then stored in boxes in a back shed at the Sims residence until donation to the McClung Museum. Upon donation, the artifacts were placed, by site, on trays and housed within climate-controlled cabinets. The maps were donated along with the artifacts and have been scanned at high resolutions so that they may be integrated into a larger GIS map. Many of his sites have been correlated with state numbered sites. Although all archaeological time periods are represented in the collection, there are exceptional quantities of Paleoindian and Archaic period materials. Some of the artifacts come sites that have been documented and excavated by professional archaeologists, furthermore, providing an excellent opportunity to supplement the data sets already available for research.

The Smeltzer collection, donated in 2007 by Charles C. Smeltzer Jr. M.D., is similar to the Sims collection in that the artifacts were methodically curated and organized by site. Clark Jr., the donor, and his father, Clark Sr., began collecting artifacts as a hobby in the 1960's. Unlike the Sims collection, which comes from a single locality,

the Smeltzer's visited several different reservoirs throughout the state of Tennessee including Kentucky Lake, Barkley Lake, Norris Lake, Chickamauga Reservoir, and Hiawassee Reservoir. Artifacts were housed on trays within detached sheds on Clark Jr.'s property. Each tray was given a unique catalog number and individual artifacts were typically labeled with site numbers. While the majority of the collection was housed on trays, 35-40 cases or plates were created to showcase the more exceptional specimens. These plates tend to be organized first by reservoir and then by time period, although some discrepancies in point type identification occurred. While individual artifacts were given unique site numbers, and in some cases identification numbers, the collection as a whole was grouped into larger geographic units. Upon transfer to the McClung, the organizational system was maintained and the artifacts were transferred to climate-controlled cabinets alongside the Sims collection. Unfortunately the Smeltzer's were not as thorough nor detail orientated in their documentation of sites, instead organizing their collections by reservoirs or drainages. While the lack of a fine-grained geographic scale limits the amount that these artifacts can inform on settlement patterns, they can be used to supplement the other collections being used in this study.

The Cambron-Hulse Collection, donated to the McClung Museum in 2004, represents one of the largest and most thoroughly documented avocational collections housed at the museum. A combination of two separate collections, both men exercised the highest standards in record keeping which include sketch maps, artifact provenience information, quadrangle maps with associated sites marked out, and a binomial catalogue number. The Cambron Collection was purchased by Randy George, M.D. and subsequently donated to the McClung Musuem. The Hulse Collection was donated by the Hulse family separately. Upon arrival at the McClung Museum, the two collections were combined due to the significant amount of overlap in collection locations as well as the historical connection of the two men. The combined Cambron-Hulse collection covers 404 sites distributed over eight states in the southeast (Pike 206:133). The majority of sites are located within Alabama (n=339) and Tennessee (n=44), with a number located along the Central Tennessee River Valley in northern Alabama (n=43). The collection contains several thousand hafted bifaces, many of which are Paleoindian and Archaic. Upon donation to the McClung, a UTK sponsored assessment of its

research potential was undertaken (Pike 2006) that resulted in a spreadsheet that displayed comprehensive artifact counts for each site present in the collection. There are some issues with this collection, however. Some of the Paleoindian and Early Archaic points were labeled with price tags, specifically those in the Cambron portion of the collection (Figure 13). It appears that many of the Paleoindian and Early Archaic points, specifically whole and finely crafted examples, originally collected were missing and may have been sold prior to the collections purchase and subsequent donation to the McClung Museum. In some instances the original artifact had been replaced with a resin cast, making identification of the original raw material impossible.

To better understand how the aforementioned samples morphologically compare on a regional scale, raw data from PIDBA was incorporated (see pidba.org for raw data, website was accessed and data was downloaded on April 1, 2016). Specific measurements for basal width and maximum thickness from Georgia, Tennessee, Mississippi, and the Sloan Site in northeast Arkansas were compared the sample analyzed for this thesis. The purpose of this comparison was to determine if LCTRV Dalton groups were manufacturing hafted bifaces in a morphologically comparable manner to Dalton groups in the rest of the southeast. Data found on PIDBA was contributed by numerous scholars and is not standardized between states, although the database itself contains a wealth of data concerning hafted bifaces across much of the mid-south.

All maps used in this study, unless otherwise noted, were prepared by the author using the ArcGIS software suite. Data used for synthesis of geological maps was downloaded from mrdata.usgs.gov on March 2, 2016. All statistical analyses were conducted using the R Studio software suite.

Figure 13 - Example of Price Tag on Paleoindian Point (upper point). The white labels were used for organization by the previous curators of the collection.

Methods

To accurately identify the source material of each point, a reference sample of chert types was used, generously donated by Dr. Ryan Parish. Given the diversity of macroscopic characteristics of chert within geologic units of the same age, particularly the chert yielding Mississippian formations, visual identification of different varieties is notoriously difficult (Parish 2009; Parish and Durham 2015). One issue with visual identification is the effects of natural weathering on chert. A patina will form when the outer surfaces of chert is exposed to both physical and chemical. This patina is formed through the replacement of elements as well as through mechanical changes to the structure of the material (see Figure 14 for an example of a patina).

The identification of fossils is one method of differentiating Dover varieties from Mississippian aged cherts such as Ft. Payne. Dover varieties have an abundance of fenestrate bryozoan fossils that range in color from light blue to white and typically occur in linear bands (Parish 2009:46)(see Figure 15). While the presence of bryozoan fossils is often easily recognizable in Dover chert, Ft. Payne varieties possess a much wider variety of unique markers depending on the geographic location of the formation. Ft. Payne formations extend throughout Northern Alabama and Western Tennessee, producing varieties of macroscopically distinct and simultaneously similar lithic material. Identification of the source material was done to the closest degree possible. Due to the continuous distribution of Ft. Payne chert in the study area and the amount of variability, distinctions between Ft. Payne varieties were based upon geographic location when feasible. Tremendous amounts of inter- and intra- outcrop variation and variability within the Ft. Payne formation make identification down to a specific location problematic. For the current study, all Ft. Payne varieties were categorized into a general Ft. Payne category. This practice is used for St. Louis formation cherts as well.

Figure 14 - Example of Patina Formation on Ft. Payne Chert. Sample from Personal Reference Collection.

Figure 15 - Common Fossils Found in Dover Chert. Samples from Personal Reference Collection.

The varieties of metric data, and explicit descriptions of where these measurements were collected for this study can be found in Figure 16. It is vital to be clear about how, and where measurements were collected not just for the sake of clarity, but also to ensure that the data collected in this study can be used in regional-scale analyses without having to guess about what the data is actually describing.

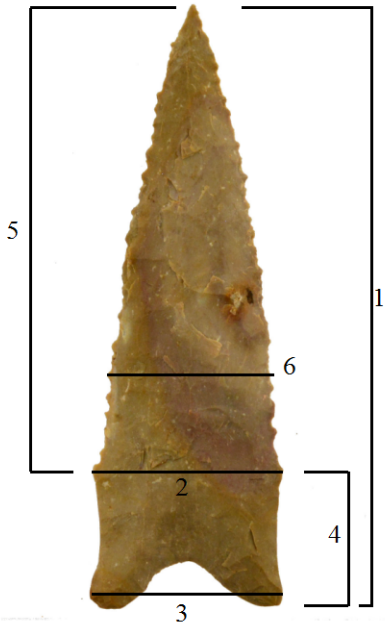
Data

This section will present the results of the raw material identification and the utility indices analysis. Following presentation of the data will be a discussion on the implications of the results. Due to inherent biases within the analyzed sample, assumptions of normality were relaxed.

Raw Material Use

As previously discussed, the Lower and Central Tennessee River Valley contains a tremendous amount of easily accessible, high quality chert. This fact coupled with the issues associated in visually identifying specific varieties and sourcing them, makes distance to source analyses exceedingly difficult. Rather than rely on an incomplete and under researched data set concerning discrete chert outcrop locations, a reference sample from each locale was used to identify cherts based on regional characteristics. Because of this, chert types were only considered to be locally available or not locally available. While this does not provide the detailed analysis that a distance to source approach would provide it is more accurate, and does attest to stone tool material use and can shed light on whether Dalton groups were in fact settling in to the landscape and mapping on to specific resources on the landscape.

Of the 87 Dalton points examined from the Central Tennessee River Valley (see Table 1 for chert use by locale and Table 2 for Ft. Payne variant use by locale), 86% (n=75) were produced on locally available Ft. Payne varieties. The most common Ft. Payne material used in this locale was the fossiliferous Tan variety that accounted for 54.66% (n=41) of the total number of Ft. Payne bifaces. The Blue-Gray Ft. Payne variety only accounted for 18.66% (n=14) of the total number the Horse Creek variety made up



1 - Overall Length
2 - Base Width at Neck
3 - Base Width At Ears
4 - Base Length
5 - Blade Length
6 - Blade Width at 30mm above Proximal end of Base

Source Material	What type of rock is the artifact made from (Ft. Payne, St. Louis, etc.)
Weight (g)	Weight in grams
Length	Overall length measured from distal tip of blade to proximal end of base or ear (depending on which extends further)
Base Width at Ears	Width measured from tip of ear to tip of ear
Base Width at Neck	Width of base measured at the juncture of blade and base
Base Length	Length of base measured from juncture of blade and proximal end of base
Blade Width (at 30mm)	Width measured at arbitrary location on point to ensure consistency
Blade Length	Length measured from distal tip of blade to juncture with base
Thickness	Maximum thickness
Breakage	How did the blade or base break?

