CUTTING CORNERS: TRANSITION FROM CORNER TO SIDE NOTCHED ARROW POINTS IN THE CENTRAL PLAINS TRADITION

by

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ABSTRACT

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One of the cultural markers of the Central Plains Tradition (CPT; A.D. 1050-1400) is the side-notched arrow point. These projectile points replaced the previous corner-notched points as the arrow tip of choice for the CPT people. This pattern of change is well established in the archaeological literature; however, little has been done to explore why this change occurred. In this thesis I argue that the spread of side notched projectile points onto the Great Plains during the CPT was influenced by point styles associated with the Mississippian mound center of Cahokia. This research looks at arrow points from Woodland, Central and Southern Plains sites in comparison to points from Mississippian sites at and around Cahokia to better understand the spread of point types and likely associations among the adoption of a new technology and co-occurring changes in cultural influence during the CPT.

Keywords: Central Plains, Projectile Points, Cahokia, American Bottom, Style

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1 The Great Plains and the American Bottom

Projectile points are ubiquitous in most archaeological sites in the Plains. In addition to the longevity of stone tools and the associated lithic debitage, projectile points are one of the best-recognized artifacts to researchers, collectors, and the general public. They serve as both chronological and cultural markers in the archaeological record: their stylistic changes are often used as an indicator of a new cultural tradition or the movement of people into an area. One such stylistic change occurred on the Central Plains between the Late Woodland and Plains Village period: around AD 1050/1100, triangular side-notched arrow points replaced Woodland corner-notched points as the arrow tip of choice for the people of the Central Plains tradition (CPT). This transition in point type is well established in archaeological literature on the CPT. However, while archaeologists have described this change, they have not delved into the reasons for why it occurred during this particular time period.

The development of the Central Plains tradition and this transition in projectile point morphology coincided with the fluorescence of the Mississippian polity at Cahokia (A.D. 1050/1100). At this time, the area known as the American Bottom experienced what is referred to as a "Big Bang" and was transformed by an influx of people and an almost total reconfiguration of the socio-cultural system. At its peak Cahokia included the mound complex at Cahokia, East St. Louis, and St. Louis, along with associated farming and village complexes. This transformation and the corresponding population boom in the American Bottom meant there was an intensification of maize agriculture at a level not seen in the previous periods. The Mississippians in the American Bottom developed a distinct material culture, including a distinctive triangular side-notched arrow point, called a Cahokia point. These points can have a

single pair of side-notches, tri-notches (two side-notches and a basal notch), or multiple side-notches. They are found throughout Cahokia, the American Bottom, and beyond.

The CPT also marked a time of rapid transformation on the Great Plains, when hunter-gatherer lifestyles were replaced with sedentary farmers. As a variant of the Plains Village period, the CPT was the first time farming, in particular maize agriculture, played a dominant role in people's subsistence strategies across the Central Plains. During this period, maize agriculture made up around 30-50 percent of the people's caloric intake (see Adair 2003, Nepstad-Thornberry et al. 2002; Roper 2007; Smith 2001) and was supplemented with hunting and gathering. The new adaptive system had "profound changes in lifeways and social institutions" for the people on the Great Plains (Roper 2007:56).

There is an established connection between Cahokia and the central Great Plains. In this thesis, I use data from the Great Plains and American Bottom to address the question of whether or not there is a connection between the adoption/spread of side-notched arrow point in the central Great Plains and the Cahokia side-notched points used in the American Bottom. I hypothesize that because this change in projectile points occurred at the same time as farming spread onto the Great Plains, the technology for side-notched arrow points came from farming groups east of the Mississippi, in particular the Mississippian mound center of Cahokia. The objective of this project is to study the temporal and geographic patterns of change in projectile point types on the Great Plains. To do this, I incorporate data from a total of 2,900 arrow points recovered from 64 sites in the American Bottom, the Central Great Plains, and the Southern Plains. My analysis allows me to look at this arrow point change across time and space on the Great Plains and some of the possible implications of this change.

THESIS ORGANIZATION

This thesis is organized into five chapters. This chapter, chapter one, gives a cultural history of the American Bottom and Great Plains. First I discuss the rise of Cahokia and its material culture. Then I demonstrate an established link between the Great Plains and eastern cultures in the Woodland period. Next I look at the spread of maize agriculture on the Great Plains and the cultures and phases within the archaeological record that emerge as a response to this spread. Finally, I discuss the evidence for interactions between Plains people and Cahokia.

Chapter two is an overview of the theories of style and function, focusing particularly on the causes of functional and stylistic variation in arrows and arrow tips. Chapter three covers the data collected and methods used in my analysis, including how sites were chosen, how the data I gathered were organized, the geographical, temporal, and morphological categories I use in this project, and the statistical tests I performed using the data I gathered. Chapter four covers the results of the research, description of the temporal and spatial changes in arrow points, and a discussion of those results and my interpretations. Finally, chapter five offers my concluding thoughts on the thesis, its implications for archaeological understanding of the American Bottom and Great Plains ca. AD 1100, and discusses further research directions which this research highlights as potentially informative.

CULTURE-HISTORICAL BACKGROUND

This thesis focuses on main two regions of prehistoric North America, the Great Plains and the American Bottom. These two regions, while being geographically distant, display a high

level of connectedness through trade and the movement of people and ideas. My research in the American Bottom focuses on the Mississippian mound complex of Greater Cahokia, including Cahokia and East St. Louis. On the Great Plains I focus on 60 sites spanning from the western border of Iowa, across to western Nebraska, and down through Kansas to northern Oklahoma.

Here, I present an overview of the culture-historical background of these regions with a focus on the Woodland, Cahokia, the Initial Middle Missouri, Southern Plains Villages, and the Central Plains tradition. I discuss (1) the connection of middle and late Plains Woodland period to Midwest Woodland and Hopewell peoples, (2) the rise of Cahokia, its chronology, material culture, and briefly the emergence of the Spiro site and its possible connections. Continuing chronologically, I then consider (3) the spread of maize farming onto the Great Plains with the Central Plains and the Initial Middle Missouri Traditions, (4) the variation within the Plains Village period, and (5) the evidence we have for Cahokia/Mississippian interaction with the Great Plains. I conclude this section with (6) a look at how at what implication(s) this previous research on the cultural history of the Great Plains and potential Mississippian interactions has for my analysis.

Lifeways on the Central Plains

By providing a basic overview of the Middle and Late Plains Woodland periods, I demonstrate that connections between Plains people and those further to the east predate the Mississippian period. The Plains Woodland period lasted from approximately 500 B.C. to A.D. 1000; I focus here on the latter two-thirds of this period, the Middle Plains Woodland period A.D. 1 – 500/750 and the Late Plains Woodland period A.D. 500/750 – 1000. A very broad

description of the Plains Woodland period is a "ceramic-making population of hunter-gatherers who increasingly relied on agriculture" (Logan 2006). The Plains Woodland period is also characterized by elongated ceramic vessels with conoidal bases, corner-notched arrow points, and earthen burial mounds.

In the eastern portions of Kansas it appears many Plains Woodland people adopted their subsistence practices and material culture from eastern Woodland contemporaries (Logan 2006). Braun (1977,1985,1987,1991) states, in fact, that many of the Middle and Late Woodland developments on the eastern portions of the central Great Plains mirror the changes happening in the Midwest. For example, earthen burial mounds are also the hallmark of the Woodland period in the Eastern United States (Johnson and Johnson 1998). Archaeologists suggest this is because there is either movement of people or indirect diffusion of ideas from the Midwest onto the Plains. Logan (2006) discusses this argument in detail. He looked for evidence indicating the indirect movement of ideas or the direct of people. He states that this phenomenon, like all things in the study of the past, was a complex process and most likely involved both the movement of ideas and people.

Middle Woodland Hopewellian expanded as far west as the Kansas City region on the eastern edge of the Great Plains, also called Kansas City Hopewell. This variant dates to around A.D. 1-750 (see Johnson 1976**,** 1979,1984, Johnson and Johnson 1998). The changes in pottery throughout this variant mimic the types of pottery and the temporal changes in Illinois Hopewell (see Logan 2006).

While there are regional distinctions of ceramics in both the eastern Plains Woodland and Hopewell, most likely due to regional resources difference, wider patterns are similar throughout. This wider pattern indicates association and similar larger cultural trends between

the regions. An example of this is the Crawford Country ware found at the MAD site, which has a cord-roughened surface finish with trailed-line decorations. This pottery is similar to Early Woodland Black Sand Incised pottery found in Illinois Woodland sites (Johnson and Johnson 1998).

The changes in Kansas City Hopewell projectile points also match changes seen among projectile points of the eastern Hopewell in the lower Illinois River valley; both variants use broad-bladed corner-notched dart points early on, then later adopt smaller corner-notched arrow points, likely concurrent with the spread of bow and arrow technology (Logan 2006). The Kansas City Hopewell was not the only Middle Woodland culture present on the eastern Plains: "the Valley variant of the Missouri River valley, the Cooper variant of northeastern Oklahoma, the Cuesta phase of southeastern Kansas, and the Schultz phase of north-central Kansas," all have similarities in material culture with cultures to the east (Logan 2006:79, Johnson 2001, Johnson and Johnson 1998). Logan notes that, in particular, all of these cultural variants share ceramic (elongate straight-walled jars with rounded or conoidal bases) and lithic attributes with eastern Hopewell cultures.

In addition to cultural connections evident in artifacts, the Woodland people in the northern Plains also participated in the trade network with southern and eastern Woodland people. Bison hunting in the Northern Plains increased to an almost "industrial" level at the same time as an "expansion of Middle Woodland exchange networks from the east onto the Great Plains, the appearance of Middle Woodland mortuary ceremonialism in many portions of the eastern Plains, and the widespread appearance of the Plains Woodland style pottery" (Bamforth 2011). Bamforth suggests that these changes are evidence for the involvement of Northern Plains people in Middle Woodland trade and exchange networks. This idea is further reinforced by

ethnohistorical accounts of Northern Plains' hunters producing surplus for trade (see Ewers 1955, Jablow 1951). Together, this research suggests that, from at least the Middle Woodland period, people living on the Plains were likely connected to people living to the east both culturally and economically. My research suggests that their connections continued through subsequent time periods, including the Central Plains tradition.

The Rise of Cahokia

To the east of the Great Plains, the Hopewell culture collapsed in the Late Woodland period and was eventually succeeded by Mississippian peoples. Cahokia was the largest and probably most powerful of the Mississippian mound centers, located in a region know as the American Bottom on a flood plain of the Mississippi River near present day St. Louis, Missouri.

Table 1.1. Time Periods in the American Bottom

Phase	**Dates**
Late Woodland / Terminal Late Woodland	A.D. 650-900
Emergent Mississipian	A.D. 900-1050
Lohmann Phase	A.D. 1050 - 1100
Stirling Phase	A.D. 1100-1200
Moorehead Phase	A.D.1200-1300

Geographic Setting and Chronology

At the end of the Terminal Late Woodland (TLW) Cahokia was a small Woodland village of a thousand people in the American Bottom. Around A.D. 1050, and the start of the

Lohman phase, the village of Cahokia experienced a dramatic transformation, what Pauketat (1994) referred to as the "Big Bang" (Table 1.1). This radically changed the cultural and physical landscapes of the American Bottom. My research focuses on Greater Cahokia, which was composed of a the Mound centers of Cahokia, St. Louis, and East St. Louis, along with outlying farming communities like that of the Richland Complex.

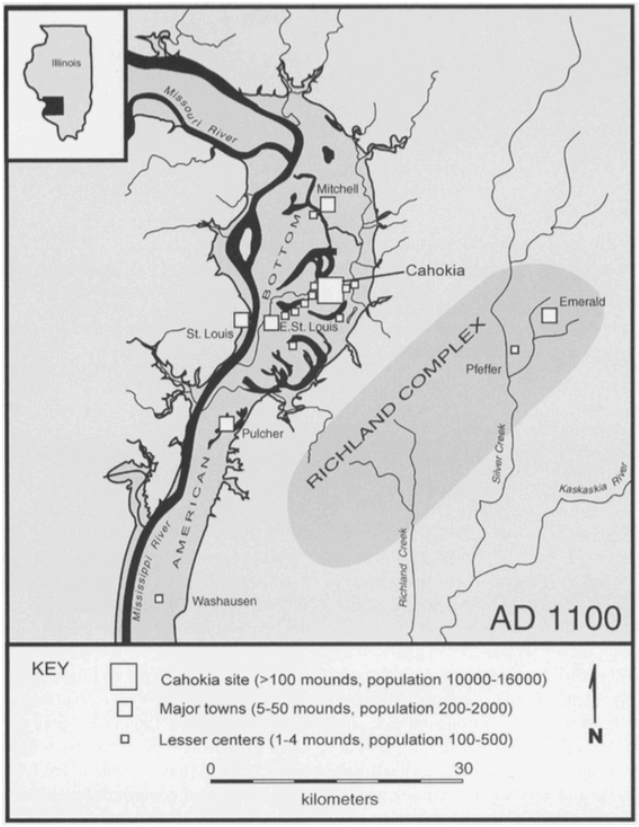

Figure 1.1. Location of sites within the American Bottom (From Benson et al. 2009)

At the start of the Lohmann phase (ca AD 1050-1100) the American Bottom had a massive influx of people moving in from the surrounding region. Population estimates for Greater Cahokia (Cahokia, East St. Louis, and St. Louis) are around 20,000+ individuals at its peak (see Pauketat and Lopinot 1997). This is a middle range population estimate for Greater

Cahokia. Some researchers (Milner 1986) put Cahokia's peak population at around 50,000 people, but researchers now consider this estimate too high.

The population boom in the American Bottom cannot be accounted for based solely on local birth rates or even through aggregation of local Terminal Late Woodland people. Slater et al. (2014) studied the strontium isotopes of human tooth enamel from burials at Cahokia, and concluded that the population of Cahokia included people from many different locations around and outside of the American Bottom. Slater et al.'s (2014:126) research and other archaeological data suggests Cahokia's population was made up of groups from Missouri, Illinois, Indiana, areas all along the Mississippi River valley, and the eastern Great Plains (see also Emerson and Lewis 1991; Stoltman 1991).

At the same time as this massive aggregation of people into the American Bottom, the once small village of Cahokia was further transformed with urban renewal-like building projects. The small Woodland village of Cahokia was replaced by new Lohmann phase planned residential centers and public buildings. The Lohmann period is also marked by intensification of maize agriculture. Maize horticulture was present in the American Bottom since the Middle Woodland period; however, it was not widely adopted by the people until the Lohmann phase. The boom in Cahokia's population resulted in a need for maize agriculture intensification. This influx of food production allowed for massive communal building projects like the pyramid earthen mounds.

The subsequent Stirling phase is considered Cahokia's Golden Age. The people of Cahokia built up ceremonial and public works, like earthen mounds, at least five Woodhenge calendars, and Monks Mound. At the start of this period, Cahokia hit its peak population of around 20,000 people. The first of several palisades with ditch and bastions were constructed

around Monks Mound and the Grade Plaza during this phase. However, at around the middle of the Stirling phase, Cahokia began to decline in population. Benson et al. (2009) estimated somewhere between 5,200 and 7,200 people resided in Cahokia at the end of this phase, a loss of over 50 percent of the local population.

Populations continued to decline during the Moorehead phase (AD 1200-1300), plateauing at around 3,000 to 4,500 people. Residential patterns changed at this time as well. People began clustering their homes into house lots, many located within palisade complexes**.** There was also a sharp decline in rural population density in the floodplains. No mounds have construction elements that date to this phase, and no Mississippian cemetery in the area is known to post-date AD 1300 (Benson et al. 2009; Emerson et al. 2003).

Cahokian Material Culture

The Mississippians at Cahokia created a distinct material culture which is visible in all of the cultural phases discussed above. One of the most recognizable traits in the archaeological record is the Mississippian wall trench house. Previous Woodland people built wall post house, digging an individual hole for each wall post. This type of construction was slow and was done by the household's family. Around A.D. 1050 there was a sudden shift to wall trench house construction. This was a type of construction unseen in the American Bottom before this time (Pauketat and Alt 2011). This new style of house construction allowed for the construction of prefabricated walls that were then set into wall trenches. Many of these houses could be completed in a short amount of time with separate work crews digging wall trenches and building walls.

A new ceramic style also emerged at the onset of Cahokia during the Lohmann phase. Pot construction and paste became more standardized and sophisticated in construction (Pauketat 2004). While Cahokians used a variety of tempers in their pots, such as limestone and grog, shell-tempered pottery became one of the most recognizable pottery types associated with Cahokia (see Milner et al. 1984 for a more in depth coverage of Cahokian ceramics). Ceramics in the Lohman phase consist of mainly jar, seed jars, and bowls of various sizes and shapes. Other ceramic vessels include "beakers, water bottles, hooded water bottles, and juice presses" (Milner et al. 1984: 161). Lohman phase ceramics can have various exterior surfaces including brown or black slips and some stumpwear vessels can be plain or cordmarked. The best-known and most frequent surface treatment in the Lohman phase is red slip. Lohman phase vessel forms continue on into the Stirling phase, although the dimensions and forms vary a bit. Ramey incised pottery was developed at this time. Ramey incised pots are dark slipped pots with heavy burnish, and fired in a way that produces a dark almost black appearance (Pauketat 2004). This ceramic type is also characterized by incised designs carved into the shoulders and lips of the pots. These designs often reflected supernatural or cosmological designs. In many ways these pots were embedded with deeply enculturated ideas (Pauketat 2004). In the Moorehead phase, Cahokia Cordmarked ceramics appear (Milner et al. 1984). Earlier phase ceramics continue in the Moorehead phase, but decrease in frequency.

Other goods associated with Cahokia are prestige goods made from copper, galena, and marine shell, along with stone pipes and detailed carved flint clay figurines (see Steponaitis et al. 1996; Bishop and Canouts 1993; Johnson 1994; Lafferty 1994). Supernatural motifs and icons such as the weeping eye or forked eye surround, sky and fertility deities, the long-nosed god, and animal effigies are abundant at Cahokia and the surrounding settlements.

At the start of the Lohman period a new distinct arrow point was developed at Cahokia, the Cahokia point. Cahokia points are skillfully-made (that is, thin, symmetric, and precisely flaked) triangular points with small side-notches, often with a basal notch (referred to as Cahokia tri-notched points) or multiple side-notches (O'Brien and Wood 1998). These points were found in a number of different contexts, including residential structures, caches, and deposits in burial mounds. At the start of Cahokia's rise (A.D. 1050) there is an increase in lithic refuse in new wall trench houses. Pauketat (2004) notes an increase in density of Cahokia style points in Lohman phase houses. Brad Koldehoff (1987, 1990, 1995) attributes this increase to the formalization of Mississippian tools. He states some of the points found in these home would have required considerable skill to produce based on the fine craftsmanship of the arrow point. Most famously, Cahokia points were recovered from caches associated with the elite burials in Cahokia's Mound 72.

Cahokia points did not fully replace all points produced and used at Cahokia (other side-notched and unnotched points were made as well), but they did become the point most associated with the settlement. Cahokia points are not limited to the boundaries of the American Bottom. O'Brien and Wood (1998) note the presence of Cahokia points across the Midwest and parts of Missouri. Pauketat (2004) mentions Cahokia arrowheads found at sites in Iowa, Minnesota, Nebraska, and South Dakota. Because of the skill involved in making Cahokia points, their presence outside of the American Bottom is often interpreted as evidence for association(s) with the settlement at Cahokia. The next chapter will expand on this, and my research follows a similar trend.

Spiro

Cahokia was not the only Mississippian settlement that came to power at the end of the Late Woodland period (around A.D. 900). To the south and west of the American Bottom, in Arkansas, Louisiana, Texas and Oklahoma, a group known as the Caddoan Mississippians arose separately from Cahokia. The Caddoan Mississippian are part of the Mississippian world, but are considered separate from the Mississippians in Cahokia. Like the American Bottom Mississippian, the Caddoan Mississippians also adopted maize agriculture, but they did not intensively farm as intensively as Cahokia (Bamforth in press).

The focal point of the Caddoan Mississippian world was the mound center of Spiro along the Arkansas River in eastern Oklahoma. Spiro was founded in the 10th century and reached the height of its importance from A.D. 1250 to 1450 (Brown and Rogers 1989). The people at Spiro also built earthen mounds. Spiro consisted of 13 mounds on 180 hectares.

James Brown (1996) notes Spiro's interaction with the Plains changed over time. Prior to AD 1250 or 1300, Spiro traded with the Ozarks and with Cahokia, as well as along the river valleys flowing south out of the Central Plains. However, Spiro was actively trading with Cahokia. The two regional Mississippian centers knew about each other and appear to have actively communicated with one another. Brown (1996:199) notes "Cahokia notched points of Crescent flint, ceremonial ax head and crown-shaped biface (maces) of Kaolin and Mill Creek cherts, red pipestone effigy pipes", sheet copper long-nosed god maskettes found at Spiro connect it to Cahokia. After the fall of Cahokia, Spiro looked more directly west, across Oklahoma and into the Texas Panhandle for trading partners.

The arrow points found in Spiro are very distinct from American Bottom Mississippian points. One of the biggest differences between Spiro and Cahokia projectile points is the level of diversity in the types of arrow points recovered at Spiro. Both side and corner-notched points were used at Spiro, and Cahokia points were not common. Unlike Cahokia, there is not a single point type that is strongly associated with Spiro, making it difficult to use projectile points to signify a close relationship with Spiro in the way Cahokia points can be used.

THE RISE OF MAIZE AGRICULTURE ON THE GREAT PLAINS

When the Mississippian centers of Cahokia and Spiro were first occupied and became heavily reliant on maize, horticulture and domesticates were not completely unknown to people on the Great Plains. Middle Woodland people on the edges of the Plains had domesticated local plants and a small amount of maize. During the Late Woodland period this domestication of maize and squash increased (Bamforth in press). It is not until around AD 1050/1100 that truly settled farmers began to live on the Great Plains. This is referred to as the Plains Village Period, and is the first time maize agriculture played a dominant role in the subsistence lifeways of the people on the Great Plains.

Roper suggests demic diffusion and individual frontier mobility as the best possible explanations for what we see in the archaeological record of the Great Plains. Demic diffusion involves what the authors refer to as randomized short movements of small groups into a new area over a long period of time, possibly generations (Ammerman and Cavalli-Sforza 2002). The authors (Ammerman and Cavalli-Sforza 2002) describe the movement in demic diffusion as randomized. However, the movement of people in the past may appear randomized in the

archaeological record, but these movements were most likely anything but random for the people. In all likelihood, the people knew where they wanted to move and had different reasons for moving to these various regions. Demic diffusion also sees movement happening over a considerable period of time and involving both of people into an area movement and population growth once in the new region. Individual frontier mobility is described as working "through contact and partner exchange that involves mostly single individuals or small groups linked by kinship, who move between hunter-gatherer and farming communities within the framework of established kin ties, marriage alliances, trading/exchange partnership, or other social ties of reciprocity and obligation" (Zvelebil and Lillie 2000:62). All of this implies that the transition to farming during the Plains Village period required the movement of people into an area and local cultural change (Bamforth in press).

First Farmers on the Great Plains

As stated above, the use of domesticates occurred on the Great Plains before the total adoption of maize agriculture. On the Plains, archaeologists label the phase between the Late Woodland and Plains Village period as "Great Oasis". The Great Oasis Phase covers from eastern Nebraska to southeastern and eastern South Dakota, southwestern Minnesota, and the northern and central portions of Iowa (Tiffany and Alex 2001). However, the evidence for maize agriculture is only present in central Iowa and surrounding regions (Bamforth in press). Yet Great Oasis pottery is found throughout the larger area. This means that while not all groups of Great Oasis people were invested in sedentary farming, they were all still communicating with one way or another (through direct contact, trade, change of partners or even captive taking).

The Great Oasis phase of the Plains maps on to the Terminal Late Woodland (TLW) in the Midwest (AD 950). This phase has similar features as the TLW. The people of the Great Oasis period are some of the first settled farmers on the Great Plains. "Great Oasis sites have produced an array of domesticated or cultivated plants suggesting both a continuation in the use of earlier Woodland stage broadcast farming crops as well as intensive late prehistoric corn production (Tiffany and Alex 2001: 84). Corn is almost ubiquitous at Great Oasis sites (see Asch 1992; Asch 1996; Dunne 1999; Gradwohl 1975; Green 1995; Lensink and Finney 1995; Mead 1981; Tiffany et al. 1998; Treat et al. 1970). Great Oasis people also relied on wild fauna, relying on a diversity of faunal types. The diversity varies east to west, bison being more common in western Great Oasis sites. The faunal evidence at Great Oasis sites shows a continuation of Woodland hunting and gathering practices (except for the increase of bison in the west) along with the adoption of farming subsistence.

Great Oasis houses were small, rectangular, wattle and daub constructions. The houses had long entryways and were semi-subterranean (Tiffany and Alex 2001). Great Oasis people made what is called Great Oasis High Rim and Great Oasis Wedge Lip ware (Tiffany and Alex 2001). These are globular cord-marked vessels with restricted necks and high-undecorated rims (Bamforth in press). Tiffany notes that Great Oasis arrow points include small unnotched points and side-notched projectile points. There is almost no evidence of Cahokian interaction with Great Oasis people. There is one house at one Great Oasis site, the Broken Kettle Site, with a few red-slip pot sherds (Bamforth in press; Tiffany and Alex 2001), but current research suggests the Great Oasis phase arose before the creation of Cahokia during the Lohman period (AD 1050).

Plains Village Variation

Before AD 1050, the only maize farmers on the Great Plains were a small section of Great Oasis farmers. After AD 1050/1100 settled farmer and farming communities appear suddenly throughout the eastern Great Plains (Bamforth in press). This dramatic change occurs at the same time as the "Big Bang" in the American Bottom and the creation of Cahokia (Lohmann phase AD1050). This period of intensive maize agriculture called the Plains Village period. The Plains Village period started at AD 1050/1100 and displays a high level of variation across the region. Some of the small-scale variation is attributed to resource variation across the Great Plains, but the larger variations are important.

Large Scale Variation in the Plains Village Period

In northwestern Iowa and up the Missouri River into South Dakota, the people of the Great Oasis settled on the landscape into true agricultural villages. This is referred to as the Initial Middle Missouri (IMM). These villages were made up of houses similar to those built during the Great Oasis period but they were organized in larger fortified villages and occupied for longer periods. In some cases IMM fortified villages were rebuilt and reoccupied multiple times. Overall, the IMM contains mostly fortified farming villages. These villages were clustered along major river drainages, like the "Missouri, James, Minnesota and the Little and Big Sioux valleys" (Tiffany 2007:5). There is ample evidence for interaction among the people in IMM sites and Cahokia (see below). Evidence for Cahokian interaction is particularly strong at Mill Creek settlements, a variant of the IMM. Mill Creek settlements are similar to other IMM sites.

They usually contain around 20 to 30 house structures, with a population around 200 to 300 people (see Bamforth in press; Mitchell 2013; Steinacher 1983; Tiffany 2007). These settlements are often heavily fortified and have deeply stratified middens indicating long periods of habitation (Henning 2007).

To the south of the IMM a second group of farmers emerged on the central Great Plains. These people are referred to as the Central Plains tradition (CPT) and are the main focus of this thesis. In her examination of the origins of the CPT, Donna Roper (1995:214) stated "the chronological evidence now available strongly suggests that the Central Plains tradition originated prior to AD 1100 on the eastern edge of the Central Plains… Over the next century, the Central Plains tradition expanded westward, throughout the drainage of the Kansas River." From there, the CPT expanded to the west and north into Nebraska around the Missouri River and its drainages.

Unlike the IMM, CPT farmers did not aggregate in villages. Instead the CPT is characterized by small isolated farmsteads centered around four center post house structures. These structures varied in size throughout the central Plains, decreasing in size and durability to the west. This difference in the western portions is likely due to the limitation of wood resources on the western Plains (Roper 2002). These sites are spread along terraces above rivers and tributaries. CPT sites can contain multiple structures, however, this likely represents rebuilds and not contemporaneous habitations. Each of these sites likely represents individual family units.

A new ceramic style also appeared during the CPT, thinner walled, grit-tempered globular to subglobular jars replaced the thicker elongated pots typical of the Plains Woodland period (Roper 2007). These new pots allowed for better boiling and cooking of maize that was

being produced in increasing quantities. CPT pottery is rarely decorated, except for vessels with decoration around the rim or lip (Roper 2006).

CPT farmers relied on a diverse number of resources for subsistence. While bison dominate faunal collections from IMM sites, the density of bison bones decreases on the Central Plains (Bamforth in press; Mitchell 2013; Meier 2007). This could be in part due to the geographic location on the northern Plains. Some northern CPT sites, like the McIntosh site (Koch 2014), have a higher density of bison bones, but while some sites may rely more heavily on bison in the west and deer in the east we do not see the total reliance on one particular animal over another.

The southern Plains went through similar cultural developments as the Central and Northern Plains between the Plains Woodland and Plains Village period. However, these developments appear to have happened later in time. Initially, farmers appeared on the Southern Plains at roughly the same time as they did to the north. The southern Plains Village period in central Oklahoma is divided into two phases: Custer (AD 800-1250) and Washita River (AD 1250-1450). Custer phase sites represent the Terminal Late Woodland and transitional Plains village periods in the Southern Plains. This dates later than the transition of the Central and northern Great Plains; it is not until the Washita River phase when we see typical Plains Village material markers.

Custer phase sites include small hamlets and hunting camps. Custer phase ceramics exhibit continuity from the Woodland period. Cordmarked or partially smoothed cordmarked vessels are the most common. The arrow points from Custer phase sites include corner and side-notched points, along with unnotched points. Drass (1997) notes that corner-notched points represent around 50% of the points in Custer assemblages.

On the other hand Washita River sites are estimated to be larger in size than Custer phase sites. These villages are estimated to contain around five to 20 houses with related pits, refuse middens, and burials (Drass 1997). The best-documented houses are square to rectangular with two to four center posts and small interior features. Horticulture increases during this phase, as indicated by the increase in bone digging implements and corncob fragments found in trash middens (Drass 1997; Hofman 1975, 1978; Lintz 1974). Ceramic surface treatment changes over time during this phase. Cordmarked pottery decreases through this phase. Side-notched and unnotched points increase in frequency during this phase. There is evidence of trade interactions with Washita River sites with Caddoan Mississippians, like Caddoan ear spools, ceramics, Olivella shell beads and conch ornaments (Drass 1997). It appears that Southern Plains Village people are looking towards Spiro and other Caddoan Mississippian villages for trade goods and not making contact with Cahokia. Researchers now believe Washita River represent "the gradual development of a Plains Village adaptation from local Plains Woodland groups through the transitional Custer phase" (Drass 1997:12; Hofman 1978; Lintz 1974). The reason for the lack of evidence of Cahokian interaction with the southern Plains is due in part to the fact that Washita River phase sites date after AD 1250, after Cahokia's initial decline.

At the end of the Washita River phase, Southern Plains Village sites are similar to those found among the northern Plains Village, and are marked by "permanent houses and small villages occupied for long periods, the development of a horticultural economy supplemented by hunting and the collecting of wild plants, and diverse artifact assemblages" (Drass 1997: 11-12). In contrast to the northern Plains, there is an emphasis on bison hunting to supplement farming practices in the southern Plains.

This discussion demonstrates the large-scale variation in the Plains Village Period. While the adoption of agriculture occurs across much of the Great Plains at approximately the same time period, the people organized themselves differently on the landscape and developed slightly different material cultures. In addition to this large-scale variability, small-scale variation occurred as well within larger IMM, CPT, and Southern Plains Village divisions.

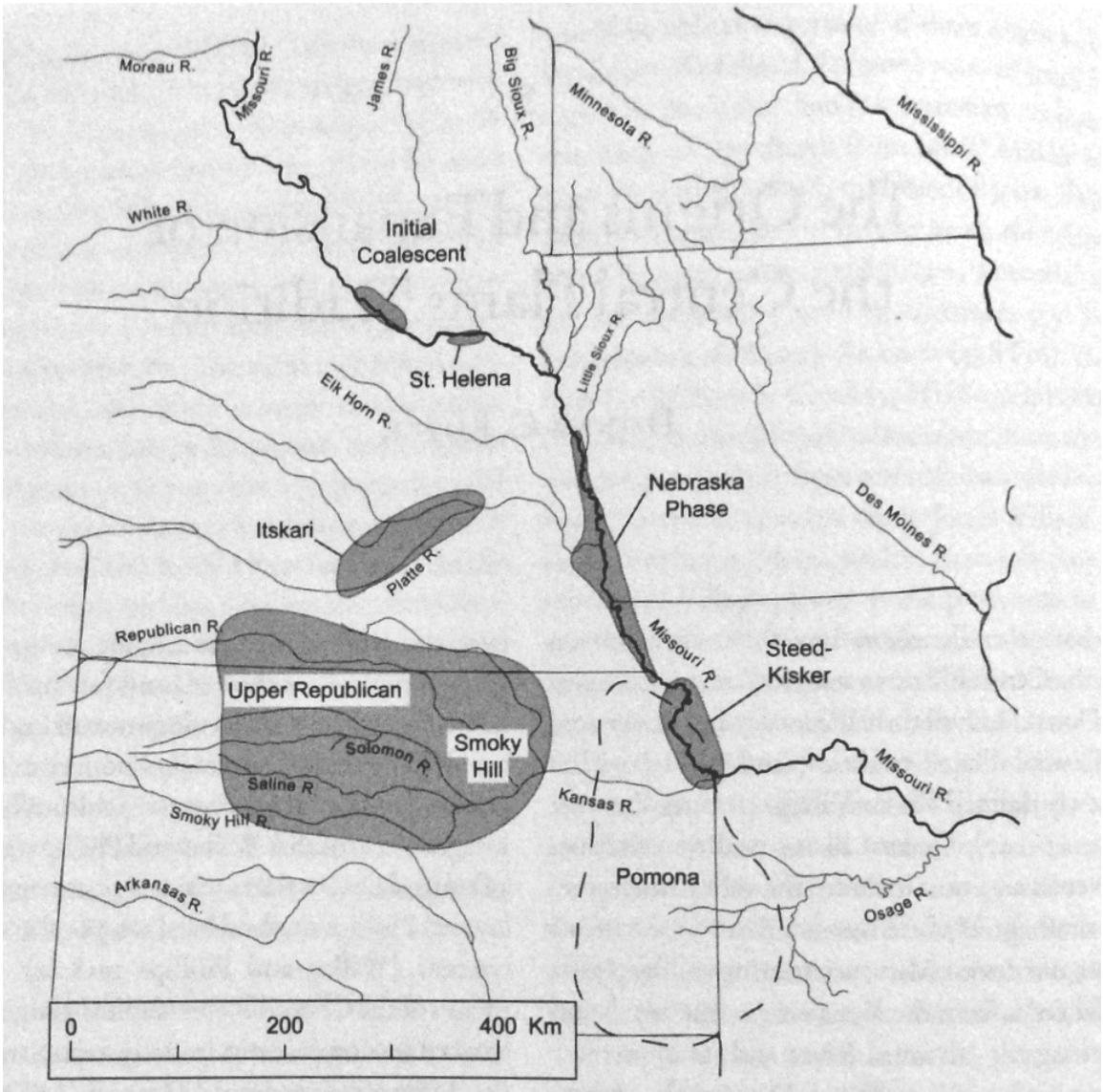

Figure 1.2. Map of Central Plains Regions (From Roper 2007)

Local Variation in the Central Plains Tradition

Although there is small-scale variation within the IMM and Southern Plains Village as well, because the main cultural focus of this thesis is the CPT, I focus on local variation within the CPT only here. The CPT ranged from A.D. 1050/1100-1400 and was first designated by Donald Lehmer (1954). Roper (2007:53) offers the best description of the location of the CPT:

> Central Plains tradition sites occur over an area that includes the valley and immediate drainage of the Missouri River in the northeast Kansas, northwestern Missouri, southwest Iowa; eastern Nebraska from Kansas state line north and west along the Missouri River and its immediate drainage into South Dakota; the Kansas River basin of northern Kansas and southern Nebraska to about 100 ˚W longitude; and portions of the lower Platte River basin in east-central Nebraska.

The CPT is divided into six cultural phases: Steed Kisker, Nebraska, Smoky Hills, Solomon River/Upper Republican, Itskari, and St. Helena. These phases are best classified as minor local variations within the CPT theme. The variations among the different phases are commonly attributed to different environmental constraints in the different areas of the Great Plains. These different phases are best used to describe groups of sites in time and space across the central Plains. I use some of these phases to organize and analyze sites. Therefore it is important to discuss the variation in house types, ceramics, and subsistence among these phases.

Housing in the CPT usually follows the square to rectangular four center-post plans. There is variation to this plan on the western Plains. In the west the lodges tend to be smaller and slightly irregular in form, like those in the Itskari/ Loup River phases. This is most likely because of the lack of wood and other building materials in the western Plain (Bamforth in press; Roper 2005). There are other deviations from the standard four-center post lodge. Archaeologists

excavated one Cahokia wall trench house at a Steed Kisker site (Shippee 1972; O'Brien 1993). Despite the different architectural style, the house produced the same material cultures as the other typical CPT house types in the area (Bamforth in press). Other CPT sites deviate from the standard house plan. Circular house structures were excavated from Pomona and Smoky Hill sites (Steinacher and Carlson 1998). I cover Pomona sites in more detail in the next section of this chapter, but for now, the Pomona was a similar cultural group in eastern Kansas that lived at the same time as the CPT. Pomona is sometimes considered part of the CPT because they made similar ceramic types as the CPT, but they never adopted a fully agricultural subsistence strategy. Smoky Hill phase sites are in close proximity to Pomona sites in eastern Kansas. The circular house structures at Smoky Hills sites may be misidentified Pomona sites.

CPT pottery is typically thin-walled globular or nearly globular vessels, with grit or sand tempering, and cord-marked surface treatment that were often partially or completely smoothed (Roper 2007, Steinacher and Carlson 1998). Decoration is limited to the rims and shoulders. But examples of shoulder decoration are rare and limited to Steed Kisker sites. Steed Kisker and Nebraska phase sites also have a high density of shell-tempered pottery. This is associated with the rise of Cahokia and the Lohman phase. Steed-Kisker ceramics also have a high density of Mississippian motifs, decorations, and effigies. Smoky Hill people appear to have had some contact with Steed Kisker or Mississippian people because of the presence of shell tempering and shoulder decoration on globular jars with low rolled rims and handles (Roper 2006). However, there are no Mississippian motifs at Nebraska sites and the designs are different than those found at Steed Kisker sites. Nebraska phase sites, and some Glenwood sites, appear to have more smoothed vessel surfaces, fewer collared rims, and more decorations on the rim and shoulders (Steinacher and Carlson 1998). The presence of shell tempered pottery declines sharply to the

west and north of the Steed-Kisker area. There are no shell-tempered ceramics in the Waconda Lake or Medicine Creek sites (Roper 2006). Smoky Hill's potters employed different types of tempering than the typical grit and sand; including shell, bones, and fibers (Steinacher and Carlson 1998).

Finally, CPT sites display a high level of diversity in faunal assemblages. The CPT is best described as a broad-spectrum economy. This includes a reliance on domesticates and wild resources. CPT people relied on a diverse number of animal species, including larger animals like bison, deer, and pronghorn, smaller mammals, birds, reptiles, and marine resources (Roper 2006). Faunal assemblages from CPT sites show variation from east to west. Robert Bozell (2013) notes the density of bison bone is more moderate in the west and lower in the east. However, bison hunting does not always dominate the faunal remains in sites from the western Plains. Sites in the Medicine creek area in southwestern Nebraska, like 25FT22, have only a small percentage of bison bones recovered from house excavations. But just to the south in Kansas, at the Albert Bell site (14SD305) bison bones dominate the collection (Roper 2006; Turnmire 1996). The McIntosh site (25BW15) in northwest Nebraska also has a high density of bison bones (see Bozell 2013). This site dates to the later end of the CPT, around AD 1250-1400. The other 12 CPT sites Bozell included in his study of Great Plains subsistence patterns reflected very low densities of bison bones. Overall a pattern appears of bison hunting in the west and deer hunting in the east with reliance on a diverse faunal assemblage across all of the CPT.

Pomona

In addition to the various Plains Village cultures, in the eastern portions of Kansas and the western border of Missouri, the Pomona people lived at roughly the same time as the CPT, from around from A.D. 700-1500 (Roper 2006, Brown 1985). The Pomona culture had closer material connections to Woodland traditions despite its geographic proximity to CPT farmers. Kenneth Brown's (1985) dissertation provides the most comprehensive look at Pomona sites to date (also see Witty (1967) for a list of traits that define the Pomona culture). Pomona has been referred to as a focus of the Middle Ceramic cultural complex (Witty 1967, 1981,); others (Brown 1985) call it a variant. I will not get into the syntactic arguments, at least not in regards to this, for the purpose of this thesis I refer to it as the Pomona culture due to the significant differences between the Pomona and the CPT phases.

Pomona pottery is similar to CPT pottery found in the eastern Plains. The main difference between Pomona pottery and that found on the central Plains is the distinctive temper and paste used in Pomona vessels. Witty (1967) originally identified Pomona pottery as being tempered with crushed sherds or indurated clay. However, more recently, grit tempered pottery was also identified in Pomona pottery (see Williams 1986). The most common vessel is a globular jar with a constricted orifice, and the exterior is cord marked, and rarely decorated, low percentages of rim decoration at the lip (Roper 2006, Witty 1967, Brown 1985).

House structures vary at Pomona sites from the ones found at CPT. Rather than the CPT four center post proto-earthlodges, Pomona sites have lighter circular to oval pole-and-thatch structures, similar to structures associated with Woodland traditions. Pomona dwellings were built on the ground surface. Witty (1967) noted these dwellings occur in pairs along low terraces

above streams. However, it is possible these paired dwellings are not contemporaneous, rather the product of people building on the same sites over a long time span, similar to CPT sites.