Figure 16 - Description of Measurements

Table 1 – Chert Use By Formation in Each of the Study Locales

Raw Material by Type	LTRV	CTRV
Bangor	0 (0%)	1 (1.14%)
Ft. Payne	45 (44.11%)	75 (86%)
Dover	50 (49.01%)	1 (1.14%)
Ste. Genevieve	0 (0%)	0 (0%)
Tuscaloosa	1 (0.98%)	1 (1.14%)
St. Louis	2 (1.96%)	0 (0%)
Burlington	1 (0.98%)	1 (1.14%)
Unidentified	3 (2.94%)	2 (2.29%)
Total Counts	102	87

Table 2 – Ft. Payne Variant Use by Locale

Ft. Payne Variety	LTRV	CTRV
North Alabama Blue-Gray	0 (0%)	14 (18.66%)
North Alabama Fossiliferous Tan	0 (0%)	41 (54.66%)
West Tennessee Dark Brown	40 (88.88%)	0 (0%)
Horse Creek	5 (11.11%)	7 (9.33%)
Undifferentiated	0 (0%)	13 (17.33%)
Total Counts	45	75

9.33% (n=7) of the sample. The other 11.49% (n=10) of the sample was produced on either locally available, non-Ft. Payne chert or extra local chert. The notable exotic cherts found in this sample were Ste. Genevieve (n=4) and Burlington (n=1) formation materials.

One hundred and two Dalton points from the Lower Tennessee River Valley were analyzed. Of those 102, 49.01% (n=50) were produced on the distinct St. Louis formation Dover chert. A further 2 samples (1.96%) were produced on the cannonball variety of St. Louis chert. Ft. Payne varieties account for 44.11% (n=45) of the bifaces analyzed, with Horse Creek composing 11.11% (n=5) of that sample. The Horse Creek variety does not outcrop within the study area, and can be considered an extra local chert variety for this case. Only one sample of Burlington chert was identified within this sample, making up 0.98% of the total sample.

Utility Indices

The model of tool utility as discussed in Chapter 3 was applied to the points examined. The primary values of the Expended utility, which looks at the amount of material used, and the Residual utility, the amount of usable material remaining, are presented for each artifact in Appendix 1, along with all the raw data for each point. The Utility indices are summarized below while summary statistical data and results of the analyses are presented in Appendix 3.

The Expended utility index is a measurement of how much material was removed over the use-life of a biface. This ratio is a basic base width/blade width expression. Due to breakage, not all points analyzed were able to produce the measurements necessary to calculate expended utility. This was predominately the case with broken points where the blade was snapped off below the set 30mm measurement site for blade width. Broken points comprise 21% (n=40) of the total sample. Discarded broken points should not be interpreted as having used up all their utility, as can be seen with the Residual utility indices.

The distribution of Expended utility values from both locales highlights the continuous nature of Dalton biface curation. With the exception of a few outliers that

were discarded due to erroneous values or data entry error, a continuous distribution of values is present. To better understand if locale or material type influenced this distribution, several t-tests and ANOVA tests were conducted. When looking at the relationship between Expended utility and locale (Figure 17), a t-test ($p=0.00316$) revealed that the locale is influencing the amount of Expended utility (see Appendix 3: Tables A.1-3 for summary statistics and results for the following discussion). A p-value of <0.05 is considered significant. The LTRV sample exhibits lower Expended utility scores, indicating that bifaces in this locale are used less intensively prior to discard or loss. The CTRV sample demonstrates a much more continuous distribution of values, although this could be due to outliers driving the significance. The continuous distribution could also be suggesting that bifaces in this locale were being maintained and curated more intensively. To see if material type was influencing these trends, an ANOVA test was conducted to test for significance between material type (Ft. Payne, St. Louis, or Other) and locale. The test revealed that there is no significant interaction between material type and the amount of expended utility present ($p=0.406$). The interaction between material types within a region and expended utility is also considered to be not significant ($p=0.05543$).

Residual utility represents the amount of material that remains to be used on a biface, and is expressed as a ratio between blade width and blade length. Not all bifaces measured, 31% (n=58), were able to produce the necessary measurements for calculating Residual utility values. Of the 58, only 9% (n=5) were on complete points. These samples had been heavily reworked into what could best be interpreted as a drill form. The rest of the bifaces unable to produce residual utility values were broken just distally of the neck.

The same series of tests were conducted for Residual utility values as were done for Expended utility. When viewing the distributions by locale, noticeable differences between the two are visible (Figure 18). Samples with a lower numerical value demonstrate more use and less residual material, while high values would indicate less material had been removed and thus less curation had occurred on the artifact. Residual utility values tend to be higher in the LTRV than those in the CTRV, suggesting that

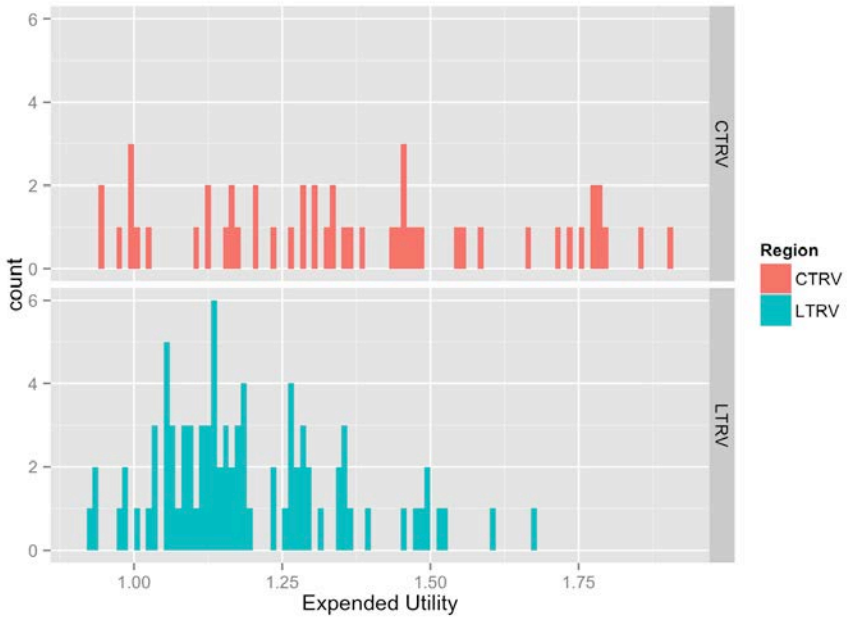


Figure 17 - Distribution of Expended Utility Values by Locale. X-Axis Interval is 0.01.

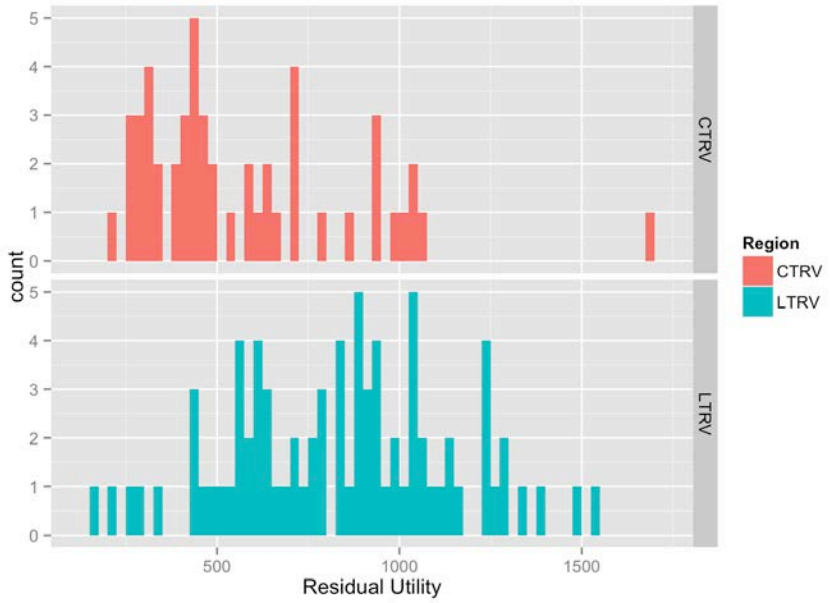


Figure 18 - Distribution of Residual Utility Values by Region. X-Axis Interval is 25.

points were discarded or lost relatively early on in their use life. The relationship between locale and Residual utility was found to be significant ($p<0.001$). ANOVA tests for significance between material types and amount of Residual utility in both locales demonstrated no significant interaction ($p=0.117$). A subsequent ANOVA test looking at material type within the two locales also demonstrated no significant interaction between material types and the values ($p=0.2058$), suggesting that the type of raw material used did not play a significant factor in Residual utility values.

Regional Comparison

Due to the identification of slight variation in usage of points based on region, additional comparative analyses were conducted to determine if geography, material type or the interaction of the two had a statistical difference in hafted biface manufacture. Additional data from Tennessee, Mississippi, Georgia, and the Sloan site in northeastern Arkansas were accessed from the Paleoindian Database of the Americas (PIDBA) on May 2, 2016. Due to the non-standard practice of collecting morphological metric data, two basic measurements were used to conduct this comparative analysis; maximum thickness and basal width. A brief caveat must be made before a description of the analyses can continue. While PIDBA not only has a tremendous amount of metric and non-metric data on hafted bifaces, there is a lack of standardization in measurements between state datasets that makes large scale comparative analyses difficult. For example, the placement of each measurement is not always specified in all the data sets, although certain states do provide references to primary literature that discusses measurement methodology. This particular instance of non-standard data collection is particularly problematic for basal width, as it could be measured anywhere between the ears and the shoulders. While it could be assumed that because Dalton points are typically parallel sided, the location for basal width measurements should not have a significant impact on width, in fact not all Dalton hafted bifaces are parallel sided. Measurements at the ears could produce drastically wider values on expanding auriculated examples like Greenbrier-Daltons than on something more parallel sided like a Colbert-Dalton or classic Dalton. For the sake of this analysis, all basal widths are assumed to have been taken at consistent loci.