Arrow points found in Pomona sites are mostly similar to CPT points, side-notched, some with multiple side-notches and basal notching, and unnotched triangular points. However, small corner-notched arrow points and larger corner-notched or stemmed dart points are also fairly common at Pomona sites. These corner-notched points are similar to points found in Woodland sites around the central plains, but corner-notched projectile points are continually made and used throughout the Pomona time frame. Pomona people never fully adopted horticultural subsistence, despite being within close proximity to farming groups. Bone chemistry studies from Pomona burials are little changed from their Woodland period ancestors, and indicate that the Pomona individuals tested obtained the majority of their protein from C3 resources, such as squash, beans, fruits, and nuts (see Conner 2001 and Wion 2014), with very little maize. Wion (2014) notes the presence of one maize kernel recovered from the Pomona site 14AT2. This suggests that the people of the Pomona culture had some access to maize but did not fully commit to an agricultural subsistence. Despite the differences between Pomona, American Bottom Mississippian, and CPT, I include Pomona in this thesis due to the fact that corner-notched projectile points were used throughout the Pomona period. Despite this these groups likely knew about one another.

CAHOKIAN INTERACTION WITH THE PLAINS

While various smaller groups of Plains Village and Pomona people lived on the Great Plains, Cahokia would have been the largest polity in the Midwest and surrounding region at the

time of its peak. The people living up and down the rivers and drainages on the Plains would have known about Cahokia. As Pauketat (2004:119) stated "there was nothing else that could rival Cahokia's size and internal complexity in the eleventh century." There is overwhelming evidence for Cahokia's extensive trade networks across the midcontinent. Sites dating to the late eleventh and twelfth centuries in central and northern Illinois southern Wisconsin, northeastern Iowa southeastern Minnesota, western Missouri, western Iowa, northeastern Nebraska and southeastern South Dakota show evidence, direct and indirect, of some kind of contact with Cahokia or its intermediaries (Pauketat 2004:124). Cahokian style pottery was found in Glenwood sites in southwestern Iowa and Steed-Kisker sites near Kansas City, both of which are CPT phases (see Pauketat 2004; O'Brien 1978; Tiffany 1991b). Cahokian goods are also found in abundance at the IMM Mill Creek sites (see Tiffany 2003, 2007; Anderson 1987; Henning 2007).

An example of Cahokian influence on the Great Plains is found in Steed-Kisker sites in western Missouri. Wedel (1943) originally suggested the Steed-Kisker variant could represent a movement of people out of Cahokia and onto the Great Plains (O'Brien 1978), citing the similarities of Steed-Kisker pottery; shell-tempered pottery, examples of Ramey Incised pots, weeping eye motifs (also called falcon-warrior forked-eye motifs), and bird effigy bowls and jars (O'Brien 1978). All of these are hallmarks of Cahokia's material culture. Except for the ceramic similarities and a few Cahokia style wall trench houses, Steed-Kisker sites have the same material culture as the rest of the CPT. In southwest Iowa, Glenwood sites show some evidence of contact with Cahokia, including a percentage of shell tempered pottery and locally made pottery with falcon-warrior forked-eyed surrounds (Bamforth in press). There are other examples of Mississippian influences in Glenwood sites, "including ear-spools, red-slipped sherds, effigy

lugs and handles, pottery figurines, side-and-basal notched projectile points, discoidals, beakers, bowls, seed jars, one red-slipped high-neck water bottle, and limited examples of Southern Cult iconography" (Tiffany 1991:198). Shell-tempered pottery is also found in Nebraska phase sites and sites along the tributaries of the Kansas River, but evidence for shell-tempered pottery disappears in central Kansas (Roper et al. 2010, Beck 2001).

In northwestern Iowa, in close proximity to Glenwood, the Mill Creek culture is a variant of the IMM. There is abundant evidence for direct contact between people in Mill Creek and Cahokia. Tiffany (2003) noted the importance of a trade network between Mill Creek people and Cahokia. Staples from Mill Creek villages were traded with Cahokia and its village. In return, the people at the Mill Creek villages received exotic shell beads and other goods (Henning 2007; Tiffany 2003). Anderson (1987) states that the Mississippian goods found at Mill Creek sites were not staples, instead these were luxury status items owned by people of higher status. Henning (2007) notes the presence of Mississippian style pottery made by local IMM potters. These include seed jars, bowls, bean pots, effigy handles, and Mississippian decorative motifs (like the weeping eye motif) made with local materials and found alongside local ceramic styles. Tiffany (2003) also discusses the evidence of Mississippian interactions at 24 Mill Creek village sites and two mortuary sites. This include "a mix of locally made and trade items" (Tiffany 2003: 21). However, even with all of this evidence for Mississippian influences in Mill Creek, it is clear the Mill Creek was its own culture (Tiffany 2003). The people at these Mill Creek sites did not construct flat-topped earthen mounds. The structures at Mill Creek sites are not Cahokian wall-trench constructions. And while the ceramics do show Cahokian influences, the majority of the pottery is a local variant (Tiffany 2003).

This is a pattern seen throughout the Great Plains: there are varying Cahokian influences, but for the most part Cahokia does not shape the entirety of a culture. People did not build houses similar to the classic wall trench houses associated with Cahokia, except for an example in the Steed-Kisker region. The evidence for Cahokian influences and trade decease from east to west, and there are no Cahokia style artifacts west of the Nebraska phase. The evidence outlined here shows that for the most part people in of the CPT had an indigenously developed material culture separate from Cahokia, but that there are still clear Cahokian influences on the Plains.

SUMMARY

In this chapter I summarized the culture history of the Great Plains and the American Bottom. Following the Woodland period, the connections between the two regions continued with the adoption of agriculture in the Great Plains. The spread of farming on the Plains coincided with the intensification of maize agriculture in the American Bottom during Cahokia's "Big Bang". Current evidence shows that the strongest interaction with Cahokia on the Great Plains occurred along the eastern portions. Two cultural groups in particular stand out for the high levels of interaction; Mill Creek of the IMM and Steed Kisker of the CPT. Despite organizing themselves in different ways; Mill Creek people in larger fortified long-term villages and Steed Kisker in scattered family farmsteads above flood plains, they both distinguish themselves from other Plains cultures during the Plains Village Period because of their high level of interaction with Cahokia. Both of these groups display higher concentrations of Cahokian style artifacts than any other Plains Village culture.

Nebraska phase sites, located further west, have some Cahokian imagery, but very little compared to Steed Kisker. As we move further west, there is a sharp decrease in evidence of interaction with Cahokia, which disappears almost entirely in the most western portions of the Central Plains. Similarly, there is little to no evidence for Cahokian interaction with the Southern Plains. I also discuss the Pomona of the eastern Plains and how, despite being within close proximity to Cahokia, the people in this culture show almost no interaction with the Mississippians nor do these groups ever become fully agricultural. The Pomona people maintain a Woodland-life lifestyle into the Plains Village Period.

This regional variation of interaction is the basis for my analysis of arrow point distribution on the Great Plains. I hypothesize that there will be a higher percentages of Cahokian points in the eastern portions of the CPT, with an exception for Pomona sites, and that this concentration will decrease as you move the west. I also hypothesize that the inhabitants of more western sites continued making older corner-notched arrow points well into the Central Plains tradition. In the next chapter, I focus on how artifacts, specifically arrow points, can provide information concerning interaction, what arrow points can tell us about how they were used, and what ideas may be embedded in arrow points.

2 Arrow Points, Style, Function, and Identity

Projectile points tend to keep a constant size and shape for fairly long periods of time and because of the nature of the materials they are made from, preserve in the archaeological record. Because of its durability and ubiquity in lithic assemblages, a projectile point is "well suited for carrying information about groups and boundaries because of its widespread social, economic, political and symbolic import" (Wiessner 1983:272). These ideas date back to cultural historic frameworks that state that systems of culture are defined by their shared material culture (see Taylor 1948; Childe 1929). It is for these reasons that projectile points are so commonly used as cultural markers. However, there is not always a clear-cut reason for *why* projectile points change in the archaeological record beyond explanations of technological shifts like the bow and arrow replacing previous spear technology necessitating a change from dart to arrow points. We rarely can identify clear-cut or obvious reasons for the changes observed in projectile point morphology. This leads archaeologists to several questions: what factors influence the decisions people made about the types of stone projectile tips they manufactured?

The theories surrounding style, function, and identity are endless in anthropology and archaeology. In this chapter I am will discuss a few of these ideas as they pertain to my thesis, focusing on discussions relevant to projectile point function, style, and the causes of the variations we see in the archaeological record.

To answer this I look at the different ideas about what causes variation in arrow function and style. To begin with, I discuss the ideas of style and how I use style. Next I look at the distinction between style and function. In this section I cover some of the causes for functional variation

first in arrows and then in arrow points. Finally, I look to style, skill, and learning to explain variation in arrow points.

STYLE

In the 1980s and 1990s there was a debate centered on style, its forms, and how conscious style was. To start, Sackett (1982) argued that style is the product of choices made by the manufacturers, "particularly choices that result in the same functional end" (Hegmon 1992:522). He refers to this as isochrestic variation in style, and argues that the choices made during production are learned and socially transmitted and that any variation may "reflect both social interaction and historical context" (Hegmon 1992:522 citing Sackett 1982). Sackett (1982) counters isochrestic style with the iconological approach, which states that style's primary function is to express social information.

Similarly to Sackett, Polly Wiessner (1983) identified two kinds of style that convey different types of information. However, her divisions are slightly different; she uses the terms emblemic and assertive style. Emblemic style refers to "formal variation in material culture that has distinct referent and transmits a clear messages to a defined target population about conscious affiliation or identity" (Wiessner 1983:257). These variations most likely reflect distinct messages about the norms and values of the social or cultural group. Emblemic style carries information about group boundaries or signals the existence of a particular group. Because emblemic style marks boundaries and group identity it should present in a uniform manner in the archaeological record. Emblemic style can change gradually or it can undergo rapid change. Rapid change of emblemic style happens when the societal system changes or

when the style itself is detached from its referent. Assertive style, on the other hand, reflects social interaction rather than group identity. The variation in material culture linked to assertive style is based on personal identity rather than group identity. This style is not a direct representation of individual style; rather it is a style that supports an individual's selected identity. Assertive style is expected to change more throughout time then emblemic style due to the unattached nature of assertive style. Its rate of change depends on innovations and diffusions of new ideas and interactions (Wiessner 1983). These changes can provide important information of corresponding changes in socioeconomics, such as increased need to boost signals of personal identities or economic incentives to produce new styles of materials (Wiessner 1983). Assertive style can contain information that is complementary to emblemic style by displaying a measure of contact within groups and over cultural borders. Whether an object carries both forms of information depends on a number of factors from the maker to the nature if the object. Wiessner (1983:258) outlines three in particular (1) the object's role within a society, (2) the "ease of replication and complexity of design", (3) the total number of artifacts containing style in a population.

Christopher Carr (1995) discussed how style is on continua from active to passive and/or conscious to unconscious. He defines the active and passive continuum as the amount of control an artisan has over the objects design. "For example, messaging status distinctions is an active communication process within the control of the artisan. In contrast, the constraints posed by raw materials or by the pool of motifs that are available for selection as a product of culture history are passive and beyond the artisan's control" (Carr 1995:184). Carr (1995:184) maps out three definable active processes. The processes are listed in order from least to most control. The first is the expression of personal preferences in a craft. The second process is the communication "of

personal and social messages to others for adaptive purposes that are not aimed at changing the existing social order" (Carr 1995:184). The third process includes actively trying to change the existing social order through manipulation and negation. The conscious and unconscious continuum reflects the artisan's awareness of the choices they are making as they produce an object. This is the level of awareness the artist has about the level of social and personal identity coded in the craft. The artist may be more aware about one aspect over the other. This information encoded in the artifact may be in the artist's deep subconscious and they are unaware of these influences.

Martin Wobst (1977:321) first proposed the information-exchange theory of style; he argued "style functions in cultural systems as an avenue of communication." Later, Polly Wiessner (1983:257) brought ideas about identity and signaling into the definition of style, the "formal variation on material culture that transmits information about personal and social identity." She (Wiessner 1990:107) states "style is a form of nonverbal communication through doing something in a certain way that communicates information about relative identity." Slightly in contrast to Wiessner, Sackett states style involves choices among functionally equivalent alternatives. Furthermore, he defines style as a "highly specific and characteristics manner of doing something, which, by its very nature is peculiar to a specific time and place" (Sackett 1982:63). In his view, style can transmit information, but much of the information encoded is related to individual choices and preferences rather than group or social identity. Last, Ian Hodder (1990) defines style as a way of doing. "Doing" in this sense includes activities of "thinking, feeling, being" (Hodder 1990:45).

With so many different definitions of style outlined in the first part of this chapter, it is necessary to be explicit concerning how I understand and use the term. From these definitions,

we see that style has dimensions in time and space, and communication and cognitive processes (Hegmon 1992). Style serves as a means of communicating information regarding group and personal identities through cognitive choices and it marks boundaries in time and space on multiple scales through conscious or subconscious (ingrained learned ways of doing things) choices about a way of doing things. I find that Wobst and Wiessner's ideas about style as a means of communication and signaling most useful in my work, mainly because style functions as a means of communicating personal and group identity. These various levels of identity will be expressed or will manifest themselves stylistically in different ways.

STYLE VS. FUNCTION

In the past researches considered style and function as opposing concepts. Dunnell (1978) expressed that style is a useless concept and that "functional attributes are those relevant to evolution and selection; the residuum is style" (Roe 1995: 34). Binford (1962) also defined style as what was left over after functional attributes are removed. Roe (1995) outlines six ways this idea of the separation of style and function mask the complexity of past peoples decision-making. I will not cover all six of Roe's points here, but the first point Roe makes fits best with the theme of this thesis; "It presumes that forms are the 'best' solution given local raw materials and craft knowledge, i.e., that their designs have been rationally 'optimized' for their function" (Roe 1995:34).

Current researchers no longer see a necessary divide between the concepts of style and function: "style has function" (Wobst 1977) and "technology has style" (Lechtman 1977). Read (1982) notes that artifacts have a dual role, they express meaning (style) and have utility

(function). Lechtman (1977) proposed that technology could be understood in its own cultural context, and introduced the concept of technological style. Technological style refers to the steps taken to create something and how these can be seen in the archaeological record. Often, differences in technological styles cannot easily be seen in finished products, and because of this reflect many of the enculturated aspects of culture; technological styles are often merely a byproduct of how things are traditionally done and remained more heavily insulated to change than other artifact attributes.

Despite this, technological styles can still change rapidly as new innovations occur and people make conscious choices. Technology can change for multiple reasons, both functional and stylistic, and the people who create them are actively engaging in both facets of the tool. Peter Bleed (1997:101) notes that technological decisions are practical and they "involve completion of tasks that are intrinsically more concrete than comparable social or ideological activities." This means that technological behaviors have "greater potential for immediate and direct feedback than do other kinds of cultural behavior" (Bleed 1997:101). This is an important concept for my research because this demonstrates that people actively engage and manipulate the products they create and that changes in production designs have larger social or personal implications.

Causes of Functional Variation

As a tool, arrows and arrow points are constrained by function. For the most part arrows have a particular function: to penetrate and wound/kill a target, be it faunal or human. Therefore, they are constrained within the functional attributes that allow for this use. But within these

constraints, there are functional variations between points. As Lance Holly (2010:5) points out "arrow shafts are complex tools that are made up of several different parts, and have attributes that pertain to both the function of flight – the aerodynamics of movement through the air and the ability to penetrate a target – and functional aesthetic design." Functional aesthetic design refers to elements of an arrow that may differ arrow-to-arrow but do not effect the overall function of the arrow. Holly (2010) uses paint color/design choice as an example of functional aesthetic design. Functional aesthetic design I will cover in a later section of this chapter, here I am concerned with the functional variation in arrows.

Arrow Variation

Projectile points are only a small part of the whole arrow. As archaeologist we tend to focus heavily on arrow points rather than the rest of the arrow. Focusing in on arrow points as a singular tool is easy to do because of the nature of the archaeological record. Arrow shafts, foreshafts, and fletching do not preserve in most archaeological contexts, as is the case for most of the Great Plains. However some climates, like dry caves and deserts, allow for the preservation of prehistoric arrows. It is important to look at differences in arrow shaft construction as a possible explanation for differences in point morphology. It may be that this change from corner to side-notched arrow points is the result from a change in arrow shaft build during this time period. However, as I stated previously, organic materials like arrow shafts do not preserve on the Great Plains, but we can look at arrows from other regions for patterns between arrow points and shaft builds.

Lance Holly (2010) analyzed complete and broken arrows excavated from sites across the southwestern US. The southwest is blessed with environmental conditions that allow for the perseveration of more delicate materials. An analogy can be made for the arrows in Holly's study to arrows used on the Great Plains. Arrows tend to have the same functions even in different regions and are, as I said, constrained within functional limitations. Holly found there is considerable variation in arrow form and this depends heavily on the intended use of the arrow and the type of bow used. Holly (2010) identifies two main types of arrows: compound and self-arrows. Compound arrows made from multiple parts, such as the mainshaft and foreshaft. Self-arrows made from a single piece of wood. LeBlanc (1999) states that self-arrows are the weaker of the two types and it appears compound arrows replaced self-arrows in the southwest. This appears to happen when compound bows replaced simple bows, made from a single piece of material. Holly found that two arrow attributes were most useful in looking at variability. The first is paint color of the arrow and stone tips. Unfortunately, arrow paint and variation of arrow types is not something I can study on the prehistoric Great Plains because of the type of preservation. Therefore I am left making inferences on arrow technology based on stone points. However, we may not be able to tell much about arrows based on stone points.

Andrew L. Christenson (1997) compared the technological advantages between side-notched points and unnotched triangular points. Christenson wished to use technological advancements to explain why certain types of projectile points would replace previous types. He looked a collection of J.W. Powell's of complete arrows from Numic groups in the Great Basin from the 1860-70s. According to Christenson (1997; also see Fowler and Matley 1979) the arrows were made from various types of materials and differed in their construction, mainshaft vs. foreshaft, similar to the categories distinguished by Holly. Christenson identified three types

of arrow in the collection: wood mainshaft/no foreshaft, cane mainshaft/ no foreshaft, and cane mainshaft/wood foreshaft. Christenson unfortunately found no correlation between arrow shaft material, the use of foreshafts, and the types of arrow points used. Side-notched points did occur slightly more frequently on wood arrows and unnotched points on more composite cane and wood arrows, but this is not a strong patterning and he did not feel confident making any inferences based on his sample. Overall, both point types were found on all arrow shaft types.

Unfortunately, because of the poor preservation in the Great Plains archaeological record we lose a considerable amount of data on variation in the types of arrows and different organic tips used. We cannot say for sure what types of arrow the people used or how they construct them. Because of this I cannot, at least at this time, explore the idea that the change in arrow morphology from side to corner notched was a result of changing arrow construction. Therefore, in the next section I look at some of the known causes for arrow tip variation, particularly, why people choose to use stone arrows verse organic tips and why we see some variation in stone points.

Arrow Tip Variation

Christopher Ellis (1997) looked at ethnographic examples of bow and arrow hunting and found that stone tipped arrows are used predominantly when hunting large game. Stone tips are needed to pierce that hides of large prey, such as bison. Stone tips also cause more damage in the body than wood tipped arrows. Holly (2010) likewise pointed out that this advantage would be worth the extra time and effort it takes to make a stone tipped arrow point when hunting larger prey (also see McEwan et al. 1991; Waguespack et al. 2009). Conversely, that if you were only

hunting smaller game, such as birds or small mammals, a stone tip would be unnecessary and counter-productive. We see this same pattern in the ethnographic record. Barret and Gifford (1933) stated the Miwok used wood arrows for the hunting of smaller game and composite arrows for larger game and warfare. Kluckhohn et al. (1971) stated that the Navajo varied the types of arrow points used depending on the activity. This varied from chert tipped points to organic blunt points for hunting birds and other small prey.

Arrows used in warfare and hunting practices are functionally different as well. In many cases war arrows are made intending to stay lodged in the victim, resulting in more internal damage (Belden 1870; Catlin 1973; Christenson 1997; James 1823; Latta 1949; Wyeth 1851). War arrow points, therefore, may be loosely hafted to the arrow. Christenson (1997) believed unnotched points would be used more in warfare practices because they are not as tightly hafted to shafts than notched points. A point that comes off in a body will do more damage. However, there is strong ethnographic evidence for barbed or corner-notched points being favored as war points, to make it more difficult to extract arrows from wounds. Grinnell (1972) discusses the Blackfeet of the northwest Plains who made different points: barbed warfare and barbless points for hunting. Similarly, the Omaha made arrows with loosely hafted barbed points for warfare. This was done so the point came off in the body if the arrow is removed (Dorsey 1896). Dorsey also noted the only other time the Omaha used stone tipped points was in the hunting of buffalo. This is a pattern seen throughout North America; barbed points for hunting and limited use of stone tips, mainly in the hunting of large game and/or warfare (also see Elmendorf 1960; Murdoch 1892; Radin 1923).

Jakob Sedig (2011) found that in some instances people made arrow points that were never meant to be fired from a bow. In his research on various arrow tip technologies of the

northern Southwest, he found stone points were also used in ceremonies, rituals and exchange. Sedig's analysis showed that arrow points played multiple roles in peoples everyday lives beyond the hunting/killing function. Sedig argues we must look at the different functions arrows play in a society and notes that some points were made to be used for something other than hunting and/or warfare. We have a similar example in the American Bottom. The best Cahokia point specimens were found in a large cache from Cahokia's Mound 72. Excavations at Mound 72 revealed Cahokia-tipped arrows rituality deposited along with a number of bodies, including the Beaded Burial and a pit directly above nineteen women (Pauketat 2004). These points were made with intention of being grave goods. They were never meant for use as traditional arrows. This indicates that arrows, at least certain stone-tipped arrows, held some ceremonial importance to the people of Cahokia.

Holly found a similar pattern in his research on stone points. He found the highest number of points excavated from Pueblo Bonito was notched points. In the other area, however, Holly found more what he called tapered points. He notes the importance of this, given Pueblo Bonito's interpretation as a ceremonial center. "If in fact tapered tips arrows are most common in the Southwest, perhaps they were the primary utilitarian hunting arrows, whereas notched tips, such as those from Pueblo Bonito, indicate the use of stone points which may be part of a more ceremonial function for Southwest arrows" (Holly 2010: 193). All in all, some of the variation we see in stone points is related to the intended purpose of the stone point, be that hunting/warfare or more cultural functions like ceremonial associations.

Going back to Christenson's study of the functional variation in arrow points, his main goal was to see if there is a functional difference between side-notched and unnotched arrows. He was looking for a functional differences between the two points that would explain the use of

one over the other. In the end he begrudgingly admits he could not find a functional differences between side and unnotched triangular arrow points in the samples he studies. He ends his study posing the question why do arrows with otherwise identical design and function vary in their morphology?

STYLE AS CAUSE OF VARIATION

The last section showed that arrows are made for specific purposes and are constrained by their intended purpose. It appears that most arrows are similar in their main function (to penetrate the bodies of animals and humans). Sinopoli (1991) states this sentiment, that arrow designs are tightly constrained by function and technological factors. However, even within these constraints there a considerable amount of variation possible and "it is in the allowable range of variation that stylistic patterns may be sought" (Sinopoli 1991:64-65). Stylistic variation in arrows points can signal important differences between groups of people.

The stylistic variation I am most concerned with is the one between corner and side notched points. It is reasonable to say that side-notched points completely or almost completely replaced corner-notched points they have to be functionally equivalent to one another. Otherwise it is safe to assume the people would have gone back to making corner-notched points. And if these points are functionally the same, why change the way you make points at all. As Hegmon (1998:265) states we should look at style as a "choice between functionally equivalent alternatives." I believe this morphological change is the result of cultural influences, mainly ones coming out of the American Bottom and Cahokia. However, the side-notched points on the Great Plains are generally not exact replicas of Cahokia points (there are some Cahokia points in my

data from the Great Plains which I will cover in chapter 4). This variation in side-notched points may relate to more individual limitations of the flint knapper, such as access to raw material, learning/skill, and cognitive abilities.

Raw Material

Access to raw material will also cause variation in the types of points we see in different regions. Bleed (1997) discussed how raw material use reflects a type of knowledge. The types of resources used reflect what people know what is available to them and how to best use it. People are constrained by the types of raw materials available to them in a given area. On the Great Plains, lithic materials vary in the different regions. For the most part people in the CPT use the limited, by Cahokian standards, locally available sources.

People at Cahokia imported complete tools and raw materials from Burlington and Mill Creek chert sources in southern Illinois. These materials are particularly high quality and may allow for better workability, especially when thermally altered or heat treated.. Chipped stone bifaces and axes made from St. Francois Mountain rock were found in Cahokia. This rock was imported to Cahokia from 100 km south down the Mississippi River (Pauketat 2004). Researchers (see Emerson and Hughes 2000; Pauketat 1998b, 2004; Pauketat and Emerson 1997) state that Cahokia imported lithic raw materials from a 150 km radius around Cahokia. On the Great Plains, people may have traveled as far for lithic sources. However they may have been more limited in their selection. In the collections I analyzed for this thesis, all of the Cahokia side-notched points I observed on the Great Plains were made from local material. We have to wonder if these point styles reflect a cultural mimicking of Cahokia.

Skill

How people learn to make arrow points will affect how new point styles are incorporated by a group. Learning a skill is not always an easy task. Peter Bleed (2008:156) defines skill as ”the proficiency with which activities are executed.” He goes on to say “…skill is a kind of knowledge. It refers to the developed ability to manipulate the vocabulary of techniques, designs, and customary resources that are available in a particular technology” (Bleed 1997:156). Skill is developed though continued practice and learning and it requires direct contact with a person who is skilled in making the craft.

It is important to talk about how we look at skill in the archaeological record. Viewing skill of manufacture in completed crafts is a relative measure rather than an absolute one (Bamforth and Finlay 2008). Researchers have purposed many different measures for skill in artifacts both metric and non-metric (Andrews 2003; Bamforth and Hick 2008; Clark 2003; Mills 1995; Mitchell 2010; Sheets 1978; Stout 2002). I here cover just a few of these measures: standardization/symmetry, flaking, and dimension measurements.

One measure of skill is standardization. Standardization is defined as the “regularity of one or more attributes” (Mitchell 2010: 62). Researchers have argued that as skill increases variation should decease and standardization should increase (Costin and Hagstrum 1995; Ferguson 2008), this assumes that there are no changes in function, style, or other factors influencing the way people make things. Along that same line, as skill increases so should the symmetry of the points. Bamforth and Hicks (2008) note the more skillfully made points display greater symmetry in their finished products. Both standardization and symmetry of arrow points takes considerable skill and would require a significant amount of practice to master.

Another measure of skill is flaking uniformity and degree and number of knapping errors. This goes hand in hand with symmetry and standardization. Researchers (such as Ahler 1989) have shown that different flakes are produced by flint knappers with different skill levels. Shelley (1990) identified the frequency of stepped or hinged flake terminations are higher in inexperienced knappers. Pressure flaking scars on a point are also a good indicator of the level of the flint knappers hand-eye coordination and strength. Ferguson (2008:61) states "…the ability to direct long flakes over the surface of a point is an indicator of both hand and forearm strength as well as fine coordination of precision hand movements." Uniform pressure flakes across a point require a high level of skill and strength to direct a flake across a point. Mitchell (2010:183) classified highly skilled points as exhibiting "no technical errors and, additionally, a high degree of plan and cross-section symmetry and flak scar regularity, indicative of well-controlled flake removals."

Finally, there are metric measurements of skill in projectile points. In particular, width/thickness ratio can be used to measure skill. Bamforth and Hicks (2008) found in their study of Paleoindian points the more skillfully made points have less variation in their width and thickness than less skillfully made points. As they point out, it is more difficult to make a thinner point than it is a thicker point. Another measure that is particularly applicable to this thesis is the characteristics of notches. Mitchell (2010) notes that notched points that display a high level of skill have deeper and narrower notches than those he assigned to average and low skill.

Learning Skill

There are many ways people can learn skills or make tools or crafts. Here I focus on one way that involves a master working closely with a novice or apprentice to work them through the step-by-step process - walking someone through the process of making a point until completion. The goal is to work closely with a novice worker until they eventually become masters. This is referred to as scaffolding. In scaffolding, the novices performs only the task they can carry out and the more skilled master takes over either with further assistance or by performing the task the novice is unable to carry out. Jeffery Ferguson (2008) outlines the idea of scaffolding in acquiring skill. He (Ferguson 2008:52) defines scaffolding as involving "the integration of novices into normal craft production by providing as much assistance as necessary to ensure success." Greenfield (1984:118) describes why the term scaffolding works best as a metaphor for this style of learning. Like the building structure, learning scaffolding "provides support; it functions as a tool; it extends the range of the worker; it allows the worker to accomplish a task not otherwise possible; and it is used selectively to aid the worker where needed." Ferguson notes that scaffolding works to help the novice learn the skill while conserving raw material. This is practically important in areas where lithic raw materials may be limited. This is accomplished by having the novice only perform tasks that can be performed with minimal risk for failure. This is a way of learning/teaching that minimizes risk of failure and loss in raw materials. Ferguson (2008) stated that learning through scaffolding would decrease the amount of variability we see in the archaeological record because of the direct involvement of a more skilled flint knapper.

Cognitive Abilities

Variation in final points may also reflect difference in individual cognitive abilities. This is not an aspect of learning/skill that can be taught. Developing skill involves practice and guidance from a skilled master. But the level of skill one acquires also depends on personal factors such as fine motor skills and cognitive abilities. Fine motor skills can be improved with practice, but flint knappers will not always measure up with one another in their abilities. This is an aspect of skill that is constrained by human biology. This will result in variation in the types of points we see in the archaeological record. Cognitive abilities also vary depending on a person ability to match a finished product based with a mental image. Keller and Keller (1996) propose this is a measurement of skill. A person's level of cognitive abilities will also result in variation in any novice taught by a master craftsman

SUMMARY

In this chapter I covered some of the ideas of style and functional variation seen in both arrows and arrow points. The concept of style is used in many different ways in archaeological research, and has many different definitions. Here, I use style to mean a form of signaling information regarding group identities or affiliations. These signals are transmitted through conscious and subconscious choices made during the production of goods. It is important to note, however, that arrow points do not serve as the best flags for signaling identity to other people or groups. Arrow points are small and spend most of their object-lives point down in quivers. Therefore, I see the arrow point style as a more personal reflection of the maker intent. In this

case how we can see evidence for group interaction at a seemingly small level. Points are not used as overt signals of a person's identity; rather they serve as small reminders of personal associations.

In the second half of this chapter I reviewed other possible causes for variation in arrow point morphology, such as arrow construction and the functional difference between point types. Currently available information indicates that we cannot explain the variation we see in stone arrow points by differences in the construction of arrows: overall arrow shaft design varies widely and appears to be independent of arrow tip design. At the same time, there are no currently known functional differences between notched and unnotched points. I argue the complete replacement of corner-notched points with side-notched points indicates there is likely to be little functional differences between the two points. Because we cannot explain the change in arrow point morphology as being related to changes in arrow shaft construction or functional differences between notch types, I argue the change in points is due to cultural influences. The people on the Great Plains are likely emulating prestige items associated with Cahokia. In the first chapter I outlined the links between the American Bottom and the Great Plains starting in the Woodland period. This connection continued in the Central Plains tradition, where we see evidence of Mississippian influence or interaction on the eastern portions of the Great Plains. As Cahokia grew, its influence spread further onto the Plains and more people came in contact with this new point type. The variation we see in side-notched arrow points the Great Plains likely comes from differences in skill levels, available raw materials, and possibly more utilitarian purposes for the points rather than as prestige goods. In the following chapter (chapter three) I present the methods I used to look at this variation, how I discern the pattern of arrow point

distribution in the American Bottom and across the Great Plains, and how the patterns map on to Cahokia's rise and decline.

3 Methods

The goal of my research is to analyze the spread of side-notched arrow points onto the Great Plains and to understand the patterning of change through both space and time. In order to do this, I gathered data on projectile point types from 64 sites from the Central and Southern Plains and the American Bottom. In this chapter I discuss the methods used in this thesis. First, I cover the criteria to select sites. Second, I talk about the sites I selected for my research using these criteria. Third, I discuss the chronological, regional, and point categories I created to best organize the site data, and the information on shaft abraders I collected. And fourth, I go over the patterns I expect to see in the data set and the statistical tests I ran on the data.

SITE CRITERIA

All of the sites were selected with four basic criteria in mind. In no particular order, these are that the sites included here have at least one structure, reliable radiocarbon dates, a single cultural component or clearly defined distinct components, and produced at least one arrow point from an excavated context. These are the criteria for site selection; however, there are exceptions to each which I will address in the following sections. Next I discuss the date and regional codes I created to organize the sites when running them through statistical programs.

Structures

The presence of a structure was one of the first criteria I looked for in gathering sites for my research. In particular, I looked for sites that had structures identified as habitation structures or house dwellings. I felt this was an important aspect of the sites included in this study, because I am trying to get at individual households and the decisions the people living there made about what types of projectile points to make. Finding sites in the American Bottom with structures was not hard, due to the population boom around AD 1050. However, this was more challenging in the Central Plains do to modern farming practices, the dispersed nature of CTP settlement sites, and site preservation.

A number of site reports discuss the probability of a structure given the number and pattern of postholes and the presence of a hearth or other interior features, but in many cases, the authors were reluctant to say whether or not this represented a house; this is particularly true in the Pomona sites with their light and ephemeral structures. In cases like this, I still included the site in the analysis, but coded in the absence of a house to differentiate it from sites with definite structures.

Radiocarbon Dates

One of the most difficult criterion to follow was finding sites with credible radiocarbon dates. Much of the dating information used here came from Donna Roper's (2014) article on CPT date assessments, which reevaluated the radiocarbon dates of CPT sites and created the most accurate CPT timeline to date. This was no easy task considering that in 1994, Donald J.

Blakeslee published a report on the assessment of central Plains radiocarbon dates and found that the dates coming out of the Gakushuin laboratory were unreliable and should not be used to construct archaeological timelines. Many of the sites I had hoped to use for this research had all of their radiocarbon dates processed by the Gakushuin laboratory and therefore could not be included.

In a few cases, though, I included sites that do not have associated radiocarbon dates; in some cases this was a necessity to obtain an adequate sample size. These sites are coded as having no dates. Most of the Pomona sites included in my data set do not have reliable radiocarbon dates. Instead, Pomona sites are dated based on the pottery. Because of this Pomona sites cannot be placed in a specific chronological order, rather I placed them all in one Pomona category. Researchers date the Pomona from AD 700-1500 (Roper 2006; Brown 1985). However, I suspect the Pomona period does not start as early as AD 700, given the pottery found in Pomona sites are similar to Smoky Hills pottery of the CPT.

Cultural components

The third criterion used for site selection was that the site needed to have either a single cultural component or have multiple cultural components which can be easily distinguished from one another. The second is the case for the sites in the American Bottom, some of which have continue occupation for up to 500 years. The cultural sequencing in the American Bottom makes specific phases easy to identify based on pottery and other material markers. However, in the Great Plains, we see less continuous occupation over hundreds of years, rather a series of sites along a river or tributary, marking the movement of swidden horticulturalists. Occasionally, CTP

sites are built on top of or in close proximity to earlier Woodland occupations. When this was the case, the site was not included in my study because I did not want to risk possible earlier Woodland arrow points being included in with CPT collections and potentially throwing off the corner-notched count.

Sample Size and Location

Finally, I looked at sample size and the location of the points when selecting sites. For inclusion, the site obviously needed to have at least one projectile point. More importantly, the points needed to found in the context of a cultural feature. Surface collections were not included in this study, because the cultural affiliation of those points cannot be confirmed. In some cases this severely reduced the number of points that are included from a single site: for example,13 arrow points from the downtown Cahokia Tract 15A excavations came from "general excavations" and were not well provenienced; because of this, these points were not included in the data set.

SITES

Following the criteria above, I analyzed a total of 64 sites for this thesis. This includes four Mississippian sites from the American Bottom with several different cultural components along with 60 sites from the central and southern Great Plains. The sites from the American Bottom include multiple cultural components and therefore occur in multiple tables. The sites adhere as closely as possible to the previously stated criteria.

Mississippian Sites

Four Mississippian excavation data sets are used in this thesis, from the Range site, Tract 15A in downtown Cahokia, the Interpretive Center Tract-II at Cahokia, and East St. Louis (Table 3.1). All of the sites are located in the American Bottom of the Mississippi flood plain. Here I provide a brief overview of each of the excavations.

Table 3.1. Mississippian Sites Investigated

Site Number	Site Name	Houses Present	Source
11S34	ICT-II	Yes	Wood 1993
Tract 15A	Downtown Cahokia Tract 15A	Yes	Pauketat 1998
11S47	Range Site	Yes	Kelly et al 1990
11S706	East St. Louis Mound Complex	Yes	Boles in Press

Range

The Range (11S47) site is the longest inhabited site included in this study. The Range site was inhabited on and off for an estimated 500 years, from around A.D. 600 to A.D. 1100 (O'Brien and Wood 1998). The site is situated in the American Bottom, about 20 kilometers south of Cahokia on the Prairie Lake meander scar. Four and a half hectares of the sites were excavated as part of the FAI-270 impact excavations from 1978 to 1981 (Kelly et al. 1990). Excavations revealed 5,500 features, including pits and house basins. For this thesis I look at the two occupation phases; the Dohack and Range phase. Both Dohack and Range phase correspond with the Emergent Mississippian phase. The last few occupation phases at the Range site did not produce enough dateable projectile points to be included in my research. The Dohack phase goes

from A.D. 800-850, and the Range phase from A.D. 850-900. Both phases were included in the Emergent Mississippian period in the research.

Tract 15A: Downtown Cahokia

At the center of the prehistoric site of Cahokia was a cluster of mounds, plazas, and habitation centers (Pauketat 1998a). Tract 15A is located to the west of the main plaza. This is a residential area of downtown Cahokia. Excavations here took place between 1960 and 1985, as part of the possible FAI-255 expansion. A total 38 arrow points were found at Tract 15A of the downtown Cahokia excavation, according to Pauketat (1998a). However, only thirteen of these points were found in features that can be culturally identified. This lack of projectile points (only 38 points from the Lohman, Stirling, and Moorehead phase combined) in the heart of downtown Cahokia is significant particularly when compared to the number coming out of the recent excavations in East. St. Louis.

Interpretive Center Tract-II

In 1984, Southern Illinois University at Edwardsville tested and excavated a portion of the Cahokia Mounds Historic Site around the proposed building site of the new Interpretative Center (Woods 1993). The site is located about a quarter mile southeast of Monks Mound, just outside of the main plaza, and to the east of the Tract 15A excavations. This excavation is called the Interpretative Center Tract (ICT-II), the collection used in this thesis in from ICT- II. A total of "14 structures, 53 pits, one hearth, six posts, one mound, one filled borrow pit, and a possible

palisade line" were unearthed in the excavations (Wood 1993:15). Sixty-four arrow points in total came out of excavations from Lohmann, Stirling, and Moorehead phase features.

East St. Louis Mound Complex

The final Mississippian data set is from the East St. Louis mound site. The East St. Louis mound site is considered apart of Greater Cahokia. At its height, East St. Louis had fifty earthen mounds, associated temple structures, storage huts, and (towards the end of its occupation) walled compounds, and covered a total of 204 ha (Pauketat 2004; Brennan 2012). East St. Louis was continuously occupied from A.D. 1000-1200 (Brennan 2012) and had 5,000 people at the peak of its occupation (Galloy Presentation 2015). From 2008 to 2012, the Illinois State Archaeological Survey's excavated the East St. Louis Mound complex for the New Mississippi River Bridge (NMRB). The data from this site presented here was generously sent to me ahead of publication by director Joseph Galloy and Steve Boles. The data from East St. Louis are split into four temporal groups: the Terminal Late Woodland (TLW), Lohmann, Stirling, and Moorehead phases. A total of four hundred and ninety-one arrow points came from these cultural phase features.

Great Plains

The collections selected from the central and southern Great Plains were viewed both in person as well as through books, articles, and grey literature. There are a total of 60 sites from the Great Plains included in this thesis. Ten Woodland sites are from a collection of southern and

central Plains states (Table 3.2). Forty-one sites are from the central Plains, including the modern states of Nebraska, Kansas, and Iowa (Table 3.3). Ten sites are from the southern Plains state of Oklahoma (Table 3.5). The final sites are Pomona sites from eastern Kansas (Table 3.4).

Table 3.2. Woodland Sites fron Central and Southern Plains

Site Number	Site Name	Houses Present	Source
25RW28	Red Willow	n/a	Grange 1980
25CC28	Walker Gilmore	n/a	Haas 1983
25FT18	The Keith site	Yes	Kivett and Metcalf 1997
14CT332	The Gilligan Site	n/a	Jones and Witty 1980
25GO2	Wallace	Yes	Winfrey 1991

Table 3.3. Central Plains Sites

Site Number	Site Name	Houses Present	Source/Location
25FT39	n/a	Yes	Kivett and Metcalf 1997
25FT54	n/a	No	NSHS
25FT35	n/a	Yes	NSHS
25FT36	n/a	No	Kivett and Metcalf 1997
25FT70	n/a	Yes	Kivett and Metcalf 1997
25FT16	n/a	Yes	Kivett and Metcalf 1997
25FT13	n/a	Yes	Kivett and Metcalf 1997
25FT17	n/a	Yes	Kivett and Metcalf 1997
25DW166	n/a	Yes	University of Colorado
25FT80	n/a	No	Grange 1980
25BW15	McIntosh	Yes	Koch 2004
25SY31	Patterson	Yes	Bozell and Ludwickson 1999
13ML128	n/a	Yes	Iowa State Archaeologist
13ML139	n/a	Yes	Iowa State Archaeologist
13ML129	Stonebrook	Yes	Brown 1967
13ML130	n/a	Yes	Iowa State Archaeologist
13ML176	n/a	No	Iowa State Archaeologist
13ML222	Steinheimer	Yes	Brown 1967
13ML216	Little Pony	Yes	Brown 1967
13ML219	n/a	Yes	Iowa State Archaeologist
13BV1	Chan-Ya-Ta	Yes	Tiffany 1982
14HO308	n/a	No	KSHS
14OT308	Markley	Yes	KSHS
14OT5	Minneapolis	Yes	KSHS
14SA1	Whiteford	No	KSHS

Table 3.4 Pomona Sites

Site Number	Site Name	Houses Present	Source
14BO319	n/a	No	Brown 1985
14CF301	Dead Hickory Tree Site	Yes	Brown 1985
14CF369	n/a	Yes	Brown 1985
14DO19	n/a	Yes	Brown 1985
14JF303	Keen Site	Yes	Brown 1985
14MM26	n/a	Yes	Brown 1985
14MM506	Garrison	Yes	Brown 1985
14MM509	William Sherwood Site	Yes	Brown 1985
14MM7	n/a	Yes	Brown 1985
14MO308	Slough Creek Site	Yes	Brown 1985
14MY309	n/a	No	Brown 1985
14MY316	n/a	Yes	Brown 1985
14MY316	n/a	Yes	Brown 1985
14OS305	Hart Site	Yes	Brown 1985
14OS314	Hatsch Site	Yes	Brown 1985
14SO305	n/a	Yes	Brown 1985

Southern Plains

Twenty sites are from the southern Plains state of Oklahoma (Table 3.6). Drass (1997) dates the Plains Village in the southern Plains from around A.D. 800-1500. The sites from the southern Plains are grouped into my date categories, which I go into further detail below. However, it should be noted that different cultural phases are recognized on the southern Plains, including the Custer, Washita, and Antelope Creek phases. Like my research with the Central

Plains tradition, I do not focus on the different cultural phases of the southern Plains Village and instead focus on this region as a whole.