Using data on Dalton hafted bifaces from Georgia, Tennessee, Mississippi, the Sloan site in northeast Arkansas, and the LTRV and CTRV locales, t-tests and ANOVA tests were conducted to determine if thickness and basal widths are functions of material type, geographic location, or an interaction of the two. Results of these analyses (see Appendix 3: Tables A.4-A.6 for summary statistics and results of the analyses) indicated that geography was a significant factor in both the thickness ($p<0.0001$) and basal width ($p<0.001$) of Dalton hafted bifaces; the basal width differences, as noted above, may reflect differences in measurement approaches. Raw material was found to be a significant factor determining thickness ($p=.023$), however, it was not statistically significant in basal width ($p=.658$). The interaction of material type and geographic location also proved to not be a statistically significant factor in either thickness ($p=0.625$) or basal width ($p=.244$). The results of these ANOVA tests suggest that geography played a significant factor in determining basal width and thickness while material type was not a significant variable determining basal width although it was a significant variable in determining thickness. This could be due to differential access to low quality materials like quartz or metavolcanics. These materials are more difficult to knap, likely resulting in a thicker biface than those artifacts produced on high quality cherts. Geography as the significant factor determining variation mirrors the trends identified within the study area, further suggesting that behavioral or cultural differences may have existed between the different geographic locales.

Interpretation and Summary

Because of the incomplete nature of the collections used in terms of tool kit composition, it is difficult to discuss Dalton settlement models for the Tennessee River Valley locale. Given these concerns, evidence provided through raw material identification and curation measures can still inform on Dalton mobility within the region. The previously discussed settlement models call for a logistically mobile, lithic resource oriented approach to land use. This is further supplemented by research examining the transition between earlier Paleoindian groups into Dalton (Daniel 2001; Gillam 1996; Koldehoff and Walthall 2004; Smallwood et al. 2014; Tune 2016). The present research shows that Dalton groups were undergoing a process of group range reduction.

Results from the raw material analysis demonstrate both the Lower and Central Tennessee River Valley locales show a high reliance on locally available raw materials. In the case of the LTRV, an increased focus on St. Louis formation cherts, specifically Dover chert, could be interpreted as evidence for more intensive exploitation of local resources. Because this variety is unique within the study area in that the outcrop is relatively well known, it represents a good piece of evidence that Dalton groups were heavily exploiting local resources. A similar trend towards reliance on Dover chert was also noted by Tune (2016). The abundance of Ft. Payne material in the LTRV sample (43%) could be attributed to Dalton groups in the locale knowing where high quality outcrops were located. Statistically the material type within the LTRV did not have an impact on the amount of curation occurring on each point, suggesting that the materials themselves were of comparable knapping quality. The presence of exotic Burlington chert, albeit a singular example, could be evidence of connection to the Dalton groups in the Central Mississippi Valley. The material could have been traded down the line or intentional transportation of the material either as a preform or a completed point, reinforcing social ties with distant groups.

The trends identified in the LTRV for raw material type also are present in the CTRV. Dalton groups in this area show a high reliance on locally available Ft. Payne varieties, specifically the fossiliferous tan variety. Unfortunately, without better spatial data on the outcrops of Ft. Payne varieties, it is impossible to determine how far Dalton groups were moving to access these materials. It is, however, safe to say that CTRV Dalton groups were heavily reliant on local materials, suggesting that there was a distinction between groups in this locale and those in the LTRV. A single instance of Burlington chert was also identified within this locale, with the same implications as for those in the LTRV. Most peculiar within this sample is the presence of Ste. Genevieve chert. This formation outcrops in Kentucky, Indiana, and Illinois and was not identified in the LTRV locale. It is possible that these represent isolates that moved south through trade and exchange.

The relative lack of extra-local raw materials in the two study areas coupled with the large amount of locally available chert suggests that Dalton groups were not moving

over large areas, but instead remaining close to reliable, well known chert resources. The lack of crossover in chert material between the two locales suggests that little interaction, or at least trade or direct procurement of raw materials, was occurring.

The differences between the two locales are further exemplified when looking at the distributions of utility index values. Expended Utility values for LTRV Dalton points are significantly less than those of the CTRV and have been shown to be statistically significant in their difference. This is supplemented by the Residual Utility values that also show a statistical difference in distributions between to the two locales. LTRV Dalton groups are characterized by a higher degree of discard or loss earlier on in the use-life of their tools. The higher expended utility values for the CTRV suggest a more mobile strategy than their northern neighbors, as high Expended utility values typically correlate with residentially mobile foragers.

Additional analyses incorporating a wider geographic area further demonstrated that regional differences did exist among Dalton groups. As demonstrated by the comparative, statistical analysis, region was a significant factor determining basal width and thickness of Dalton bifaces. Regional differences could be attributed to behavioral differences or differences in raw material package size, although the two factors do not have to be mutually exclusive. The presence of comparatively more difficult to knap quartz and metavolcanic material on the Atlantic Slope would undoubtedly have an impact on how effectively and efficiently hafted bifaces could be thinned. However, the lack of a larger sample might be influencing the statistical output. ANOVA analyses on the PIDBA data supports the trends identified in the initial analyses, providing additional evidence that geography played a far more important role than raw material in the production and use of Dalton hafted bifaces in the sample areas examined.

Without more complete data concerning site-specific function as well as tool-kit composition from these sites, it is problematic at best to comment on the type of settlement strategy implemented. Instead, these trends demonstrate that there were behavioral differences between the two locales. These differences could be related to the availability of raw materials on the landscape, slowly diverging cultural practices, different responses to variable ecological constraints, or simply a sampling bias.

CHAPTER SIX CONCLUSIONS AND FUTURE DIRECTIONS

In summary, a total of 187 Dalton points were analyzed for material type, Expended utility, and Residual utility. Relationships between locale, Expended, and Residual utility were identified. Dalton points from the CTRV exhibit a more even distribution of Expended utility values, while also demonstrating lower Residual utility values. Dalton points from the LTRV have much lower Expended utility values and higher Residual utility values. ANOVA tests conclude that material type was not a significant variable in producing these trends, but instead that locale was the dominant variable. This can also be seen when looking at material types within each locale, rather than material dictating the utility, it was the geographic area in which the points were used and made that made the statistical difference.

Additional analyses using larger data sets found on PIDBA supported the trends initially identified within the original sample. ANOVA tests demonstrated that again, material type was not a significant factor determining morphological variation, but rather geography was the mitigating factor, which is consistent with the trends identified in the original sample. These two lines of evidence support the hypothesis that morphological and hence behavioral differences likely existed among Dalton groups in geographically dispersed areas.

Further research incorporating greater numbers of individual Dalton bifaces, from both avocational collections and professionally excavated sites would allow for a more robust analyses of Dalton 'settling in'. The Paris collection, recently loaned to the McClung Museum of Natural History and Culture, would be an excellent starting point. The collection is unique in that its geographic focus is specifically on Hardin County. This county lies directly between the LTRV and CTRV study locales, providing an almost uninterrupted sampling of sites and artifacts along the Tennessee River in Northern Alabama and West Tennessee. This collection is also unique in that collection of artifacts occurred not just along the primary waterway of the Tennessee River, but also along secondary and tertiary drainages. Unlike the sample analyzed for this thesis, which were consolidated almost exclusively along the banks of the Tennessee River, the Paris

collection would allow for a better understanding of land use along some of the more minor water ways in the region.

Research by Herrmann (2013) has demonstrated that archaeological sites in lowland settings are less likely to remain visible over time, resulting in a biased archaeological record. This calls into question how representative a sample can be that only looks at sites located in river lowlands. The majority of the sites analyzed in this study are located adjacent to the Tennessee River, suggesting that perhaps there is an inherent bias within the analyzed sample. To get a more comprehensive idea of how Dalton groups were using the landscape in the LCTRV, incorporation of data from sites on secondary and tertiary water ways would be necessary. It would also benefit future research to incorporate diachronic geomorphological processes to better understand not just how the landforms have changed over time but also how these changes have affected the archaeological record.

Additional biases within the sample could stem from collector preferences for whole, nearly complete, and otherwise in good condition artifacts. Unlike professionally excavated sites, where all artifacts would be collected and catalogued, bifaces from the avocational collections analyzed in this study are almost entirely complete or nearly complete pieces. This undoubtedly had an impact on the results of the statistical analyses as the sample analyzed was made up of these whole and mostly whole bifaces. Utility indices values are likely skewed because of this preference; however, it should not be assumed that the validity of the results is diminished.

An alternative approach to understanding Dalton mobility and land use practices, particularly the 'settling in' question could be to look at morphological variability of Dalton bifaces. This approach has been used effectively looking at the succession of Paleoindian-Early Archaic hafted biface types in the Midcontintent (White 2012, 2013). White's (2012, 2013) use of large datasets at a regional scale allows for a more comprehensive understanding of small variations across large distances, ultimately providing valuable insights into regional differences that could support the 'settling in' hypothesis. The use of social networks to better understand morphological variability in hafted bifaces is another complementary method of looking at the question of Dalton

‘settling in.’ A combination of White’s (2012, 2013, 2014) methods and those used in this study could help further identify differences between regional Dalton groups.

The goal of this study was to better understand Dalton mobility by looking at the use of raw materials and the amount of curation Dalton points underwent in two different locales within the Tennessee River Valley. Identification of raw material type revealed that Dalton groups in each locale preferentially selected high quality, locally available materials to manufacture bifaces from. Curation in each locale was different, with higher degrees of curation occurring in the LTRV. This could be indicative of behavioral differences between groups in these two areas or the result of sampling bias. The evidence from this study supplements a growing body of data that indicates Dalton groups are becoming more regionalized and focused on constricted territorial ranges.