Table 3.5 Southern Plains Woodland Sites

Site Number	Site Name	Houses Present	Source
34SM29	n/a	Yes	Drass 1997
34CL46	n/a	Yes	Drass 1997
34PT28	n/a	Yes	Drass 1997
34GV161	n/a	Yes	Drass 1997
34SM20	n/a	Yes	Drass 1997
34LN76	n/a	Yes	Drass 1997

Table 3.6 Southern Plains Sites

Site Number	Site Name	Houses Present	Source
34GV165A	n/a	Yes	Drass 1997
34GV55	n/a	Yes	Drass 1997
34ML3	n/a	Yes	Drass 1997
34GV165B	n/a	No	Drass 1997
34GV22	Currie Site	Yes	Drass 1997
34GV5	Lacy Site	Yes	Drass 1997
34GD1	n/a	Yes	Drass 1997
34GV3	Lee Site	Yes	Drass 1997
34GV2	Grant Site	Yes	Drass 1997
34GD119	n/a	NA	Drass 1997
34GV32	Authur Site	Yes	Drass 1997
34PT20	n/a	Yes	Drass 1997
34GV167	n/a	Yes	Drass 1997
34GV43	n/a	Yes	Drass 1997

Mill Creek – Initial Middle Missouri

One Mill Creek phase site is in this study. Mill Creek is a phase in the Initial Middle Missouri variant of the Plains Village period. The Chan-Ya-Ta site (13BV1) contained 212 projectile arrow points. The site, located in northwestern Iowa, is a small village (15 house depressions are present) with a possible fortification ditch (Hurt 1953, Tiffany 1982).

DATA ORGANIZATION

In this section I discuss the ways in which I organized the sites and the projectile point data. First I talk about the chronological and regional categories. I created coded categories for both the dates and geographical area. This was done in order to get the best picture I could any changes that occurred and to view these changes through both time and space. Next, I describe the morphological arrow point categories I created.

Date Codes

The most difficult part of my data processing was how to organize the sites chronologically given the rather large age-ranges for many of them. I developed a way of coding the sites in six different time ranges (Table 3.7). The first code (0) includes all Woodland sites. The beginning and ending of the Woodland period varies across the Great Plains and ends earlier in the Midwest. Because Woodland sites make up only a small portion of my total data set I did not break the Woodland down any further. The only distinction made is in the next date code (1),

the Terminal Late Woodland/Emergent Mississippian (AD 800 to 1050). I choose to make this a category because this is an important transition period in the American Bottom; the only sites designated with this code are sites in and around Cahokia.

Table 3.7 Date Codes and Divisions

Date Codes	Phases
0	Woodland / Terminal Late Woodland and Emergent Mississippian (AD 800-1050)
1	
2	Early CPT and Lohmann (AD 1050-1150)
3	Middle CPT and Stirling (AD 1150-1250)
4	Late CPT and Moorehead (AD 1250-1400)
5	Pomona
6	Sites with no radiocarbon dates

I divide the duration of the Central Plains Tradition into three segments: time code 2 AD 1050 to 1150, time code 3 AD 1150 to 1250, and time code 4 AD 1250 to 1400. The first of these corresponds to a plateau in the radiocarbon calibration curve; we can identify sites dated to this plateau but cannot sort them in time within it. In human terms, it also corresponds on the Central Plains to the initial appearance and spread of maize horticulture. I code Lohman Phase data from Cahokia into this period as well. The next period corresponds to the interval when the CPT way of life flourished and also, roughly, to the Stirling Phase at Cahokia, the peak of Cahokia's power and influence. Finally, the last interval includes another calibration plateau spanning the 1300s, and also marks a period of major change on the Central Plains, when new communities migrated onto the Plains from the Midwest (Ritterbush/Oneota). It also corresponds to the decline and ultimate collapse of Cahokia, the Moorehead and Sand Prairie Phases. I placed the southern Plains sites in the same date categories, (the Southern Plains

Village recognize different cultural phases than on the Central Plains, but date them to essentially the same spans of time). I review the two main phases included in this thesis in chapter 1.

Regional Codes

Along with date codes, all of the sites are coded within regions of the Great Plains. The regions are coded 0-4. The American Bottom has its own code (0), because there are no other central Plains sites near the American Bottom included in this set. Region 1 is the eastern Great Plains. Region 2 is the central Great Plains. Region 3 is the far western portion of the Great Plains. Finally, region 4 is the southern Plains. Figure 3.1 is a map of the regional break down.

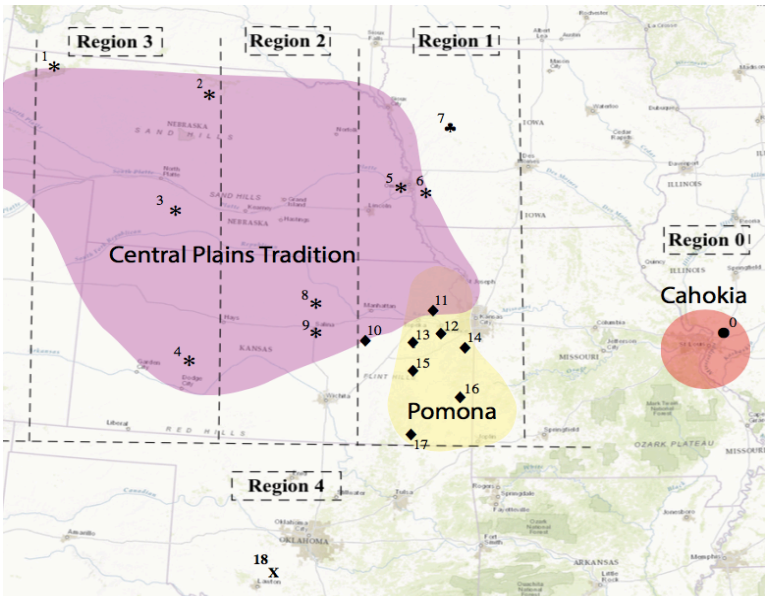

Figure 3.1. Map of Regional Divisions. Created by Erin Hughes

Arrow Point Morphology and Categories

I classified the arrow points from the sites analyzed into ten morphological categories. I chose to forego regional name types, with the exception of Cahokia points. Many of the different point types on the Great Plains have different names in different regions or in different states, but it is not always clear that the points in these areas are really different. Because I look at a large section of the Great Plains it is easier to compile all of the points into morphological types. However, Cahokia points refer to a very specific point type that is recognized and used in the different regions.

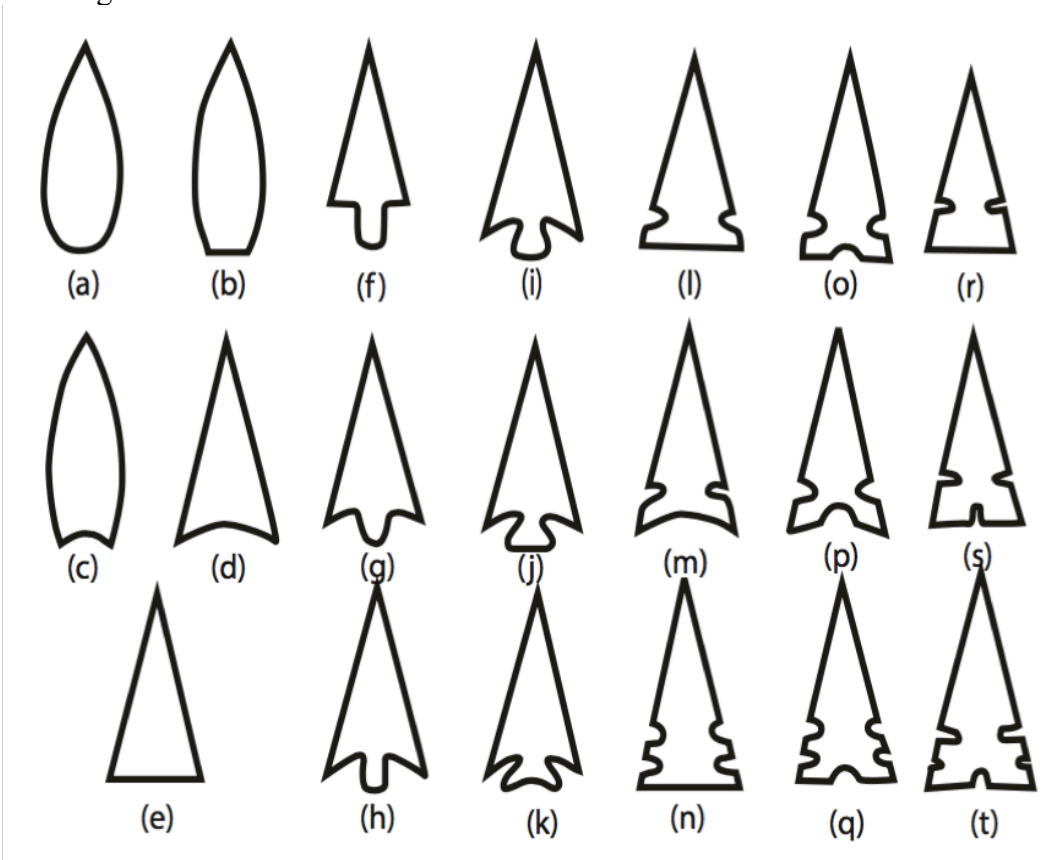

Figure 3.2. Point Categories: (a-e) Un-notched, (f-h) Stemmed, (i-k) Corner-Notched, (l-m) Side-Notched, (o,p) Side with Basal Notch, (n,q) Multi Side-Notched, (r) Cahokia Side-Notched, (s) Cahokia Tri-Notched (t) Cahokia Multi Side-Notched. Based on Strong 1935, created by Erin Hughes.

The categories are; (1) side-notched types (side-notched, side with basal notch, and multi-side-notched), (2) Cahokia side-notched types (Cahokia side-notched, Cahokia tri-notched, and Cahokia multi-side-notched), (3) unspecified side-notched, (4) corner-notched, (5) stemmed, and (6) unnotched points (see Figure 3.2). These categories are lumped and split in different ways for the analysis (for example, some analyses examine frequencies of side-notched types overall and some consider the frequencies of specific kinds of side-notched points). My morphological categories are based on W.D. Strong's (1935) point classification system.

The data set includes a total of 2,900 arrow points. The points selected for analysis include both complete and broken arrow points. The broken arrows display enough morphological features in order to identify the point types. I did not include any arrow fragments that were too small or too broken to properly identify. I held the points to the standard that they had at least 50 percent of their distal portion; for the most part this offered enough characteristics for their identification.

Figure 3.3. Side Notched Point from 25FT35. Photo taken by Erin Hughes at the NSHS.

Side-Notched Types

Side-notched points have notches originating from the lateral edges of the point, generally about 1/3 of the way up the blade from the base. The first category (Figure 3.2 l-q) of arrow points, side-notched types, is broken into three separate categories; side-notched, side-notched with basal, and

multiple side-notched points. The categories should be self-explanatory, however, some clarification on the multiple side notched points (see Figure 3.5). This point type has at least one side-notch on each edge, along with additional side-notches on at least one edge side, not including any basal notches. Multiple side-notches can have additional side-notches on either side, one extra side-notch, or anywhere up to five side-notches.

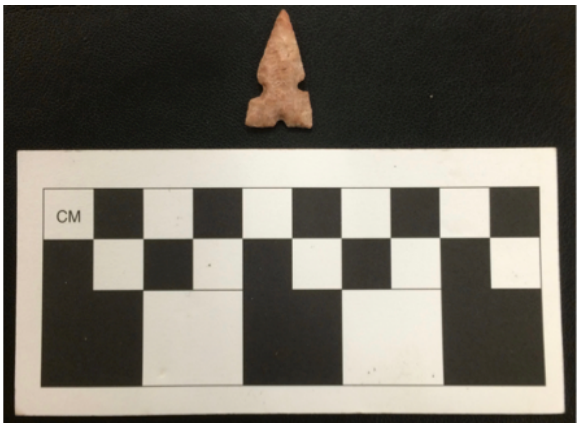

Figure 3.4 Side with Basal Notch Point from 14OT5. Photo taken by Erin Hughes at the Kansas Historical Society.

Points in this category display high to low levels of skill in the finished product. Side-notched points are standard side-notched points, with one side-notch on each side near the base of the point. These points have a variety of blade shapes. I did not feel it was necessary for the task at hand to further separate the side-notched points based on blade shape, notching width, or edge type. 710 points out of all the sites are side-notched, 104 are side-notched with basal notching, 94 are multi side-notched points.

Figure 3.5. Multi Side-Notched Point from 14OT5. Photo taken by Erin Hughes at Kansas Historical Society

Cahokia Types

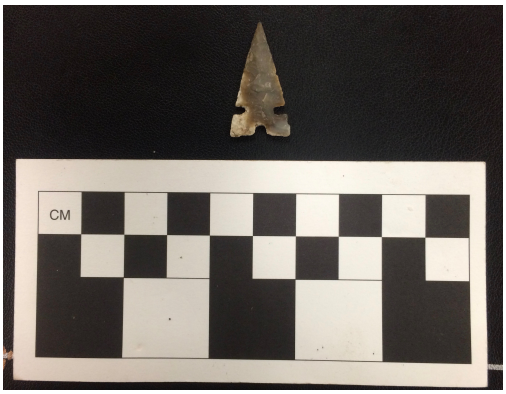

Figure 3.6. Cahokia Side-Notch Point from 14OT5. Photo taken by Erin Hughes at the Kansas Historical Society

The Cahokia type points have the same breakdown as the side-notched point categories; Cahokia side-notched, Cahokia tri-notched (side with basal notching), and Cahokia multi-notched. Cahokia arrow points first appear in the American Bottom around A.D. 900 (TLW/Emergent Mississippian period), and, while they did not replace all the previous point types, Cahokia points became one of the most frequent points at American Bottom Mississippian sites (O'Brien and Wood 1998). Cahokia points display a high level of craftsmanship, with small side-notches and, often, well-made serrated edges. The best-known Cahokia point, the Cahokia Tri-Notch, also features a small notch at the base. The best-known cache of Cahokia points was found in Cahokia's Mound 72, found in context with the elite burial. This cache provided dates for the start of production of Cahokia points and the importance these points played in the "Mississippification" of the region. There are 132 Cahokia side-notched points in the total data set, along with 97 Cahokia tri-notched and 26 Cahokia multi-notched points.

Unspecified Side-Notched

The "unspecified side-notched point" category is a catchall for side-notched points that did not have enough information to classify them as either side-notched points or Cahokia side-notch. This category was created in order to avoid speculation about the exact classification of the point. All of these points are side-notched points, meaning they have two side-notches, one on either side. The majority of these points come from sites reviewed in books and grey literature that did not offer enough detail to further classify the points. Forty-eight unspecified side-notched points are present in the sample.

Corner-notched

Corner-notched points have notches at originate at the corner formed by the lateral edges and the base; these notches produce an expanding base, not one with parallel sides. These points were ubiquitous in Plains and Eastern Woodland sites. The corner-notched points included in this thesis are only arrow points; I have not included any larger corner-notched dart points. A total of 356 corner-notched points are present in the data set.

Figure 3.7. Corner-Notched from 14OT308. Photo taken by Erin Hughes at the Kansas Historical Society.

Stemmed

Stemmed arrow points are non-lanceloated (the blade of the point does not widen in the middle) points with straight to contracting stemmed bases (O'Brien and Wood 1998). In some cases researchers split stemmed points into corner and side-stemmed points and in various type names. Here all stemmed points are lumped into one category. Stemmed points continue into the CPT and to a lesser extent in the American Bottom. The data on stemmed pointed are included here, however, I do not look at their numbers in much detail. These points are included to look at all the variation in the sites. Only 62 stemmed points total are in the sites in this data set.

Unnotched

The final category is a catchall for unnotched projectile points. These points vary in blade and base shape. Similar to the other categories I use here, it made the most sense to lump all the unnotched points into one single category. I did not see the purpose in further dividing the points into more morphological categories. In some cases the points in this category could be finished points or performs awaiting notching and final flaking. The unnotched points in this thesis are most likely a mixture of both performs and finished points. Unnotched arrow points are the largest total category in this data set, with 1,271 total points.

Odd Points

Before I continue on to the discussion on the tests I run I would like to briefly mention a number of odd points from the collection. These are points that did not fit into my main categories; the total number of these points is so small it did not warrant creating a new category for them (6 points out of 2,900). I will discuss a few of the odd points found in the collection (see Table 3.8 for a complete list). One point in the odd category came from 13BV1, the Mill Creek site. This point is a mall triangular arrow with only a single notch at its base. The second point is from 25FT30 (catalog number 333). This is an interesting point (Figure 3.3), it has one small notch on one side when it looks like the point broke during the notching process and was discarded; it is likely unfinished. The other four tools were labeled as arrow points in the curated collection but they appear to be other stone tools or reworked projectile points

Figure 3.8. Broken Notched Point from 25FT30, catalog number 333, from the Nebraska State Historical Society. Photograph by Erin Hughes

Table 3.8 Descriptions of Odd Points

Site	Catalog #	Description
13BV1	n/a	Triangular arrow with single basal-notch
13ML128	322-852	Classified as a point, most likely another stone tool
13ML129	323-718	Classified as a point, most likely another stone tool
13ML130	324-813	Classified as a point, reworked into a drill
25FT35	065-67-203	Classified as a point, reworked into a drill
25FT30	333	Single notch, discarded when the point broke during manufacture

Shaft Abraders

The final information I collected from the site collections was the total number of shaft abraders recovered during excavations. Shaft abraders, also called a shaft straightener, grooved abraders, shaft polishers, or U-shaped abraders, are typically ground stone tools with one or more U-shaped grooves worked into the surface of the stone to accommodate an arrow shaft. Adams (2002) describes two types of abraders, fine and course grain, used in the reduction and manufacture of shafts. Coarse grain ground stone is used for the removal of "bark and leveling unwanted projections" (Adams 2002:87). A super fine grain or cryptocrystalline material is used as a fine grain polisher to add a smooth finish to the shaft (Adams 2002). Grooved abraders on the Great Plains are noted as being used in pairs, with two grooved abraders are placed together and the shaft of the arrow is passed through the hole (Adams 2002).

I collected shaft abrader counts for this thesis because researchers (see Blakeslee 1999) noted an increase in shaft abrader at the same time we see the switch to side-notched points in

the Great Plains. Donald J. Blakeslee (1999) proposed that the influx of shaft abraders after the transition from Late Woodland to Central Plains Tradition is due to the morphological difference between the hafting elements required for corner notched and side notched arrow points. I discuss this idea in further detail in Chapter 4.

The shaft abraders used here were found in the same context as the arrow points, in house structures and associated their features. The abraders used here were both complete and broken u-shaped abraders. The abraders had at least one u-shaped groove worked into it. Some of the abraders had multiple u-shaped grooves. These multi-grooved abraders were not counted differently. Appendix A contains a table of the full site of sites and shaft abrader counts.

PATTERNS AND STATISTICAL TESTS

All of the categories and codes I discussed in this chapter were created in order to better understand the transition from corner to side-notched arrow points through time and space and how this change relates to influences out of Cahokia. If this change in point type is due to Cahokian influences we would expect to see more Cahokia side-notched points at sites with other indicators for Cahokian interaction/influence. This implies that Cahokian points should be more common overall on the eastern Plains, particularly in Steed-Kisker and southern Nebraska Phase sites, than elsewhere. We also expect to see the numbers of Cahokia points on the Plains fluctuate based on the rise and decline of Cahokia. It is for this reason the time phases I created correspond to the different cultural phase at Cahokia.

I have a number of questions I wish to answer with this data:

(1) What sites maintain a higher percentage of corner-notched projectile points in all time periods? With this I wanted to look at how side-notched points spread on the Great Plains, and in particular, are there CPT or other sites that continue using corner-notched points into the agricultural age or do we see the highest number of corner-notched points during the beginning of the CPT?

(2) How do we see this change geographically during the different time periods? Specifically I want to see where are the sites with higher frequencies of corner-notched points?

(3) Does the presence of Cahokia points decrease from east to west? What time periods do we see the highest number of Cahokia points? Do sites that have a higher number of Cahokia style points also have a higher number of side with basal and multi notched points?