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APPENDICES

Appendix 1 – Raw Data

Collection	Craib ID	Photo Number	Smeltzer	Sims	Hulse	Cambron	Source Material	Weight (g)	Length (mm)	Base Width at Neck	Base Width at Ears	Base Length	Blade Width (at 30mm)	Blade Length	Thickness	Breakage	Expended Utility	Residual Utility
Cambron/Hulse	CH-29-1	CH-29-1.jpg			29		Ft. Payne	10	61.64	21.87	24.15	15.97	21.93	46.48	6.22	x	0.997264022	1019.3064
Cambron/Hulse	CH-32-1	CH-32-1.jpg			32		Ste. Genevieve	7.4	51.59	19.8	23.88	14.22	17.58	40.38	5.6	x	1.126279863	709.8804
Cambron/Hulse	CH-32-2	CH-32-2.jpg			32		Ft. Payne - Fossiliferous Tan	6.7	72.18	19.02	24.07	10.56	12.03	59.68	6.22	x	1.581047382	717.9504
Cambron/Hulse	CH-32-3	CH-32-3.jpg			32		Ft. Payne - Fossiliferous Tan	5.5	x	21.95	22.24	15.89	x	x	5.77	BB	x	x
Cambron/Hulse	CH-32-4	CH-32-4.jpg			32		Dover	3	x	x	27.62	x	x	x	5.53	BB	x	x
Cambron/Hulse	CH-32-5	CH-32-5.jpg			32		Ft. Payne - Fossiliferous Tan	2	x	x	25.23	x	x	x	4.79	BB	x	x
Cambron/Hulse	CH-32B-1	CH-32B-1.jpg			32B		Ste. Genevieve	6	42.97	21.49	24.55	11.16	12.26	30.63	6.1	x	1.752854812	375.5238
Cambron/Hulse	CH-32B-2	CH-32B-2.jpg			32B		Ft. Payne - Blue-Gray	5.1	54.54	16.11	17.9	21.49	13.42	32.1	6.55	x	1.200447094	430.782
Cambron/Hulse	CH-32B-3	CH-32B-3.jpg			32B		Ft. Payne - Blue-Gray	7.4	69.6	17.79	15.35	16.89	17.77	52.63	5.33	x	1.001125492	935.2351
Cambron/Hulse	CH-32S-1	CH-32S-1.jpg			32S		Ft. Payne	5.5	40.62	24.36	26.19	12.15	11.22	28.54	5.19	x	2.171122995	320.2188
Cambron/Hulse	CH-33W-1	CH-33W-1.jpg			33W		Ft. Payne - Fossiliferous Tan	2	x	x	23.46	x	x	x	5.27	BB	x	x
Cambron/Hulse	CH-37-1	CH-37-1.jpg			37	76	Horse Creek	4.9	44.66	18.14	22.37	15.15	10.89	30.51	5.38	x	1.665748393	332.2539
Cambron/Hulse	CH-37-2	CH-37-2.jpg			37	76	Ft. Payne	5.1	46.39	18.93	19.19	14.46	11.02	30.63	6.45	x	1.717785844	337.5426
Cambron/Hulse	CH-37-3	CH-37-3.jpg			37	76	Ft. Payne	4.8	48.82	16.38	18.27	16.77	10.58	28.8	6.75	x	1.548204159	304.704
Cambron/Hulse	CH-37-4	CH-37-4.jpg			37	76	Ft. Payne - Fossiliferous Tan	3.4	x	21.08	24.23	18.38	x	x	4.98	BB	x	x
Cambron/Hulse	CH-37-5	CH-37-5.jpg			37		Ft. Payne - Blue-Gray	5.4	x	19.72	20.3	17.2	x	x	7.48	BB	x	x
Cambron/Hulse	CH-37E-1	CH-37E-1.jpg			37E		Ft. Payne - Fossiliferous Tan	4.4	x	21.57	25.03	19.09	x	x	6.81	BB	x	x
Cambron/Hulse	CH-37E-2	CH-37E-2.jpg			37E		Ft. Payne	5.4	39.93	19.69	21.03	15.05	11.04	24.53	6.6	x	1.783514493	270.8112
Cambron/Hulse	CH-37M-1	CH-37M-1.jpg			37M		Ft. Payne - Fossiliferous Tan	5.5	42.71	18.96	22.27	11.12	13.93	32.42	4.77	x	1.36109117	451.6106
Cambron/Hulse	CH-38-1	CH-38-1.jpg			38		Ft. Payne	3.8	x	x	24.42	x	x	x	6.53	BB	x	x
Cambron/Hulse	CH-38-2	CH-38-2.jpg			38		Ft. Payne - Fossiliferous Tan	51.49	51.49	17.43	18.58	14.28	11.81	37.41	6.15	x	1.475867909	441.8121
Cambron/Hulse	CH-38E-1	CH-38E-1.jpg			38E		Ft. Payne - Fossiliferous Tan	5	x	x	21.11	21.53	x	x	6.41	BB/B	x	x
Cambron/Hulse	CH-38N-1	CH-38N-1.jpg			38N		Horse Creek	4.6	x	x	x	x	x	x	4.84	BB	x	x
Cambron/Hulse	CH-38NE-1	CH-38NE-1.jpg			38NE		Ft. Payne - Fossiliferous Tan	2.4	x	18.31	17.9	13.99	x	x	4.48	BB	x	x
Cambron/Hulse	CH-39-1	CH-39-1.jpg			39	84	Horse Creek	8.3	66.42	18.9	22.29	25.19	14.7	40.8	6.75	x	1.285714286	599.76
Cambron/Hulse	CH-39-2	CH-39-2.jpg			39	84	Ft. Payne - Fossiliferous Tan	5.5	x	21.63	26.36	18.28	x	x	6.81	BB	x	x
Cambron/Hulse	CH-39-3	CH-39-3.jpg			39	84	Ft. Payne - Fossiliferous Tan	1.8	x	x	23.19	x	x	x	4.53	BB	x	x
Cambron/Hulse	CH-39-4	CH-39-4.jpg			39	84	Ft. Payne - Fossiliferous Tan	5.1	48.69	20.97	22.29	13.71	12.12	35.87	4.73	x	1.73019802	434.7444
Cambron/Hulse	CH-39-5	CH-39-5.jpg			39	84	Ft. Payne - Blue-Gray	7.6	62.22	21.51	25.13	17.05	18.69	46.58	5.6	x	1.150882825	870.5802
Cambron/Hulse	CH-39-6	CH-39-6.jpg			39	84	Ft. Payne - Blue-Gray	3.8	x	16.8	18.3	12.82	x	x	6.77	BB/B?	x	x
Cambron/Hulse	CH-39-7	CH-39-7.jpg			39	84	Ste. Genevieve	6.5	49.27	20.58	24.01	13.14	14.06	35.09	5.71	x	1.463726885	493.3654
Cambron/Hulse	CH-46-1	CH-46-1.jpg				46	Ft. Payne	7.9	67.45	21.27	22.6	16.17	19.22	51.74	5.34	x	1.106659729	994.4428
Cambron/Hulse	CH-48-1	CH-48-1.jpg				48	Ft. Payne	5.4	54.77	18.52	18.48	23.52	15.66	30.57	4.92	x	1.182630907	478.7262
Cambron/Hulse	CH-50-1	CH-50-1.jpg				50	Bangor	5.2	x	21.73	23.93	7.68	x	x	6.83	BB	x	x
Cambron/Hulse	CH-53-1	CH-53-1.jpg				53	Ft. Payne - Blue-Gray	7.3	43.9	25.61	25.24	16.66	19.98	x	5.29	BB	1.281781782	x
Cambron/Hulse	CH-54-1	CH-54-1.jpg			54		Ft. Payne - Fossiliferous Tan	5.1	40.43	19.25	22.88	16.41	10.81	24.94	7.29	x	1.780758557	269.6014
Cambron/Hulse	CH-54-2	CH-54-2.jpg			54		Ft. Payne - Blue-Gray	3.8	x	x	28.3	x	x	x	5.74	B	x	x
Cambron/Hulse	CH-54-3	CH-54-3.jpg			54		Ft. Payne - Blue-Gray	8.1	x	19.32	23.05	15.27	16.63	x	7.82	BB	1.161755863	x
Cambron/Hulse	CH-55-1	CH-55-1.jpg			55		Ft. Payne - Fossiliferous Tan	5.6	42.12	20.03	23.69	16.79	11.28	26.14	5.91	x	1.77570922	294.8592
Cambron/Hulse	CH-63-1	CH-63-1.jpg				63	Ft. Payne - Fossiliferous Tan	5.3	67.49	x	25.96	x	11.25	x	6.1	x	x	x
Cambron/Hulse	CH-69-1	CH-69-1.jpg				69	Ft. Payne	4.4	53.43	17.04	18.37	16.97	12.2	36.79	5.53	x	1.396721311	448.838