In order to answer these questions I broke the data down into the different temporal and spatial categories. The first step was to make a series of maps to plot the different arrow point types in space for each of the three basic time periods. This allowed me to get a picture of this transition over time and space, by comparing the maps to see how the percentages changed. Next, I ran the data through various statistical tests to look at the significance of the changes and patters I saw. These statistical tests included diversity indices, correspondence analysis, and calculating the coefficient of variation.

The first two statistical analysis run offered visual representation of my data's distribution. Diversity indices allow me to look at the change over time of the overall diversity of arrow points in the different time periods. This test compares the number of categories with arrow point counts within each category and determines how homogenous the sample is (Johansson 2013). Diversity indices measure evenness, or the probability that two arrow points

randomly selected from a sample will be different morphological types. Specifically, I used Simpson's index of diversity and the Shannon-Weaver index to measure evenness.

Simpson's index of diversity was calculated using the equation $1-\sum\Phi^2$. Here Φ is calculated by dividing the number of points within a specific category by the total number of points found at the site. Simpson's index values range between 0 and 1; the greater the value, the greater the amount of diversity exists within the sample. Similar to Simpson's index of diversity, the Shannon-Weaver index reaches a maximum value (dependent on richness) when groups within a sample are perfectly equal. To better facilitate comparison of diversity between assemblages, I have rescaled the Shannon-Weaver Index by calculating the maximum possible value for each assemblage size and then by dividing the calculated values by their corresponding maxima so that 0 represents no diversity (e.g., all points belonging to a single category) and 1 represents the maximum possible evenness (e.g., an equal number of points from each category). This rescaling also facilitates comparison between the Shannon-Weaver index and Simpson's index of diversity. When rescaled, the equation for the Shannon-Weaver Index is $1\sum(\Phi*\log \Phi)$. Similar to Simpson's index of diversity, Φ is calculated based on individual counts for each projectile point category in this equation as well.

The second statistical test I used was correspondence analysis. This test works best when looking for patterns in counts or the presence/absence in the data set and representing that graphically (Shennan 1997, Greenacre 2007). This analysis calculates the relationship between variables and uses a set of points in a scatterplot along two perpendicular axes to graphically represent the cross-tabulations in the data. In order to cross-tabulate, data must be separated into two or more distinct sets of categories, such as the temporal, spatial, and morphological categories discussed above, and cross tabulations are calculated based on weighted Euclidean

distances between the normalized row and column values (individual entries divided by the sum of the row or column), and weighted inversely proportional to the square root of the row or column total.

When viewing the plotted data, the simplest way to determine the relationship between two variables is to draw lines from their corresponding points to the origin point of the graph. If the angle between the two is acute, then the two variables are more closely related to one another than the average. Conversely, if the angle is obtuse, the two variables are less related to one another than the average.

Another way to interpret correspondence graphs is by understanding relative frequencies of a particular variable by viewing where variables intersect one another and the relative distances between them. If a line through the origin point of the graph is drawn which intersects with the column variables (the column variables used here are the morphological point categories), then the position at which a perpendicular line drawn from the row variables (the row variables here are the sites or time periods) intersect with the column variable line demonstrates how frequently the column and row variables occur together—with shorter distances indicating greater frequency and longer distances indicating lesser frequency.

Finally, I calculated the coefficient of variation for the ratio of arrow points to shaft abraders. My goal in doing this is to consider the possibility that Central Plains Tradition communities began to develop some level of household specialization in arrow and, perhaps, arrow point production as they began to interact more (directly or indirectly) with Cahokia: such specialization is likely to have resulted in an increase in production skill that might help to explain the frequency of Cahokia points. To look for specialization, I begin by using the frequency of shaft abraders in a site as a measure of the volume of arrow production. To take

account of the extent of site excavation, I standardized this by dividing it by the number of arrow points from each site, which I use as a rough measure of arrow consumption. In a setting where some households or communities are involved in specialized production and others are not, this ratio should vary. Where a small number of households or communities specialized to some degree in making arrows, we should see a few sites with many abraders relative to arrows and many sites with few abraders; where every household or community made their own arrows, abrader to arrow ratios should be constant. The coefficient of variation (CV = ([standard deviation/mean] * 100) makes it possible to assess the degree of variation in a simple and straightforward way for groups of sites in time and space.

SUMMARY

For this study I collected information on 2,900 arrow points from 64 sites from the Great Plains and the American Bottom. All of the sites used in this study had three basic criteria; reliable radiocarbon dates, single cultural occupations, and at least one domestic structure. These criteria offered the best way to look at arrow point change on the Great Plains from AD 1050 – 1400 in the closes detail. In the next chapter I first go over the results of my analysis using the above methods by covering the overall results, the data patterns, and the results of the descriptive statistics.

4 Results and Discussion

In Chapter 1, I provided background information on the geographic regions and cultures I focus on as well as the transition from corner to side-notched arrow points. In Chapter 2 I discussed how archaeologists understand style and its connections to identity, enculturation, and learning networks. In Chapter 3, I presented the methods of analysis I used to address the question of cultural influences based on the current archaeological understanding of Plains/Mississippian relationships and theoretical understandings of style as well as the specific sites I chose to include in the analysis presented here. In this chapter, I focus on the results and patterns I identified in my data using those methods. I do this by first looking at the overall patterns present in the different regions. Then I go over the spatial and temporal changes that occur in the central Great Plains. Finally, I consider two possible explanations other than Cahokian influence for the patterning of arrow points.

OVERALL PATTERNS

In the following section I review the overall patterns of arrow point distribution in time and space on the Great Plains and the American Bottom. To discuss the overall patterns in projectile point morphology, I divide the results into several different regions, defined in Chapter 3. Within each of these regional divisions, I discuss the temporal divisions as well. These regions are: (1) American Bottom, (2) Plains Woodland, (3) Central Plains tradition (CPT), (4) Pomona, (5) southern Plains Village, and (6) Initial Middle Missouri. The southern Plains Village, Woodland, and Initial Middle Missouri are not analyzed as intensely as the rest of the regions.

American Bottom

The pattern of arrow point change from the Terminal Late Woodland to the end of Cahokia is well documented in the American Bottom. The arrow point data used in this thesis closely replicate this pattern. As discussed in Chapter 1, I include four Mississippian sites located in the American Bottom: the Terminal Late Woodland/Emergent Mississippian levels at Range site, the East St. Louis Mound Center, Downtown Cahokia Tract 15A, and the Interpretive Center tract (11S34). The East St. Louis mound complex is the only single component site included from the American Bottom, and was exclusively occupied during the Emergent Mississippian phase. The other two sites were occupied during the Lohmann, Stirling, and Moorehead phases.

Terminal Late Woodland/Emergent Mississippian Phase

The Terminal Late Woodland (TLW) and Emergent Mississippian periods discussed here include the Range and Dohack phase from the Range site and TLW features from the East St. Louis Mound Center. At these sites, side-notched arrow points are already the most common type, comprising thirty-eight percent of the overall collection. These are simple side-notched points; assemblages from these early periods are not basally notched and do not contain multiple side-notches.

Triangular unnotched points are the next highest percentage of points. Corner-notched points are still present in these sites (17 percent), but only found in the two phases at the Range site.

Cahokia style points (seven Cahokia side-notched and one Cahokia-tri notched point) are present in East St. Louis Mound Center, indicating that this style appeared prior to Cahokia's rise.

Lohmann Phase

Excavations at Downtown Cahokia (Tract 15A), the Interpretive Center (11S34), and East St. Louis Mound Center are included in the Lohmann phase analysis. Cahokia side-notched points make up 21 percent of the points from these sites, essentially the same proportion as seen in the Terminal Late Woodland material from East St. Louis. Cahokia tri-notched points are seven percent and Cahokia multi-notched points come in at four percent. Simple side-notched points and unspecified side-notched points drop to around seven and eight percent respectively. Unnotched arrows are the largest category at this time, 41 percent. Despite the presence of Cahokia style points, there are still corner-notched points present in collections from this time period although they drop to only four percent of the overall assemblage.

Stirling Phase

Arrow points from Stirling phase features from 11S34, East St. Louis, and Tract 15A demonstrate a similar pattern to that seen during the Lohmann phase. Unnotched arrow points make up the highest percentage of arrow points, at almost 50 percent. Cahokia style points are common in East St. Louis where 177 were found. There were eight Cahokia-tri notched points in 11S34's collection. Simple side-notched and unspecified side-notched points only make up

Table 4.1 Terminal Late Woodland and Emergent Mississippian Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri %	Ca-hokia-tri Count	Cahokia multi %	Cahokia multi Count
East St. Louis	41.94	13.00	0.00	0.00	0.00	0.00	0.00	0.00	22.58	7.00	3.23	1.00	0.00	0.00
Range	55.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Range	31.34	21.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	38.14	45.00	0.00	0.00	0.00	0.00	0.00	0.00	5.93	7.00	0.85	1.00	0.00	0.00

Table 4.1 Continued

Site	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
East St. Louis	22.58	7.00	3.23	1.00	0.00	0.00	0.00	0.00	3.23	1.00	29.03	9.00	31.00
Range	0.00	0.00	0.00	0.00	0.00	0.00	20.00	4.00	0.00	0.00	25.00	5.00	20.00
Range	0.00	0.00	0.00	0.00	0.00	0.00	23.88	16.00	7.46	5.00	37.31	25.00	67.00
Total	5.93	7.00	0.85	1.00	0.00	0.00	16.95	20.00	5.08	6.00	33.05	39.00	118.00

around 4 percent of the total arrow points. Two corner-notched points were found in the East St. Louis excavations, comprising only 0.5 percent of the total points.

Moorehead Phase

Arrow point patterns change considerably during the Moorehead phase. The total number of arrow points also drops considerably during this time period: only 32 arrow points were recovered from the Moorehead phase at sites included in this project. Unnotched points make up 31 percent of the arrows. Cahokia point categories drop to 12 percent for both Cahokia side and tri-notched points. Interestingly, there are no Cahokia multi-notched points. Side-notched points rise to 43 percent, 14 points in total. There are no corner-notched points in the Moorehead phase features.

Summary of Point Change in the American Bottom

In the American Bottom we see the introduction of Cahokia side-notched points during the TLW/Emergent Mississippian period. These points are found along with side-notched points in these early sites. The percentages of Cahokia side-notched points increase in the Stirling phase (AD 1100 – 1200) and replace simpler side-notched style points in these sites. Throughout the Lohmann and Stirling we also see the decline in corner-notched points, none of which are present in the Morehead phase (AD 1200 -1300). The percentages of Cahokia side-notched points also drop in the Moorehead phase and there is an increase in simpler side-notched points.

Table 4.2 Lohmann Phase Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count
11S34	0.00	0	0	0	0	0	15.38	2	7.69	1	15.38	2	0	0
East St. Louis	10.14	7	0	0	0	0	0	0	27.54	19	4.35	3	5.80	4
Tract 15A	0.00	0	0	0	0	0	50	6	0	0	16.67	2	0	0
Total	7.45	7	0	0	0	0	8.51	8	21.28	20	7.447	7	4.255	4

Table 4.2 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
11S34	0	0	30.77	4	30.77	4	13
East St. Louis	1.45	1	1.45	1	49.28	34	69
Tract 15A	25.00	3	0	0	8.33	1	12
Total	4.26	4	5.32	5	41.49	39	94

Table 4.3 Stirling Phase Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count
11S34	0.00	0	0	0	3.57	1	32.14	9	0	0	28.57	8	0	0
East St. Louis	1.57	6	0	0	0	0	0	0	26.11	100	14.62	56	5.48	21
Tract 15A	0.00	0	0	0	0	0	66.67	2	0	0	0	0	0	0
Total	1.45	6	0	0	0.24	1	2.66	11	24.15	100	15.46	64	5.07	21

Table 4.3 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
11S34	0	0	7.14	2	28.57	8	28
East St. Louis	0.52	2	0.52	2	51.17	196	383
Tract 15A	0	0	0	0	33.33	1	3
Total	0.48	2	0.97	4	49.52	205	414

Table 4.4 Morehead Phase Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count
11S34	56.52	13	0	0	0	0	0	0	0	0	13.04	3	0	0
East St. Louis	12.50	1	0	0	0	0	0	0	50	4	12.50	1	0	0
Tract 15A	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	43.75	14	0	0	0	0	0	0	12.5	4	12.5	4	0	0

Table 4.4 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
11S34	0	0	0	0	30.43	7	23
East St. Louis	0	0	0	0	25.00	2	8
Tract 15A	0	0	0	0	100.00	1	1
Totals	0	0	0	0	31.25	10	32

Plains Woodland

Along with the four Mississippian sites from the American Bottom, ten Plains Woodland sites from the central and southern Plains are included in this data set. These sites were not broken down into different time periods. Instead Woodland sites were analyzed as a single unit. Here I discuss the overall pattern of the Woodland sites from the central and southern Great Plains.

Central Plains Woodland

There are five Plains Woodland sites from the central Plains (table 4.5). Corner-notched points make up the largest category, 54 percent or 55 total points. The next highest category is unnotched points (21 percent). Side-notched arrows make up five percent and unspecified side-notched points make up one percent. There is one side-notched arrow point with a basal notch present in this period.

Southern Plains Woodland

Five southern Plains Woodland sites are also included in this study. As was true on the Central Plains, corner-notched points make up the highest category in these sites, 57 total points and 71 percent of the collection. However, in these sites side-notched points make up the next highest group, 19 specimens or 24 percent. There are no basally notched or multi side-notched points in the southern Plains Woodland sites and there are only 4 unnotched projectile points in these sites, five percent.

Table 4.5 Central Plains Woodland Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Cahoka tri %	Cahokia tri Count	Cahokia multi %	Cahokia multi Count
25CC28	80.00	4	20.00	1	0	0	0	0	0	0	0	0	0	0
25GO2	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0
25FT18	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0
25RW28	0.00	0	0	0	0	0	33.33	1	0	0	0	0	0	0
14CT332	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3.96	4	0.99	1	0.00	0	0.99	1	0.00	0	0.00	0	0.00	0

Table 4.5 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
25CC28	0	0	0	0	0	0	5
25GO2	86.36	38	4.55	2	9.09	4	44
25FT18	15.63	5	37.50	12	46.88	15	32
25RW28	33.33	1	0	0	33.33	1	3
14CT332	64.71	11	29.41	5	5.88	1	17
Total	54.46	55	18.81	19	20.79	21	101

Table 4.6 Southern Plains Woodland Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri %	Ca-hokia-tri Count	Cahokia multi %	Cahokia multi Count
34LN76	45.45	5	0	0	0	0	0	0	0	0	0	0	0	0
34SM20	20.00	2	0	0	0	0	0	0	0	0	0	0	0	0
34SM29	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0
34CL46	22.22	2	0	0	0	0	0	0	0	0	0	0	0	0
34PT28	21.28	10	0	0	0	0	0	0	0	0	0	0	0	0
Total	23.75	19	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0

Table 4.6 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
34LN76	36.36	4	0	0	18.18	2	11
34SM20	80.00	8	0	0	0	0	10
34SM29	100.00	3	0	0	0	0	3
34CL46	55.56	5	0	0	22.22	2	9
34PT28	78.72	37	0	0	0	0	47
Total	71.25	57	0.00	0	5.00	4	80

Plains Village Sites

Following the Plains Woodland, as discussed in Chapter 1, there is a higher amount of diversity across the Great Plains. This is particularly evident among farming groups. Although there are many ways to subdivide the people living on the Great Plains after the Woodland period, I focus here on only six divisions: the early CPT, the middle CPT, the late CPT, the Pomona, the Southern Plains, and the IMM.

Early Central Plains Tradition

There are seven CPT sites within the period I consider the early CPT, which dates from A.D. 1050-1150 (Date Code 2). Geographically, these sites span the Central Plains. Unnotched

arrows make up the highest category followed by side-notched points. Already there is considerable variation in the side-notched types. Corner-notched points still present in these early CPT sites: there are 21 corner-notched points total. All sites have at least one corner-notched point, except for 14HO308. There are three Cahokia tri-notched points. 14HO308 has two Cahokia tri-notched points. 14SA1 has one Cahokia tri-notched point.

Middle Central Plains Tradition

Eleven sites comprise what I consider the middle CPT, dating from A.D. 1150-1250. Around half of these sites are from the Glenwood local of the CPT in western Iowa. Once again, unnotched points are the highest category (42 percent). All side-notched point types combined make the next highest group. There is increased variation in side-notched types during this time period. Simple side-notched points are 20 percent of the collection. Basally notched points jump up to 16 percent. And multi side-notched points are at 8 percent of the total collection. There is also an increase in Cahokia style points during this time period relative to the previous period, with Cahokia tri-notched points the most common of these. There are five Cahokia tri-notched points total. 13ML128 has the most Cahokia tri-notched points (2 points). 25FT35 has one point of each Cahokia type points. Corner-notched points make up three percent of the collection. There are eight corner-notched points in this collection. There is only one corner-notched point in all of the Glenwood sites. Stemmed points make up a higher percentage, around 6 percent or 13 points.

Late Central Plains Tradition

The final CPT time period, (the late CPT dating from A.D.1250-1400: date code 4), is represented in my data set by a total of seven sites. Unnotched points make up 48 percent for the points. All the side-notched point types combined make up 43 percent of the collections. There is continued diversity of side-notched types. Side-notched points are 20 percent and unspecified side-notched points are ten percent. Side with basal-notch points are eight percent. Lastly, multi side-notched points are only five percent. Corner-notched points are still present at this time. There are 12 corner-notched points in all but three sites. Cahokia points drop to a single Cahokia tri-notched point at 14OT5.

Pomona

The Pomona sites show several interesting patterns, particularly the continued use of corner-notched points throughout the sites. Each of the 14 sites included in the study have at least one corner-notched point. 14BO319 has a total of 19 corner-notched points, the largest category of points in its collection. When comparing just notched points from the Pomona sites, omitting unnotched points, total side and corner-notched points are close in percentage: 45.1 percent corner-notched points and 38.7 percent all side-notched points. Side-notched points in

Table 4.7 AD 1050 - 1150 CPT Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count
25FT13	11.54	3	23.08	6	0	0	0	0	0	0	0	0	0	0
25FT39	33.33	4	8.33	1	0	0	0	0	0	0	0	0	0	0
25FT70 A2	16.67	4	16.67	4	8.33	2	0	0	0	0	0	0	0	0
25SY31	42.52	54	8.66	11	0	0	0	0	0	0	0	0	0	0
14SA1	25.00	1	25.00	1	0	0	0	0	0	0	25.00	1	0	0
14HO308	37.50	12	21.88	7	6.25	2	0	0	0	0	6.25	2	0	0
25DW166	36.36	12	0	0	0	0	0	0	0	0	0	0	0	0
Total	15.99	90	5.33	30	0.71	4	0.00	0	0.00	0	0.53	3	0.00	0

Table 4.7 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
25FT13	15.38	4	7.69	2	42.31	11	26
25FT39	8.33	1	8.33	1	41.67	5	12
25FT70 A2	4.17	1	0	0	54.17	13	24
25SY31	3.94	5	0	0	44.88	57	127
14SA1	25.00	1	0	0	0	0	4
14HO308	0	0	0	0	28.13	9	32
25DW166	27.27	9	6.06	2	30.30	10	33
Total	3.73	21	0.89	5	18.65	105	258

these sites show variation in their notching; the total side-notched points are spilt between simple side-notched points (count 22) and multi side-notched points (count 20). There is only 1 point that has side and a basal notch, from 14OS305. Cahokia points are present in Pomona sites. Six percent of the total points are Cahokia tri-notched points.

Table 4.8 AD 1150 - 1250 CPT Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count
13ML128	19.51	8	26.83	11	7.32	3	0	0	0	0	4.88	2	0	0
13ML129	11.11	2	11.11	2	11.11	2	0	0	0	0	5.56	1	0	0
13ML139	7.69	3	20.51	8	5.13	2	0	0	0	0	2.56	1	0	0
13ML176	47.06	8	5.88	1	23.53	4	0	0	0	0	0	0	0	0
13ML216	50.00	2	0	0	0	0	0	0	0	0	0	0	0	0
13ML222	25.00	2	0	0	0	0	0	0	0	0	0	0	0	0
25FT16	29.17	7	4.17	1	4.17	1	0	0	0	0	0	0	0	0
25FT17	17.65	6	20.59	7	11.76	4	0	0	0	0	0	0	0	0
25FT35	30.43	7	4.35	1	13.04	3	0	0	4.35	1	4.35	1	4.35	1
25FT36	25.00	4	31.25	5	0	0	0	0	0	0	0	0	0	0
25FT70 A1	0.00	0	25.00	3	0	0	0	0	0	0	0	0	0	0
Total	20.76	49	16.53	39	8.05	19	0.00	0	0.42	1	2.12	5	0.42	1

Table 4.8 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
13ML128	2.44	1	7.32	3	31.71	13	41
13ML129	0	0	5.56	1	55.56	10	18
13ML139	0	0	0	0	64.10	25	39
13ML176	0	0	0	0	23.53	4	17
13ML216	0	0	0	0	50.00	2	4
13ML222	0	0	0	0	75.00	6	8
25FT16	8.33	2	8.33	2	45.83	11	24
25FT17	8.82	3	11.76	4	29.41	10	34
25FT35	4.35	1	8.70	2	26.09	6	23
25FT36	0	0	0	0	43.75	7	16
25FT70 A1	8.33	1	8.33	1	58.33	7	12
Total	3.39	8	5.51	13	42.80	101	236

Table 4.9 AD 1250 to 1400 CPT Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count
13ML130	16.39	10	11.48	7	4.92	3	0	0	0	0	0	0	0	0
13ML219	27.78	5	0.00	0	5.56	1	0	0	0	0	0	0	0	0
14OT308	11.76	2	5.88	1	5.88	1	0	0	0	0	0	0	0	0
14OT5	37.50	24	4.69	3	7.81	5	0	0	0	0	1.56	1	0	0
25FT54	28.57	2	28.57	2	0	0	0	0	0	0	0	0	0	0
25FT80	0.00	0	7.69	1	7.69	1	38.46	5	0	0	0	0	0	0
25BW15	0.00	0	8.33	3	0	0	50	18	0	0	0	0	0	0
Totals	19.91	43	7.87	17	5.09	11	10.65	23	0.00	0	0.46	1	0.00	0

Table 4.9 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
13ML130	0	0	3.28	2	63.93	39	61
13ML219	0	0	0	0	66.67	12	18
14OT308	11.76	2	0	0	64.71	11	17
14OT5	1.56	1	0	0	46.88	30	64
25FT54	0	0	0	0	42.86	3	7
25FT80	7.69	1	15.38	2	23.08	3	13
25BW15	22.22	8	0	0	19.44	7	36
Totals	5.56	12	1.85	4	48.61	105	216

Southern Plains

Plains Village sites from the southern Plains fall into two temporal categories, corresponding with the middle and late CPT (see Chapter 1 for more details on temporal subdivisions). The first group falls in date code 3, A.D 1150-1250. There are four southern Plains sites in this group. Side-notched points are the largest category in these sites at 39 percent. There are also 4 unspecified side-notched points (three percent). Corner-notched points are the next highest at 28 percent (31 total). Unnotched points are a close second, coming in at 27 percent (30 total). There are no Cahokia style points in these sites, nor are there any basally notched or multi side-notched points.