Collection	Craib ID	Photo Number	Smeltzer	Sims	Hulse	Cambron	Source Material	Weight (g)	Length (mm)	Base Width at Neck	Base Width at Ears	Base Length	Blade Width (at 30mm)	Blade Length	Thickness	Breakage	Expended Utility	Residual Utility
Cambron/Hulse	CH-76-1	CH-76-1.jpg			37M, 37, 38	76	Ft. Payne - Fossiliferous Tan	2.7	x	x	23.73	x	x	x	5.28	BB	x	x
Cambron/Hulse	CH-76-2	CH-76-2.jpg			37M, 37, 38	76	Ft. Payne - Fossiliferous Tan	4.2	x	x	29.53	x	x	x	5.02	BB	x	x
Cambron/Hulse	CH-76-3	CH-76-3.jpg			37M, 37, 38	76	Ft. Payne - Fossiliferous Tan	3.8	x	20.92	22.72	15.21	x	x	5.47	BB	x	x
Cambron/Hulse	CH-76-4	CH-76-4.jpg			37M, 37, 38	76	Ft. Payne	16.3	62.55	23.43	25.54	17.99	24.86	43.22	9.1	x	0.942477876	1074.4492
Cambron/Hulse	CH-76-5	CH-76-5.jpg			37M, 37, 38	76	Ft. Payne - Fossiliferous Tan	4	38.05	20.4	23.09	11.62	11.37	26.07	4.8	x	1.794195251	296.4159
Cambron/Hulse	CH-76-6	CH-76-6.jpg			37M, 37, 38	76	Ft. Payne - Fossiliferous Tan	6.5	55.69	20.39	23.96	13.36	14.04	41.94	5.91	x	1.452279202	588.8376
Cambron/Hulse	CH-76-7	CH-76-7.jpg			37M, 37, 38	76	Ft. Payne - Fossiliferous Tan	8.6	57.03	25.35	28.33	18.07	25.49	38.28	4.94	x	0.99450765	975.7572
Cambron/Hulse	CH-76-8	CH-76-8.jpg			37M, 37, 38	76	Ft. Payne - Fossiliferous Tan	6	55.63	17.16	19.11	12.64	14.73	43.02	7.32	x	1.16496945	633.6846
Cambron/Hulse	CH-76-9	CH-76-9.jpg			37M, 37, 38	76	Horse Creek	11	61.01	23.4	25.28	20.65	22.81	41.37	6.86	x	1.025865848	943.6497
Cambron/Hulse	CH-76-10	CH-76-10.jpg			37M, 37, 38	76	Ft. Payne - Blue-Gray	6.1	47.01	18.47	20.01	17.4	13.85	29.61	6.59	x	1.333574007	410.0985
Cambron/Hulse	CH-76-11	CH-76-11.jpg			37M, 37, 38	76	Ft. Payne - Fossiliferous Tan	8.1	58.66	22.46	27.62	25.32	15.67	31.45	6.32	x	1.433312061	492.8215
Cambron/Hulse	CH-76-12	CH-76-12.jpg			37M, 37, 38	76	Horse Creek	9.7	61.53	26.05	27.29	18.45	17.92	43.61	5.6	x	1.453683036	781.4912
Cambron/Hulse	CH-76-13	CH-76-13.jpg				76	Ste. Genevieve	6.2	52.02	19.86	23.24	13.94	16.5	37.52	5.47	x	1.203636364	619.08
Cambron/Hulse	CH-76-14	CH-76-14.jpg			37M, 37, 38	76	Ft. Payne - Blue-Gray	8	46.01	25.74	25.96	15.62	17.31	30.87	6.11	x	1.487001733	534.3597
Cambron/Hulse	CH-76-15	CH-76-15.jpg				76	Ft. Payne - Fossiliferous Tan	11.7	76.67	28.16	28.86	18.6	28.17	60.16	5.74	x	0.999645012	1694.7072
Cambron/Hulse	CH-79-1	CH-79-1.jpg				79	Ft. Payne - Fossiliferous Tan	3.6	x	18.75	21.91	13.02	x	x	4.6	BB	x	x
Cambron/Hulse	CH-79-2	CH-79-2.jpg				79	Ft. Payne - Fossiliferous Tan	3.6	x	20.1	19.54	17.17	x	x	5.19	B	x	x
Cambron/Hulse	CH-83-1	CH-83-1.jpg				83	Ft. Payne - Fossiliferous Tan	9.9	x	22.11	25.74	8.97	16.26	x	6.81	BB/B	1.359778598	x
Cambron/Hulse	CH-84-1	CH-84-1.jpg			38M, 37E, 38NE, 39	84	Ft. Payne - Fossiliferous Tan	2.5	x	20.11	19.89	17.56	x	x	5.17	BB	x	x
Cambron/Hulse	CH-84-2	CH-84-2.jpg			38M, 37E, 38NE, 39	84	Ft. Payne - Blue-Gray	2.5	x	18.27	23.47	10.51	x	x	5.17	BB	x	x
Cambron/Hulse	CH-84-3	Ch-84-3.jpg			38M, 37E, 38NE, 39	84	Ft. Payne	4.3	46.21	18.22	18.3	18.98	9.8	25.92	6.32	x	1.859183673	254.016
Cambron/Hulse	CH-84-4	CH-84-4.jpg			38M, 37E, 38NE, 39	84	Ft. Payne - Fossiliferous Tan	5.8	52.52	17.84	20.88	18.64	13.63	32.97	6.02	x	1.308877476	449.3811
Cambron/Hulse	CH-84-5	Ch-84-5.jpg			38M, 37E, 38NE, 39	84	Ft. Payne - Fossiliferous Tan	4.2	44.05	18.59	18.69	14.36	10.48	29.49	5.18	x	1.773854962	309.0552
Cambron/Hulse	CH-84-6	CH-84-6.jpg			38M, 37E, 38NE, 39	84	Ft. Payne - Fossiliferous Tan	10.3	66.19	20.07	21.33	14.82	20.64	50.52	5.93	x	0.972383721	1042.7328
Cambron/Hulse	CH-84-7	CH-84-7.jpg			38M, 37E, 38NE, 39	84	Ft. Payne	10	65.15	22.47	26.4	12.16	20	51.56	5.89	x	1.1235	1031.2
Cambron/Hulse	CH-84-8	CH-84-8.jpg			38M, 37E, 38NE, 39	84	Ft. Payne - Fossiliferous Tan	4.6	48.56	16.71	15.79	19.23	11.48	27.9	5.59	x	1.455574913	320.292
Cambron/Hulse	CH-84-9	CH-84-9.jpg			38M, 37E, 38NE, 39	84	Ft. Payne - Fossiliferous Tan	3.6	43.85	15.32	19.81	8.34	8.05	35.99	5.23	x	1.90310559	289.7195
Cambron/Hulse	CH-84-10	CH-84-10.jpg			38M, 37E, 38NE, 39	84	Ft. Payne - Fossiliferous Tan	8.2	63.26	18.8	19.84	11.23	13.59	52.78	6.97	x	1.383370125	717.2802
Cambron/Hulse	CH-84-11	CH-84-11.jpg			38M, 37E, 38NE, 39	84	Ft. Payne - Fossiliferous Tan	4.9	40.26	20.65	19.2	13.26	15.88	26.12	5.75	BB	1.300377834	414.7856
Cambron/Hulse	CH-84-12	CH-84-12.jpg			38M, 37E, 38NE, 39	84	Ft. Payne	11.6	59.26	21.29	26.04	18.27	22.56	41.31	6.1	x	0.943705674	931.9536
Cambron/Hulse	CH-84-13	CH-84-13.jpg			38M, 37E, 38NE, 39	84	Ft. Payne - Blue-Gray	3.7	38.82	19.21	22.59	10.83	7.32	27.51	5.73	x	2.62431694	201.3732
Cambron/Hulse	CH-84-14	CH-84-14.jpg			38M, 37E, 38NE, 39	84	Horse Creek	4.3	x	25.46	29.13	16.57	x	x	5.83	B	x	x
Cambron/Hulse	CH-84-15	CH-84-15.jpg			38M, 37E, 38NE	84	Ft. Payne	5.9	48.4	19.27	20.71	14.25	13.3	32.6	6.09	x	1.44887218	433.58
Cambron/Hulse	CH-154-1	CH-154-1.jpg				154	Ft. Payne - Fossiliferous Tan	6.8	53.85	20.52	22.05	19.92	18.61	33.67	5.95	x	1.102632993	626.5987
Cambron/Hulse	CH-162-1	CH-162-1.jpg				162	Ft. Payne	9.3	56.2	24.8	27.39	20.07	20.11	35.57	6.21	x	1.233217305	715.3127
Cambron/Hulse	CH-162-2	CH-162-2.jpg				162	Tuscaloosa	2.4	x	x	24.42	x	x	x	5.35	BB	x	x
Cambron/Hulse	CH-162-3	CH-162-3.jpg				162	Ft. Payne - Fossiliferous Tan	2.4	x	x	23.83	x	x	x	5.51	BB	x	x
Cambron/Hulse	CH-162-4	CH-162-4.jpg				162	Ft. Payne - Blue-Gray	6.6	41.43	22.44	26.22	13.62	14.42	26.24	6.88	x	1.556171983	378.3808
Cambron/Hulse	CH-195-1	CH-195-1.jpg				195	Ft. Payne - Blue-Gray	7.1	59.74	20.47	20.9	16.53	15.36	42.51	5.76	x	1.332682292	652.9536
Cambron/Hulse	CH-195-2	CH-195-2.jpg				195	x	x	49.23	17.75	17.3	18.22	15.05	30.63	5.63	x	1.179401993	460.9815
Cambron/Hulse	CH-195-3	CH-195-3.jpg				195	Ft. Payne - Fossiliferous Tan	4.6	x	22.68	24.14	18.54	x	x	6.87	BB	x	x