Table 4.10 Pomona Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count
14MO308	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0
14JF303	10.71	6	0	0	12.50	7	0	0	0	0	12.50	7	0	0
14DO19	18.75	3	0	0	18.75	3	0	0	0	0	0	0	0	0
14OS305	20.00	3	6.67	1	20.00	3	0	0	0	0	0	0	0	0
14OS314	28.57	2	0	0	0	0	0	0	0	0	14.29	1	0	0
14MM26	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0
14MM506	8.00	2	0	0	20.00	5	0	0	0	0	4.00	1	0	0
14MM509	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0
14MM7	20.00	1	0	0	0	0	0	0	0	0	0	0	0	0
14CF301	33.33	1	0	0	0	0	0	0	0	0	0	0	0	0
14CF369	20.00	1	0	0	0	0	0	0	0	0	20.00	1	0	0
14BO319	5.41	2	0	0	5.41	2	0	0	0	0	5.41	2	0	0
14MY309	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0
14MY316	16.67	1	0	0	0	0	0	0	0	0	0	0	0	0
Total	11.17	22	0.51	1	10.15	20	0.00	0	0.00	0	6.09	12	0.00	0

The second set of southern Plains village sites date from A.D. 1250-1400 (date code 4). There are six sites in this group (Table 4.12). The number of total points jumps significantly in this group. There were a total of 108 points in the early Plains Village sites and 835 points in this later group. Unnotched points are the largest category, 53 percent. Side-notched points come in at 35 percent. Corner-notched points are still present in these sites at 11 percent (96 total points). There are no Cahokia style points, basally notched points, or multi side-notched points in these collections.

Table 4.10 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
14MO308	100.00	2	0	0	0	0	2
14JF303	14.29	8	0	0	50.00	28	56
14DO19	18.75	3	0	0	43.75	7	16
14OS305	6.67	1	0	0	46.67	7	15
14OS314	28.57	2	0	0	28.57	2	7
14MM26	25.00	1	0	0	75.00	3	4
14MM506	20.00	5	12	3	36.00	9	25
14MM509	10.00	1	0	0	90.00	9	10
14MM7	20.00	1	0	0	60.00	3	5
14CF301	33.33	1	33.33	1	0	0	3
14CF369	20.00	1	0	0	40.00	2	5
14BO319	51.35	19	2.70	1	29.73	11	37
14MY309	66.67	4	16.67	1	16.67	1	6
14MY316	16.67	1	0	0	66.67	4	6
Total	25.38	50	3.05	6	43.65	86	197

Table 4.11 AD 1150 - 1250 Southern Plains Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Cahokia tri %	Cahokia tri Count	Cahokia multi %	Cahokia multi Count
34GV165B	44.44	4	0	0	0	0	11.11	1	0	0	0	0	0	0
34GV167	36.36	16	0	0	0	0	2.27	1	0	0	0	0	0	0
34GV5	36.84	14	0	0	0	0	0	0	0	0	0	0	0	0
34GV55	52.94	9	0	0	0	0	11.76	2	0	0	0	0	0	0
Total	39.81	43	0.00	0	0.00	0	3.70	4	0.00	0	0.00	0	0.00	0

Table 4.11 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
34GV165B	11.11	1	0	0	33.33	3	9
34GV167	36.36	16	0	0	25.00	11	44
34GV5	23.68	9	0	0	39.47	15	38
34GV55	29.41	5	0	0	5.88	1	17
Total	28.70	31	0.00	0	27.78	30	108

Table 4.12 AD 1250 - 1400 Southern Plains Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count
34GD1	42.86	48	0	0	0	0	0	0	0	0	0	0	0	0
34GV2	29.16	128	0	0	0	0	0	0	0	0	0	0	0	0
34GV22	13.64	9	0	0	0	0	1.52	1	0	0	0	0	0	0
34GV3	47.70	83	0	0	0	0	0	0	0	0	0	0	0	0
34GV32	70.59	12	0	0	0	0	0	0	0	0	0	0	0	0
34GV43	51.85	14	0	0	0	0	0	0	0	0	0	0	0	0
Totals	35.21	294	0.00	0	0.00	0	0.12	1	0.00	0	0.00	0	0.00	0

Table 4.12 Continued

Site	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
34GD1	7.14	8	0	0	50.00	56	112
34GV2	0.23	1	0	0	70.62	310	439
34GV22	83.33	55	0	0	1.52	1	66
34GV3	17.24	30	0	0	35.06	61	174
34GV32	0	0	0	0	29.41	5	17
34GV43	7.41	2	0	0	40.74	11	27
Totals	11.50	96	0.00	0	53.17	444	835

Initial Middle Missouri

While this project focused mainly on CPT sites as opposed to IMM, one IMM site was included in this data set, 13BV1. The site is from the Mill Creek variant. A total of 214 arrows points come from this site. I already mentioned that one of the points from the site was placed in the odd point category (a triangular point with a single notch at the base). This point will not feature here. Unnotched points are again the largest arrow category, 39 percent. Side-notched points are the next highest category, with 74 specimens or 35 percent of the total collection. Side-notched points with a basal notch are 7.5 percent and multi-notched points are 18.5 percent. The authors (Tiffany 1985) made no mention of Cahokia style points. And the illustrations they provided of a sample of the points do not appear to be Cahokia in workmanship.

Table 4.13 Initial Middle Missouri Sites

Site	Side %	Side Count	Side w/B %	Side w/B Count	Multi-notched %	Multi-notched Count	Unsp. Side %	Unsp. Side Count	Cahokia Side %	Cahokia Side Count
13BV1	35.07	74	7.58	16	18.48	39	0	0	0	0

Table 4.13 Continued

Site	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count	Corner %	Corner Count	Stem %	Stem Count	Un-notched %	Un-notched Count	Total
13BV1	0	0	0	0	0	0	0	0	38.86	82	211

Table 4.14 Summary of Points

Time Periods	All Side %	All Side Count	Unsp. Side %	Unsp. Side Count	All Cahokia %	All Cahokian Count	Corner %	Corner Count	Stemmed %	Stemmed Count	Un-notched %	Un-notched Count	Total
TLW/Emergant Mississppian	38.14	45	0.00	0	6.78	8	16.95	20	5.08	6	33.05	39	118
Lohmann	7.45	7	8.51	8	32.98	31	4.26	4	5.32	5	41.49	39	94
Stirling	1.69	7	2.66	11	44.69	185	0.48	2	0.97	4	49.52	205	414
Moorehead	43.75	14	0.00	0	25.00	8	0.00	0	0.00	0	31.25	10	32
Plains Woodland	4.95	5	0.99	1	0.00	0	54.46	55	18.81	19	20.79	21	101
CPT AD 1050 - 1150	48.06	124	0.00	0	1.16	3	3.73	21	0.89	5	18.65	105	258
CPT AD 1150 - 1250	45.34	107	0.00	0	2.97	7	3.39	8	5.51	13	42.80	101	236
CPT AD 1250 - 1400	32.87	71	10.65	23	0.46	1	5.56	12	1.85	4	48.61	105	216
IMM	61.14	129	0.00	0	0.00	0	0.00	0	0.00	0	38.86	82	211
Pomona	21.83	43	0.00	0	6.09	12	25.38	50	3.05	6	43.65	86	197
Southern Woodland	23.75	19	0.00	0	0.00	0	71.25	57	0.00	0	5.00	4	80
Southern Plains AD 1150-1250	39.81	43	3.70	4	0.00	0	28.70	31	0.00	0	27.78	30	108
Southern Plains AD 1200 -1400	35.21	294	0.12	1	0.00	0	11.50	96	0.00	0	53.17	444	835

POINTS IN TIME AND SPACE

The previous section demonstrates that there are distinctions both temporally and spatially in projectile point morphology in the Great Plains and at the four American Bottom Mississippian sites included. That discussion focused on cultural/regional subdivisions, and established not only that certain projectile point styles increase and decrease in quantity in various areas, but that these trends in morphological change in projectile points are present in many regions across the Great Plains. Cahokia side-notched points first appear on the Plains around AD 1050-1150 and the percentages increase from AD 1150 to 1250. But the percentages fall in the final phase (AD 1250-1300). The same pattern appears in the American Bottom sites.

Here, I use this data, along with theoretical orientations presented in Chapter 2, background information presented in Chapter 1, and supplemental data from other sites on the Great Plains and in the American Bottom that were not included here to address a number of questions. Among these are: first (1) what sites maintain a higher percentage of corner-notched projectile points in all time periods? With this I want to get at how side-notched points spread on the Great Plains, and in particular, are there CPT or other sites that continue using corner-notched points into the agricultural age or do we see the highest number of corner-notched points during the beginning of the CPT? Along the same lines (2) how is this change geographically visible during the different time periods? Specifically, I want to see where are the sites are with higher corner-notched points? Finally I have a number of questions about the distribution of Cahokia style points and the variations in side-notched points. (3) Do the patterning of Cahokia points lessen from east to west? In what time periods do we see the highest number of Cahokia points? Do sites that have a higher number of Cahokia style points also have a higher number of

side with basal and multi notched points? To address my research questions concerning specifics of these changes and their implications, it is necessary to also aggregate the data for each morphological type separately. This section focuses on the temporal and spatial changes in projectile points across the Great Plains. Although during analysis, I used a greater number of morphological categories, I group them here into four point types: corner-notched, side-notched, Cahokia points, and triangular un-notched points. First I present a series of maps and corresponding tables. On all of the maps I include point data for all of the Pomona sites. The Pomona are not split into different time codes, instead the data is included in all time codes for comparison. Next, I offer an overview of my finds and how they answer the questions I proposed.

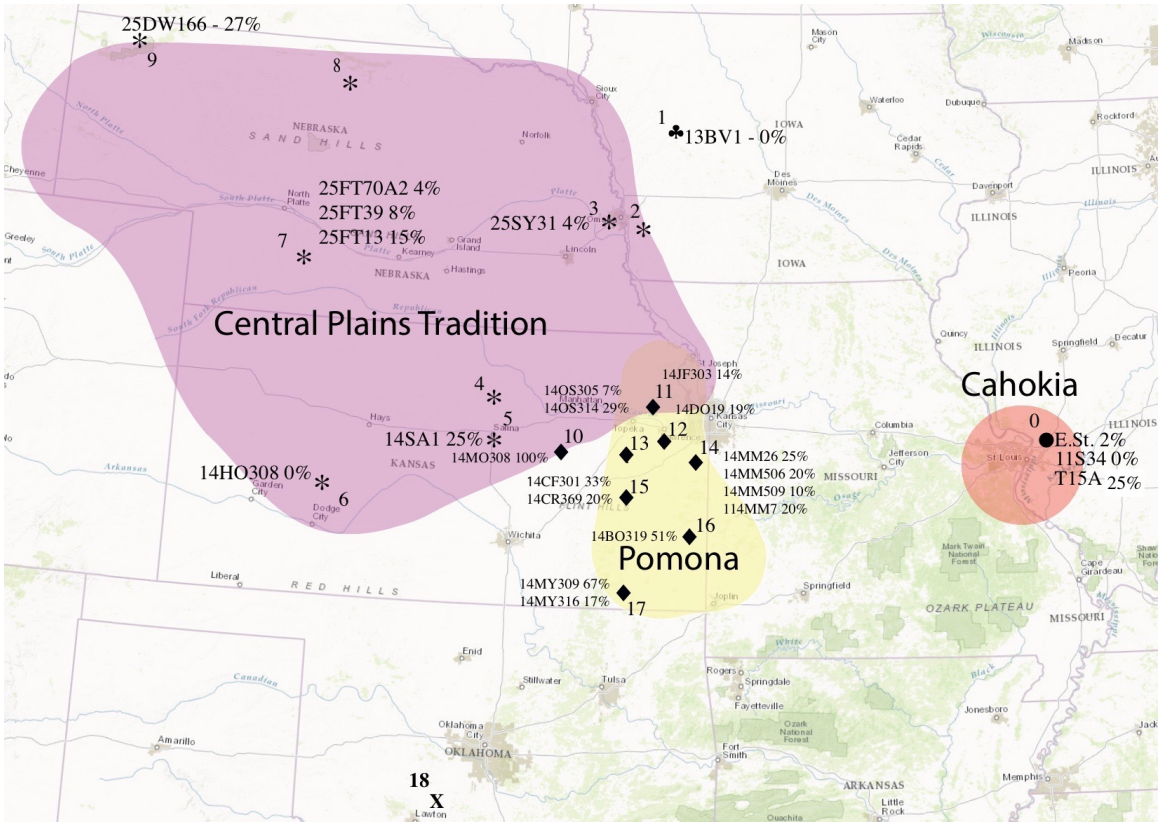

Figure 4.1. Corner Notched Points AD 1050-1150

Table 4.15 Corner Notched Points AD 1050 - 1150

Map #	Site	Corner %	Corner Count
0	East St. Louis	1.45	1
0	11S34	0	0
0	Tract 15A	25	3
1	13BV1	0	0
3	25SY31	3.94	5
5	14SA1	25	1
6	14HO308	0	0
7	25FT70 A2	4.17	1
7	25FT39	8.33	1
7	25FT13	15.38	4
9	25DW166	27.27	9

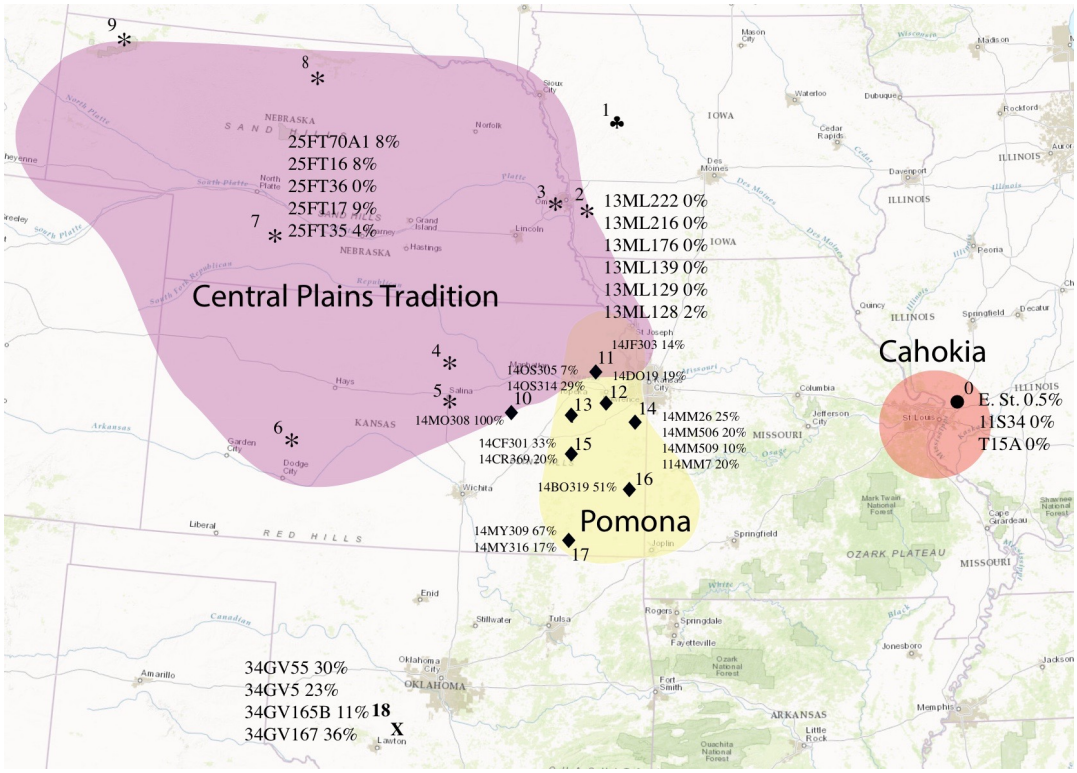

Figure 4.2. Corner Notched Points AD 1150 – 1250

Table 4.16 Corner Notched Points AD 1150 - 1250

Map #	Site	Corner %	Corner Count
0	East St. Louis	0.52	2
0	11S34	0	0
0	Tract 15A	0	0
2	13ML222	0	0
2	13ML216	0	0
2	13ML176	0	0
2	13ML139	0	0
2	13ML129	0	0
2	13ML128	2.44	1
7	25FT70 A1	8.33	1
7	25FT16	8.33	2
7	25FT36	0	0
7	25FT17	8.82	3
7	25FT35	4.35	1
18	34GV55	29.41	5
18	34GV5	23.68	9
18	34GV165B	11.11	1
18	34GV167	36.36	16

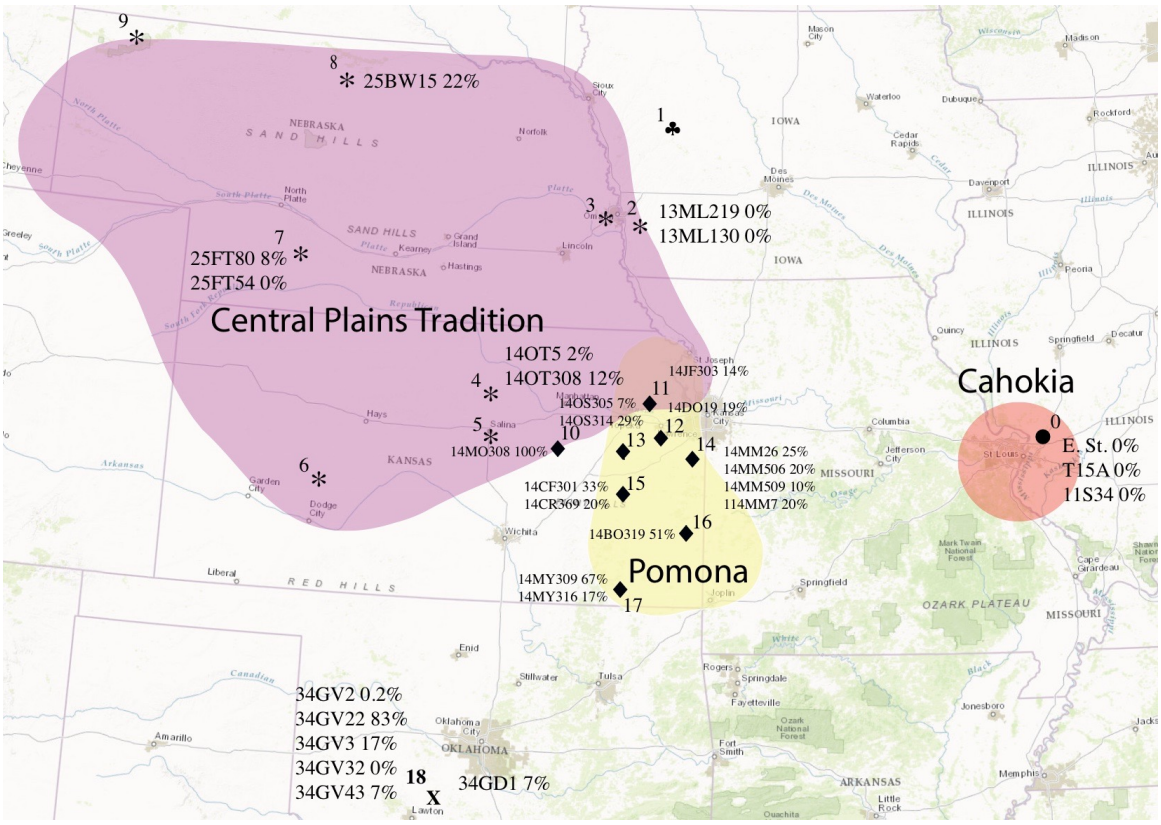

Figure 4.3. Corner Notched Points AD 1250 - 1400

Table 4.17 Corner Notched Points AD 1250 - 1400

Map #	Site	Corner %	Corner Count
0	East St. Louis	0	0
0	Tract 15A	0	0
0	11S34	0	0
2	13ML219	0	0
2	13ML130	0	0
4	14OT5	1.56	1
4	14OT308	11.76	2
7	25FT80	7.69	1
7	25FT54	0	0
8	25BW15	22.22	8
18	34GD1	7.14	8
18	34GV2	0.23	1
18	34GV22	83.33	55
18	34GV3	17.24	30
18	34GV32	0	0
18	34GV43	7.41	2