Collection	Craib ID	Photo Number	Smeltzer	Sims	Hulse	Cambron	Source Material	Weight (g)	Length (mm)	Base Width at Neck	Base Width at Ears	Base Length	Blade Width (at 30mm)	Blade Length	Thickness	Breakage	Expended Utility	Residual Utility
Cambron/Hulse	CH-195-4	CH-195-4.jpg				195	Horse Creek	5.1	28.18	24.65	27.89	18.08	x	x	4.92	B	x	x
Cambron/Hulse	CH-301-1	CH-301-1.jpg				301	Burlington	3.9	x	17.35	20.93	13.59	x	x	7.39	B	x	x
Cambron/Hulse	CH-388-1	CH-388-1.jpg				388	x	12.1	x	21.51	23.36	15.6	x	x	9.21	B/BB	x	x
Cambron/Hulse	CH-394-1	CH-394-1.jpg				394	Ft. Payne - Fossiliferous Tan	2.7	x	x	24.99	x	x	x	5.14	BB	x	x
Sims	SI-1-1	SI-1-1.jpg		1			Dover	2.9	x	x	26.06	x	x	x	5.71	BB	x	x
Sims	SI-1-2	SI-1-2.jpg		1			Dover	11.2	81.32	20.8	20.45	19.72	19.47	63.05	5.57	x	1.068310221	1227.5835
Sims	SI-1-3	SI-1-3.jpg		1			Ft. Payne	10.3	71.79	20.86	21.15	13.33	18.43	57.13	6.03	x	1.131850244	1052.9059
Sims	SI-1-4	SI-1-4.jpg		1			Dover	7.8	60.02	20.09	x	10.58	17.77	49.78	5.8	x	1.130557119	884.5906
Sims	SI-1B-1	SI-1B-1.jpg		1B			Ft. Payne	10.6	54.26	25.06	27.84	17.9	19.48	36.41	7.33	x	1.286447639	709.2668
Sims	SI-1B-2	SI-1B-2.jpg		1B			Ft. Payne	13.5	64.05	23.2	24.12	15.73	22.01	47.48	8.52	x	1.054066333	1045.0348
Sims	SI-1B-3	SI-1B-3.jpg		1B			Horse Creek	9.5	64.68	23.52	27.59	16.01	17.37	48.84	6.98	x	1.354058722	848.3508
Sims	SI-10-1	SI-10-1.jpg		10			Ft. Payne	8.9	44.05	27.42	29.19	14.45	17.98	28.61	6.72	x	1.525027809	514.4078
Sims	SI-10-2	SI-10-2.jpg		10			Dover	8.9	x	26.32	x	14.26	x	x	8.23	BB	x	x
Sims	SI-10-3	SI-10-3.jpg		10			Dover	6.3	53.51	20.75	23.11	10.47	16.82	41.7	5.27	x	1.233650416	701.394
Sims	SI-10-4	SI-10-4.jpg		10			Dover	10.5	59.73	23.91	26.57	20.18	20.24	41.14	5.92	x	1.181324111	832.6736
Sims	SI-10-5	SI-10-5.jpg		10			Ft. Payne	4.3	x	19.94	23.01	19.22	x	x	5.24	BB	x	x
Sims	SI-10-6	SI-10-6.jpg		10			Dover	6.8	43.28	21.71	25.44	19.86	14.61	23.28	6.87	x	1.485968515	340.1208
Sims	SI-10-7	SI-10-7.jpg		10			Ft. Payne	8.5	55.72	21.06	24.26	14.15	18.6	41.36	6.94	x	1.132258065	769.296
Sims	SI-10-8	SI-10-8.jpg		10			Dover	10.3	46.09	28.34	28.97	16.04	18.94	29.83	7.78	x	1.496304118	564.9802
Sims	SI-10-9	SI-10-9.jpg		10			Dover	4.4	27.56	25.01	27.78	16.53	x	11.24	6.37	x	x	x
Sims	SI-10-10	SI-10-10.jpg		10			Ft. Payne	4.1	29.27	24.44	25.95	13.56	x	15.2	6.12	x	x	x
Sims	SI-10-11	SI-10-11.jpg		10			Dover	7	49.36	20.16	x	15.58	16.95	33.91	5.99	x	1.189380531	574.7745
Sims	SI-10-12	SI-10-12.jpg		10			Ft. Payne	2.6	x	x	25.3	x	x	x	5.27	BB	x	x
Sims	SI-10-13	SI-10-13.jpg		10			Ft. Payne	12.1	72.84	22.96	x	19.14	19.88	54.68	6.59	x	1.154929577	1087.0384
Sims	SI-10-14	SI-10-14.jpg		10			Dover	3.6	38.72	16.33	21.84	14.88	6.88	22.58	5.67	x	2.373546512	155.3504
Sims	SI-10A-1	SI-10A-1.jpg		10a			Horse Creek	11.2	x	25.22	25.45	15.05	19.64	x	6.37	BB	1.284114053	x
Sims	SI-13B-1	SI-13B-1.jpg		13B			Ft. Payne	9.1	55.07	24.26	26.8	18.03	22.8	38.74	6.31	x	1.064035088	883.272
Sims	SI-13B-2	SI-13B-2.jpg		13B			Ft. Payne	13.5	83.76	23.52	24.82	21.98	21.83	63.88	5.94	x	1.077416399	1394.5004
Sims	SI-13B-3	SI-13B-3.jpg		13B			Ft. Payne	10.1	63.83	22.89	27.22	17.58	18.09	46.49	6.19	x	1.265339967	841.0041
Sims	SI-13B-4	SI-13B-4.jpg		13B			Ft. Payne	10.8	x	27.53	29.46	24.29	26.08	x	5.47	BB	1.05559816	x
Sims	SI-13B-5	SI-13B-5.jpg		13B			Ft. Payne	13	59.99	27.23	x	22.37	24.51	38.06	7.08	x	1.110975112	932.8506
Sims	SI-13B-6	SI-13B-6.jpg		13B			Dover	4.7	x	x	25.35	x	x	x	x	BB	x	x
Sims	SI-13B-7	SI-13B-7.jpg		13B			Unknown	5.2	x	x	23.86	x	x	x	x	B	x	x
Sims	SI-13B-8	SI-13B-8.jpg		13B			Ft. Payne	12.4	x	23.91	28.44	20.16	22.63	x	6.67	B	1.056562086	x
Sims	SI-13B-9	SI-13B-9.jpg		13B			Dover	8.5	x	26.37	24.25	26.65	x	x	5.48	BB	x	x
Sims	SI-13B-10	SI-13B-10.jpg		13B			Unknown	11	61.93	23.94	26.07	22.53	22.8	40.95	6.59	x	1.05	933.66
Sims	SI-13B-11	SI-13B-11.jpg		13B			Ft. Payne	12.2	68.26	21.67	23.98	18.76	22.1	48.23	7.24	x	0.980542986	1065.883
Sims	SI-13B-12	SI-13B-12.jpg		13B			Ft. Payne	7	x	26.94	30.24	22.51	24.91	x	4.59	BB	1.081493376	x
Sims	SI-13B-13	SI-13B-13.jpg		13B			Ft. Payne	16.3	77.93	28.41	28.74	23.76	20.98	53.86	6.75	x	1.354146806	1129.9828
Sims	SI-13B-14	SI-13B-14.jpg		13B			Ft. Payne	13.6	x	27.71	30.26	37.39	x	x	6.66	BB	x	x
Sims	SI-13B-15	SI-13B-15.jpg		13B			Horse Creek	16.8	x	30.96	32.06	33.38	33.14	x	6.15	BB	0.934218467	x
Sims	SI-13B-16	SI-13B-16.jpg		13B			Ft. Payne	11.9	x	25.59	26.45	27.9	26.12	x	6.29	BB	0.979709035	x

Collection	Craib ID	Photo Number	Smeltzer	Sims	Hulse	Cambron	Source Material	Weight (g)	Length (mm)	Base Width at Neck	Base Width at Ears	Base Length	Blade Width (at 30mm)	Blade Length	Thickness	Breakage	Expended Utility	Residual Utility
Sims	SI-13B-17	SI-13B-17.jpg		13B			St. Louis	7	x	23.55	25.01	25.94	x	x	5.84	BB	x	x
Sims	SI-13B-18	SI-13B-18.jpg		13B			Ft. Payne	9.9	53.66	26.65	26.84	22.06	23.32	33.41	6.56	x	1.142795883	779.1212
Sims	SI-13B-19	SI-13B-19.jpg		13B			Tuscaloosa	10	61.19	23.97	27.4	38.71	22.77	34.79	5.97	x	1.052700922	792.1683
Sims	SI-13B-20	SI-13B-20.jpg		13B			Ft. Payne	9.4	55.47	27.06	26.83	27.06	23.51	28.26	5.26	x	1.150999575	664.3926
Sims	SI-13B-21	SI-13B-21.jpg		13B			Ft. Payne	11.3	51.98	25.37	23.81	18.86	23.21	24.46	7.21	B	1.093063335	567.7166
Sims	SI-14-1	SI-14-1.jpg		14			Ft. Payne	7.4	x	22.89	22.57	14.44	19.8	x	5.19	BB	1.156060606	x
Sims	SI-14-2	SI-14-2.jpg		14			Ft. Payne	6.5	x	21.2	27.95	26.1	18.92	x	6.5	BB	1.1205074	x
Sims	SI-14-3	SI-14-3-jpg		14			Dover	11	x	21.85	30.57	19.61	21.12	x	6.84	BB, B	1.034564394	x
Sims	SI-14-4	SI-14-4.jpg		14			Dover	6.3	x	23.57	26.56	20.69	23.55	x	5.18	BB	1.000849257	x
Sims	SI-14-5	SI-14-5.jpg		14			Ft. Payne	12.4	86.69	18.4	23.96	17.3	17.96	68.9	5.85	x	1.024498886	1237.444
Sims	SI-14-6	SI-14-6.jpg		14			Dover	8.8	69.36	16.57	22.43	12.76	17.99	57.41	6.32	x	0.92106726	1032.8059
Sims	SI-14-7	SI-14-7.jpg		14			Horse Creek	14.3	81.12	25.59	26	17.75	21.73	61.92	6.82	x	1.177634607	1345.5216
Sims	SI-17-1	SI-17-1.jpg		17			Burlington	4.5	53.1	19.3	20.87	19.79	8.55	32.05	5.23	B	2.257309942	274.0275
Sims	SI-18-1	SI-18-1.jpg		18			Dover	4.4	38.32	20.36	23.59	15.46	8.95	22.65	5.62	x	2.274860335	202.7175
Sims	SI-20-1	SI-20-1.jpg		20			Ft. Payne	19.6	82.6	27.7	28.14	17.57	24.91	61.79	8.07	x	1.112003212	1539.1889
Sims	SI-23-1	SI-23-1.jpg		23			Ft. Payne	27.1	90.1	31.45	30.67	34.79	x	54.27	8.25	x	x	x
Sims	SI-23-2	SI-23-2.jpg		23			Unknown	19.4	91.34	27.32	26.98	31.42	x	60.7	6.48	x	x	x
Smeltzer	SM-D6-1	SM-D6-1.jpg	D6				Dover	8.4	52.24	21.52	19.48	14.89	19.57	35.7	6.6	x	1.09964231	698.649
Smeltzer	SM-D6-2	SM-D6-2.jpg	D6				Dover	9.3	46.16	20.13	21.53	15.02	17.1	25.98	8.95	x	1.177192982	444.258
Smeltzer	SM-D6-3	SM-D6-3.jpg	D6				Ft. Payne	14.2	71.93	23.31	25.78	20.26	23.65	53.74	6.74	x	0.985623679	1270.951
Smeltzer	SM-D6-4	SM-D6-4.jpg	D6				Ft. Payne	17.7	73.92	26.98	31.24	18.92	26.11	57.37	7.85	x	1.033320567	1497.9307
Smeltzer	SM-D6-5	SM-D6-5.jpg	D6				Dover	7.1	48.08	21.46	27.17	17.06	14.78	31.87	7.16	x	1.451962111	471.0386
Smeltzer	SM-D6-6	SM-D6-6.jpg	D6				Ft. Payne	9.2	52	24.02	26.21	17.84	18.61	34.83	7.12	x	1.290703923	648.1863
Smeltzer	SM-D6-7	SM-D6-7.jpg	D6				Dover	11.2	81.6	22.24	x	19.93	19.74	62.2	5.4	x	1.126646403	1227.828
Smeltzer	SM-D6-8	SM-D6-8.jpg	D6				Ft. Payne	11.6	69.17	22.65	26.59	22.72	19.49	47.65	7.2	x	1.162134428	928.6985
Smeltzer	SM-D6-9	SM-D6-9.jpg	D6				Ft. Payne	7.8	73.7	18.99	23.84	18.48	16.22	60.34	5.55	x	1.170776819	978.7148
Smeltzer	SM-D6-10	SM-D6-10.jpg	D6				Dover	12.1	74.54	23.36	25.89	19.45	18.34	56.62	6.15	x	1.273718648	1038.4108
Smeltzer	SM-D6-11	SM-D6-11.jpg	D6				Dover	7.1	69.83	21.24	25.05	18.52	12.69	50.46	5.35	x	1.673758865	640.3374
Smeltzer	SM-D6-12	SM-D6-12.jpg	D6				Dover	14.4	84.03	21.38	25.58	14.98	18.98	67.81	7.62	x	1.126448894	1287.0338
Smeltzer	SM-D6-13	SM-D6-13.jpg	D6				Dover	7.7	50.13	23.66	25.05	19.54	17.97	29.86	6.72	x	1.316638843	536.5842
Smeltzer	SM-D6-14	SM-D6-14.jpg	D6				Dover	8.5	56.03	24.61	27.1	19.59	16.24	36.39	5.84	x	1.515394089	590.9736
Smeltzer	SM-D6-15	SM-D6-15.jpg	D6				Dover	15.4	72.68	27.66	30.48	16.82	21.47	52.97	7.72	x	1.288309269	1137.2659
Smeltzer	SM-D6-16	SM-D6-16.jpg	D6				Dover	7.1	62.57	19.85	23.7	13.9	13.32	45.99	5.98	x	1.49024024	612.5868
Smeltzer	SM-D6-17	SM-D6-17.jpg	D6				Dover	7.8	53.8	20.4	23.91	17.04	16	35.94	6.7	x	1.275	575.04
Smeltzer	SM-D6-18	SM-D6-18.jpg	D6				Dover	9.3	64.81	19.71	24.86	13.47	18.22	51.52	5.62	x	1.081778266	938.6944
Smeltzer	SM-D6-19	SM-D6-19.jpg	D6				Dover	10.2	68.24	23.3	26.4	20.27	17.26	50.07	6.38	x	1.349942063	864.2082
Smeltzer	SM-D6-20	SM-D6-20.jpg	D6				Dover	8.1	65.67	17.93	24.87	19.99	14.17	45.18	6.15	x	1.26534933	640.2006
Smeltzer	SM-D6-21	SM-D6-21.jpg	D6				Dover	9.5	59.27	21.82	22.18	17	19.88	45.26	6.31	x	1.097585513	899.7688
Smeltzer	SM-D6-22	SM-D6-22.jpg	D6				Ft. Payne	7.4	55.17	19.32	26.11	12.45	15.24	40.37	5.54	x	1.267716535	615.2388
Smeltzer	SM-D6-23	SM-D6-23.jpg	D6				Dover	10.2	69.44	20.01	17.6	20.54	19.4	47.54	6.18	x	1.031443299	922.276
Smeltzer	SM-D6-24	SM-D6-24.jpg	D6				Dover	11.7	55.5	28.7	29	17.9	21	37.5	7.43	x	1.366666667	787.5

Collection	Craib ID	Photo Number	Smeltzer	Sims	Hulse	Cambron	Source Material	Weight (g)	Length (mm)	Base Width at Neck	Base Width at Ears	Base Length	Blade Width (at 30mm)	Blade Length	Thickness	Breakage	Expended Utility	Residual Utility
Smeltzer	SM-D6-25	SM-D6-25.jpg	D6				St. Louis	9.3	54.21	25.8	30.71	16.94	18.99	39.77	6.11	x	1.358609795	755.2323
Smeltzer	SM-D6-26	SM-D6-26.jpg	D6				Dover	16.1	75.74	27.88	33.56	22.58	18.86	53.08	7.44	x	1.47826087	1001.0888
Smeltzer	SM-D6-27	SM-D6-27.jpg	D6				Dover	13.7	71.48	24.71	28.73	14.6	23.3	55.2	6.47	x	1.060515021	1286.16
Smeltzer	SM-D6-28	SM-D6-28.jpg	D6				Dover	9.2	61.67	21.75	x	16.5	19.11	47.46	6.49	x	1.138147567	906.9606
Smeltzer	SM-D6-29	SM-D6-29.jpg	D6				Dover	10.1	61.42	21.21	22.9	14.95	16.78	43.27	6.3	x	1.264004768	726.0706
Smeltzer	SM-D6-30	SM-D6-30.jpg	D6				Dover	13.5	80.23	22.14	x	14.94	19.26	64.49	6.91	x	1.14953271	1242.0774
Smeltzer	SM-D6-31	SM-D6-31.jpg	D6				Dover	10.4	64.3	24.8	27.94	18.37	21.84	47.63	5.76	x	1.135531136	1040.2392
Smeltzer	SM-D6-32	SM-D6-32.jpg	D6				Dover	12.7	61.37	24.12	26.62	12.02	21.33	48.88	7.29	x	1.130801688	1042.6104
Smeltzer	SM-D6-33	SM-D6-33.jpg	D6				Dover	11.5	63.07	24.53	27.25	16.7	19.62	44.92	6.04	x	1.250254842	881.3304
Smeltzer	SM-D6-34	SM-D6-34.jpg	D6				Dover	9.9	63.73	24.79	26.98	16.96	20.86	45.95	5.83	x	1.188398849	958.517
Smeltzer	SM-D6-35	SM-D6-35.jpg	D6				Ft. Payne	7.4	52.5	19.85	23.7	14.16	16.1	37.28	6.29	x	1.232919255	600.208
Smeltzer	SM-D6-36	SM-D6-36.jpg	D6				Dover	6.7	40.24	27.96	31.25	14.22	11.73	24.04	7.25	x	2.383631714	281.9892
Smeltzer	SM-D6-37	SM-D6-37.jpg	D6				Ft. Payne	5.9	48.91	21.55	x	15.92	13.43	31.93	6.13	x	1.60461653	428.8199
Smeltzer	SM-D6-38	SM-D6-38.jpg	D6				Ft. Payne	13.2	70.24	23.32	x	15.15	20	55.86	6.78	x	1.166	1117.2
Smeltzer	SM-D6-39	SM-D6-39.jpg	D6				Dover	12.8	61.28	26.54	29.76	16.1	20.49	40.75	7.82	x	1.295265983	834.9675
Smeltzer	SM-D6-40	SM-D6-40.jpg	D6				Dover	7.9	52.45	20.63	23.06	16.9	17.28	36.05	5.87	x	1.193865741	622.944
Smeltzer	SM-D6-41	SM-D6-41.jpg	D6				Dover	10.7	63.65	21.54	28.52	17.88	19.82	45.13	6.19	x	1.086781029	894.4766
Smeltzer	SM-D6-42	SM-D6-42.jpg	D6				Dover	10.4	57.66	24.57	25.73	18	22.1	41.34	6.08	x	1.111764706	913.614
Smeltzer	SM-D30-1	SM-D30-1.jpg	D30				Horse Creek	8.1	45.74	25.73	28.45	15.39	19.08	29.84	6.5	x	1.348532495	569.3472
Smeltzer	SM-D37-1	SM-D37-1.jpg	D37				Dover	15.7	76.2	19.71	20.87	21.2	21.14	54.84	8.01	x	0.932355724	1159.3176
Cambron/Hulse	No ID	No Photo				76	Ft. Payne	6.2	47	18.58	19.92	18.04	14.04	29.43	6.41	x	1.323361823	413.1972
Cambron/Hulse	No ID	No Photo			37E	84	Ft. Payne - Fossiliferous Tan	4.1	43.27	18.74	x	11.87	14.86	31.63	5.92	B	1.261103634	470.0218

Appendix 2 – Photographs of Artifacts

Artifacts are presented by collection and in numerical order by site.

All images are to the same scale.

CH – Cambron/Hulse Collection

SI – Sims Collection

SM – Smeltzer Collection

CH-29-1

CH-32-1

CH-32-2

CH-32-3

CH-32-4

CH-32-5

CH-32B-1

CH-32B-2

CH-32B-3

CH-32S-1

CH-33W-1

CH-37-1

CH-37-2

CH-37-3

CH-37-4

CH-37-5

CH-37E-1

CH-37E-2

CH-37M-1

CH-38-1

CH-38-2

CH-38E-1

CH-38N-1

CH-38NE-1

CH-39-1

CH-39-2

CH-39-3

CH-39-4

CH-39-5

CH-39-6

CH-39-7

CH-46-1

CH-48-1

CH-50-1

CH-53-1

CH-54-1

CH-54-2

CH-54-3

CH-55-1

CH-63-1

CH-69-1

CH-76-1

CH-76-2

CH-76-3

CH-76-4

CH-76-5

CH-76-6

CH-76-7

CH-76-8

CH-76-9

CH-76-10

CH-76-11

CH-76-12

CH-76-13

CH-76-14

CH-76-15

CH-79-1

CH-79-2

CH-83-1

CH-84-1

CH-84-2

CH-84-3

CH-84-4

CH-84-5

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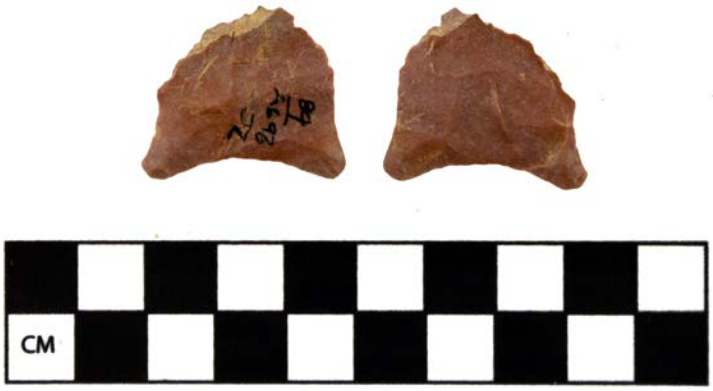
CH-84-9

CH-84-10

CH-84-11

CH-84-12

CH-84-13



CH-84-14

CH-84-15

CH-154-1

CH-162-1

CH-162-2

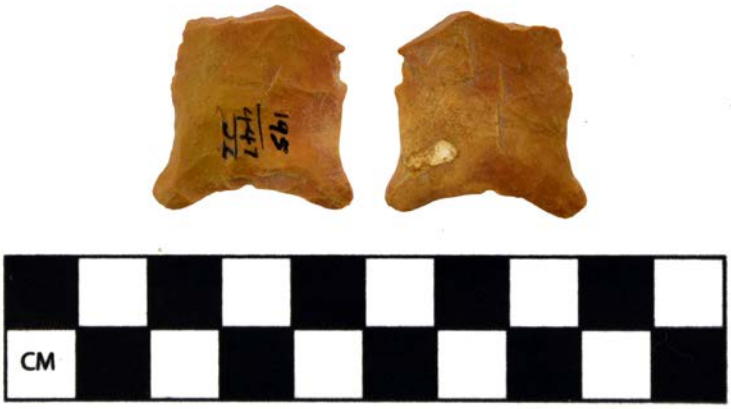
CH-162-3

CH-162-4

CH-195-1

CH-195-2

CH-195-3



CH-195-4

CH-301-1

CH-388-1

CH-394-1

SI-1-1

SI-1-2

SI-1-3

SI-1-4

SI-1B-1

SI-1B-2

SI-1B-3

SI-10-1

SI-10-2

SI-10-3

SI-10-4

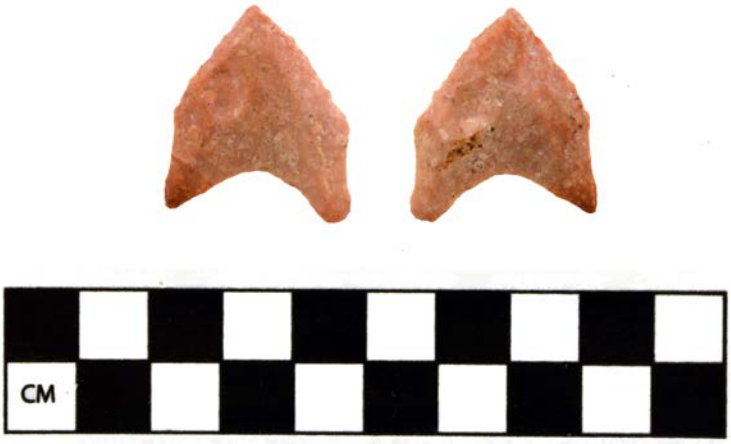
SI-10-5

SI-10-6

SI-10-7

SI-10-8

SI-10-9



SI-10-10

SI-10-11

SI-10-12

SI-10-13

SI-10-14

SI-10A-1

SI-13B-1

SI-13B-2

SI-13B-3

SI-13B-4

SI-13B-5

SI-13B-6

SI-13B-7

SI-13B-8

SI-13B-9

SI-13B-10

SI-13B-11

SI-13B-12

SI-13B-13

SI-13B-14

SI-13B-15

SI-13B-16

SI-13B-17

SI-13B-18

SI-13B-19

SI-13B-20

SI-13B-21

SI-14-1

SI-14-2

SI-14-3

SI-14-4

SI-14-5

SI-14-6

SI-14-7

SI-17-1

SI-18-1

SI-20-1

SI-23-1

SI-23-2

SM-D6-1

SM-D6-2

SM-D6-3

SM-D6-4

SM-D6-5

SM-D6-6

SM-D6-7

SM-D6-8

SM-D6-9

SM-D6-10

SM-D6-11

SM-D6-12

SM-D6-13

SM-D6-14

SM-D6-15

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SM-D6-32

SM-D6-33

SM-D6-34

SM-D6-35

SM-D6-36

SM-D6-37

SM-D6-38

SM-D6-39

SM-D6-40

SM-D6-41

SM-D6-42

SM-D30-1

SM-D37-1

Appendix 3 – Statistical Data and Analysis Results

Table A.1 – Legend and Results for Statistical Analysis of Thesis Sample

	Description of Analysis	p-value
t-test 1	Expended Utility and Region	0.003
t-test 2	Residual Utility and Region	<0.01
ANOVA 1	Residual Utility and Source Material	0.117
ANOVA 2	Interaction of Source Material and Region in Relation to Residual Utility	0.206
ANOVA 3	Expended Utility and Source Material	0.406
ANOVA 4	Interaction of Source Material and Region in Relation to Expended Utility	0.055

The above table presents each of the statistical analyses run using the Lower and Central Tennessee River Valley samples. A p-value of <0.05 was considered significant for these analyses.

Table A.2 – Summary Statistics for Expended Utility Values

	Mean	Standard Deviation	Sample Size
CTRV	1.41	0.28	53
LTRV	1.24	0.33	89

Above are the summary statistics for the Expended Utility values generated from the thesis sample.

Table A.3 – Summary Statistics for Residual Utility Values

	Mean	Standard Deviation	Sample Size
CTRV	575.37	295.04	50
LTRV	840.02	302.03	79

Above are the summary statistics for the Residual Utility values generated from the thesis sample.

Table A.4 – Legend and Results for Analysis of PIDBA and Thesis Sample Data

	Description of Analysis	p-value
t-test 1	Basal Width and State	<0.01
t-test 2	Thickness and State	<0.01
t-test 3	Basal Width and Source Material	0.658
t-test 4	Thickness and Source Material	0.023
ANOVA 1	Interaction of State and Material Type in Relation to Thickness	0.625
ANOVA 2	Interaction of State and Material Type in Relation to Basal Width	0.244

The above table presents each of the statistical analyses run using the Lower and Central Tennessee River Valley samples as well as data derived from PIDBA. A p-value of <0.05 was considered significant for these analyses. T-tests looking at basal width and thickness against state compared the means of each of the states against the means of the basal width and thickness of the sample analyzed here before producing a p-value.

Table A.5 – Summary Statistics for Base Width by Material Type and Region

Region	Material Type	Mean	Standard Deviation	Sample Size
CTRV	Chert	20.47	2.65	71
	Metavolcanic	0	0	0
	Quartz	0	0	0
LTRV	Chert	23.32	3.15	98
	Metavolcanic	0	0	0
	Quartz	0	0	0
Georgia	Chert	27.47	3.11	616
	Metavolcanic	27.1	3.15	15
	Quartz	25.88	4.58	153
Mississippi	Chert	22.69	3.03	216
	Metavolcanic	0	0	0
	Quartz	22.3	1.79	5
Sloan Site	Chert	24.2	6.54	157
	Metavolcanic	0	0	0
	Quartz	0	0	0
Tennessee	Chert	26.63	4.18	392
	Metavolcanic	19.74	N/A	1
	Quartz	28.01	1.36	2

The above table presents the summary statistics for Base Width, arranged by Region and then by material type.

Table A.6 – Summary Statistics for Thickness by Material Type and Region

Region	Material Type	Mean	Standard Deviation	Sample Size
CTRV	Chert	5.97	0.9	85
	Metavolcanic	0	0	0
	Quartz	0	0	0
LTRV	Chert	6.42	0.85	100
	Metavolcanic	0	0	0
	Quartz	0	0	0
Georgia	Chert	6.28	1.93	518
	Metavolcanic	5.95	1.08	13
	Quartz	6.7	1.36	139
Mississippi	Chert	5.87	1.55	202
	Metavolcanic	0	0	0
	Quartz	6.38	1.38	4
Sloan Site	Chert	6.78	1.95	157
	Metavolcanic	0	0	0
	Quartz	0	0	0
Tennessee	Chert	6.67	1.11	415
	Metavolcanic	5.34	N/A	1
	Quartz	8.39	0.35	2

The above table presents the summary statistics for Thickness, arranged by Region and then by material type.

VITA

Alexander Craib grew up in historic Mt. Vernon, Virginia. Upon graduation from St. Stephen's & St. Agnes School, he attended the University of Oregon where he received a Bachelor of Arts degree in Anthropology. Upon graduation he was an intern at the Nels Nelson North American Archaeology Laboratory at the American Museum of Natural History in New York City. After numerous CRM and academic projects, he returned to school and entered the Master of Arts program in the Department of Anthropology at the University of Tennessee-Knoxville. Upon graduation from the University of Tennessee-Knoxville, he began the Ph.D. program in Archaeology at the University of Wyoming.