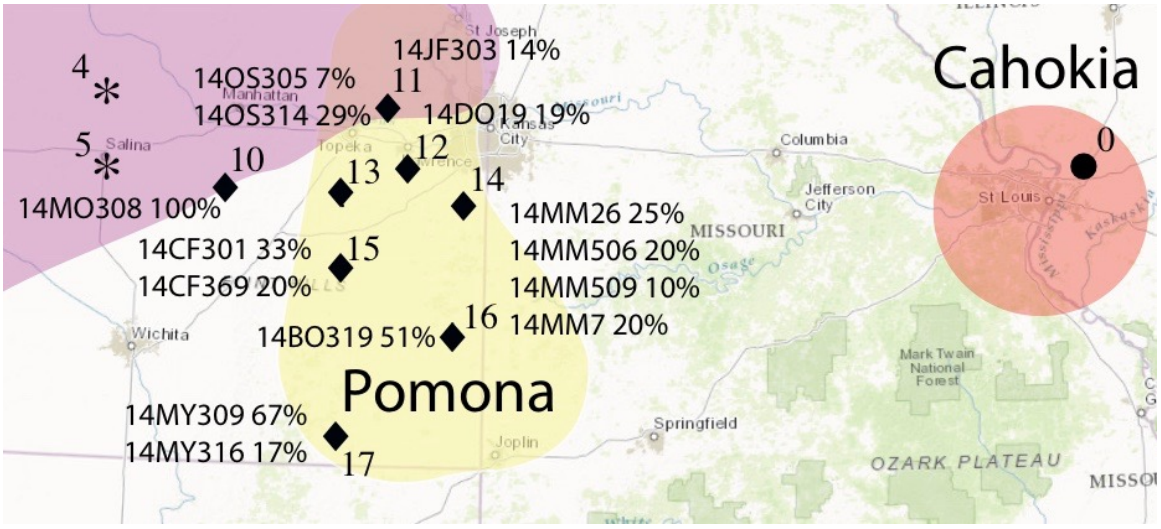

Figure 4.4. Pomona Corner Notched Points

Table 4.18 Pomona Corner Notched Points

Map #	Site	Corner %	Corner Count
10	14MO308	100	2
11	14JF303	14.29	8
12	14DO19	18.75	3
13	14OS305	6.67	1
13	14OS314	28.57	2
14	14MM26	25	1
14	14MM506	20	5
14	14MM509	10	1
14	14MM7	20	1
15	14CF301	33.33	1
15	14CF369	20	1
16	14BO319	51.35	19
17	14MY309	66.67	4
17	14MY316	16.67	1

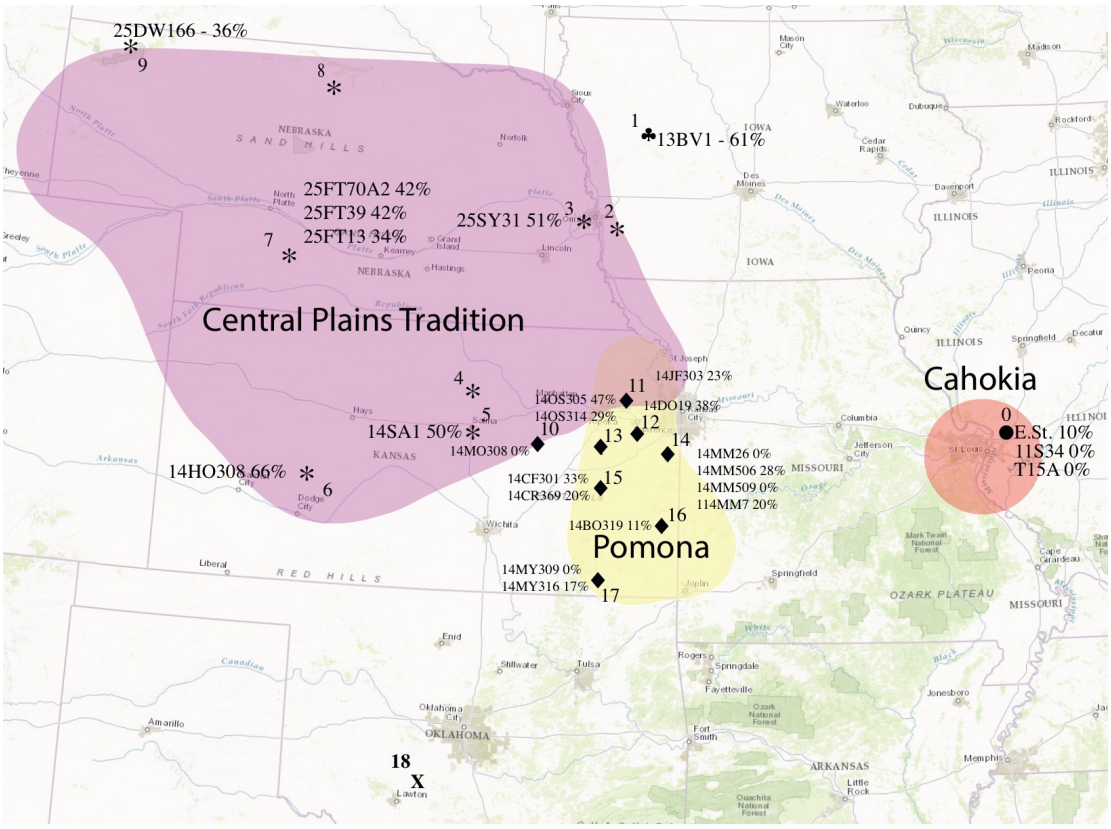

Figure 4.5. All Side-notched Points AD 1050-1150

Table 4.19 All Side-notched Points AD 1050 - 1150

Map #	Site	Side %	Side Count	Side w/ Basal %	Side w/ Basal Count	Multi-notched %	Multi-notche Count	Total Side
0	East St. Louis	10.14	7	0	0	0	0	7
0	11S34	0	0	0	0	0	0	0
0	Tract 15A	0	0	0	0	0	0	0
1	13BV1	35.07	74	7.58	16	18.48	39	129
3	25SY31	42.52	54	8.66	11	0	0	65
5	14SA1	25	1	25	1	0	0	2
7	25FT70 A2	16.67	4	16.67	4	8.33	2	10
7	25FT39	33.33	4	8.33	1	0	0	5
7	25FT13	11.54	3	23.08	6	0	0	9
6	14HO308	37.5	12	21.88	7	6.25	2	21
9	25DW166	36.36	12	0	0	0	0	12

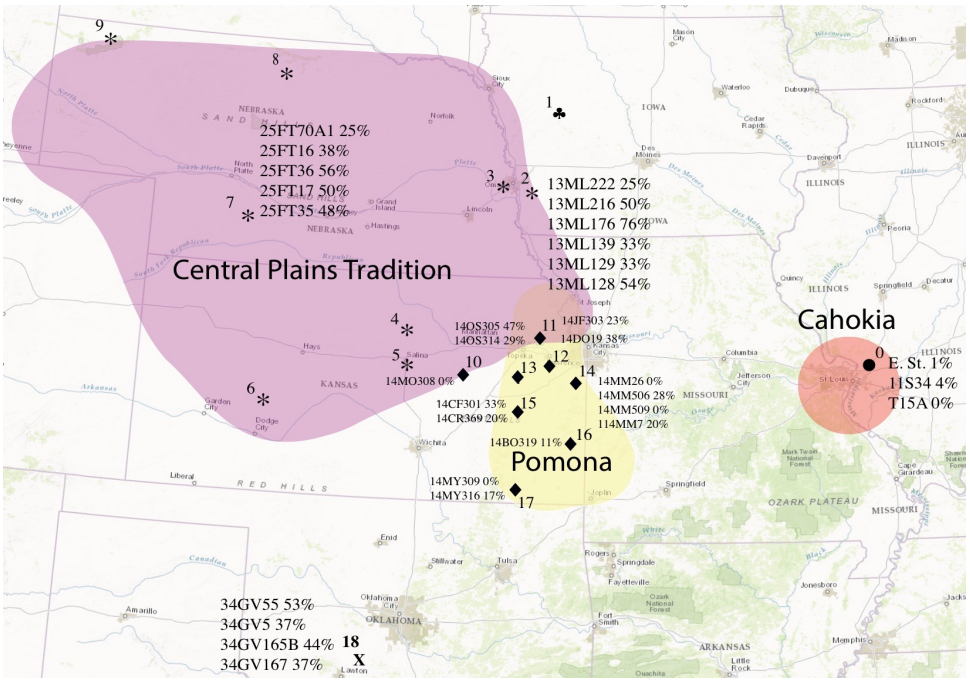

Figure 4.6. All Side Notched Points AD 1150 -1250

Table 4.20 Side Notched Points AD 1150 - 1250

Map #	Site	Side %	Side Count	Side w/ Basal %	Side w/ Basal Count	Multi-notched %	Multi-notched Count	Total Side
0	East St. Louis	1.57	6	0	0	0	0	6
0	11S34	0	0	0	0	3.57	1	1
0	Tract 15A	0	0	0	0	0	0	0
2	13ML222	25	2	0	0	0	0	2
2	13ML216	50	2	0	0	0	0	2
2	13ML176	47.06	8	5.88	1	23.53	4	13
2	13ML139	7.69	3	20.51	8	5.13	2	13
2	13ML129	11.11	2	11.11	2	11.11	2	6
2	13ML128	19.51	8	26.83	11	7.32	3	22
7	25FT70 A1	0	0	25	3	0	0	3
7	25FT16	29.17	7	4.17	1	4.17	1	9
7	25FT36	25	4	31.25	5	0	0	9
7	25FT17	17.65	6	20.59	7	11.76	4	17
7	25FT35	30.43	7	4.35	1	13.04	3	11
18	34GV55	52.94	9	0	0	0	0	9
18	34GV5	36.84	14	0	0	0	0	14
18	34GV165B	44.44	4	0	0	0	0	4
18	34GV167	36.36	16	0	0	0	0	16

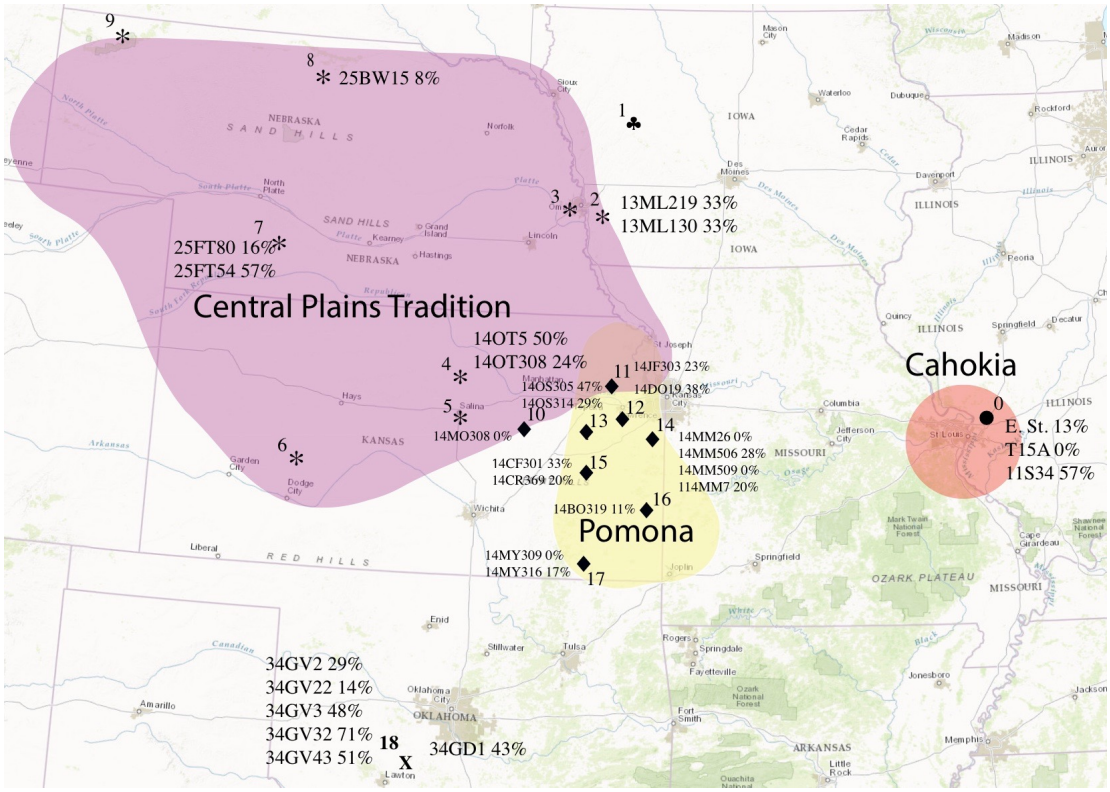

Figure 4.7. All Side Notched Points AD 1250 - 1400

Table 4.21 Side Notched Points AD 1250 - 1400

Map #	Site	Side %	Side Count	Side w/ Basal %	Side w/ Basal Count	Multi-notched %	Multi-notche Count	Total Side
0	East St. Louis	12.5	1	0	0	0	0	1
0	Tract 15A	0	0	0	0	0	0	0
0	11S34	56.52	13	0	0	0	0	13
2	13ML219	27.78	5	0	0	5.56	1	6
2	13ML130	16.39	10	11.48	7	4.92	3	20
4	14OT5	37.5	24	4.69	3	7.81	5	32
4	14OT308	11.76	2	5.88	1	5.88	1	4
7	25FT80	0	0	7.69	1	7.69	1	2
7	25FT54	28.57	2	28.57	2	0	0	4
8	25BW15	0	0	8.33	3	0	0	3
18	34GD1	42.86	48	0	0	0	0	48
18	34GV2	29.16	128	0	0	0	0	128
18	34GV22	13.64	9	0	0	0	0	9
18	34GV3	47.7	83	0	0	0	0	83
18	34GV32	70.59	12	0	0	0	0	12
18	34GV43	51.85	14	0	0	0	0	14

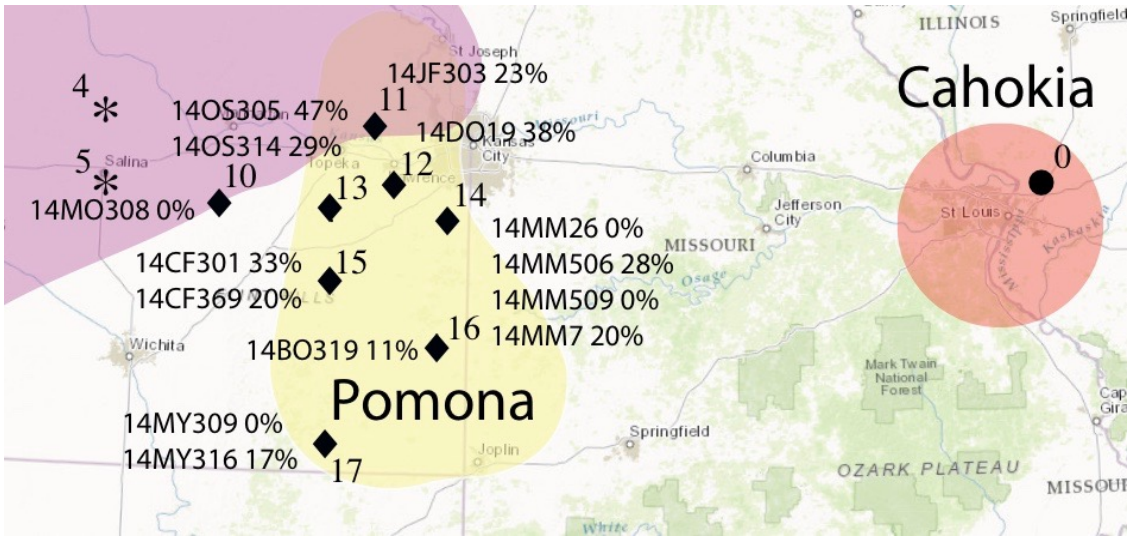

Figure 4.8. Pomona Side-Notched Points

Table 4.22 Side Notched Points at Pomona Sites

Map #	Site	Side %	Side Count	Side w/ Basal %	Side w/ Basal Count	Multi-notched %	Multi-notched Count	Total Side
10	14MO308	0	0	0	0	0	0	0
11	14JF303	10.71	6	0	0	12.5	7	13
12	14DO19	18.75	3	0	0	18.75	3	6
13	14OS305	20	3	6.67	1	20	3	7
13	14OS314	28.57	2	0	0	0	0	2
14	14MM26	0	0	0	0	0	0	0
14	14MM506	8	2	0	0	20	5	7
14	14MM509	0	0	0	0	0	0	0
14	14MM7	20	1	0	0	0	0	1
15	14CF301	33.33	1	0	0	0	0	1
15	14CF369	20	1	0	0	0	0	1
16	14BO319	5.41	2	0	0	5.41	2	4
17	14MY309	0	0	0	0	0	0	0
17	14MY316	16.67	1	0	0	0	0	1

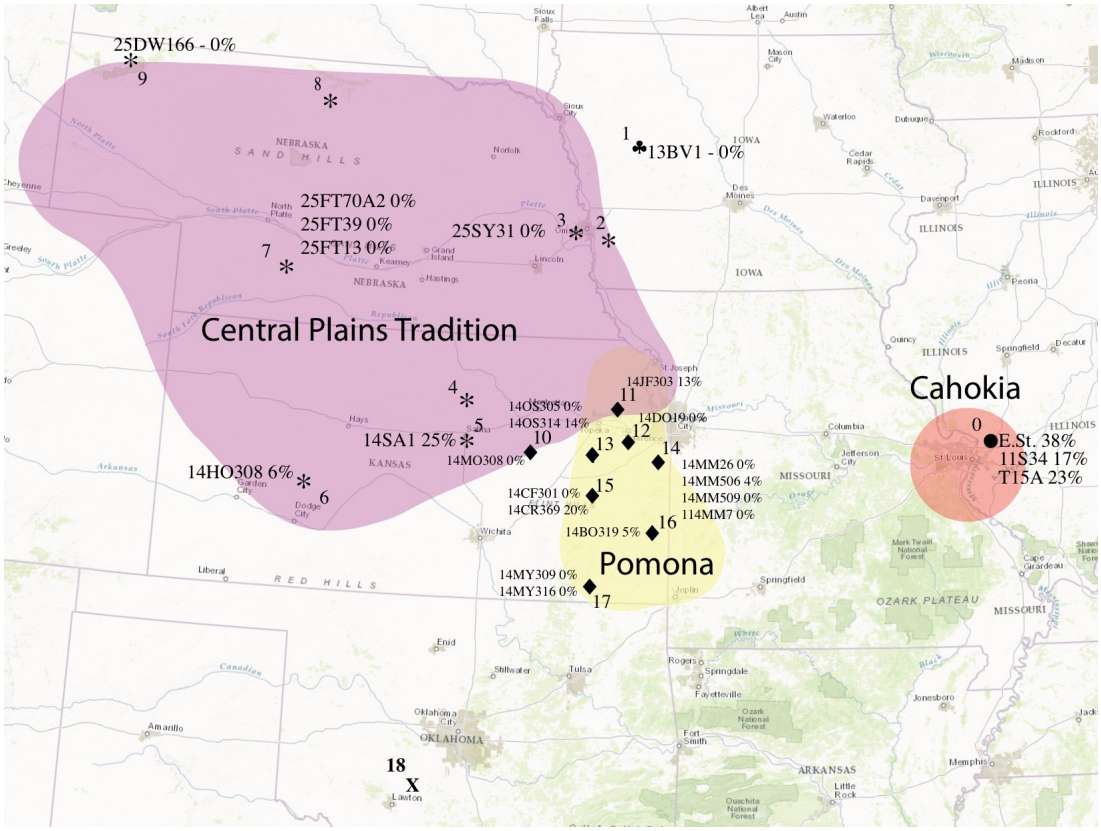

Figure 4.9. Cahokia Points, AD 1050-1150

Table 4.23 Cahokia Points at Sites AD 1050 - 1150

Map #	Site	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri %	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count	Cahokian Total
0	East St. Louis	27.54	19	4.35	3	5.80	4	26
0	11S34	7.69	1	15.38	2	0	0	3
0	Tract 15A	0	0	16.67	2	0	0	2
1	13BV1	0	0	0	0	0	0	0
3	25SY31	0	0	0	0	0	0	0
5	14SA1	0	0	25	1	0	0	1
6	14HO308	0	0	6.25	2	0	0	2
7	25FT70 A2	0	0	0	0	0	0	0
7	25FT39	0	0	0	0	0	0	0
7	25FT13	0	0	0	0	0	0	0
9	25DW166	0	0	0	0	0	0	0

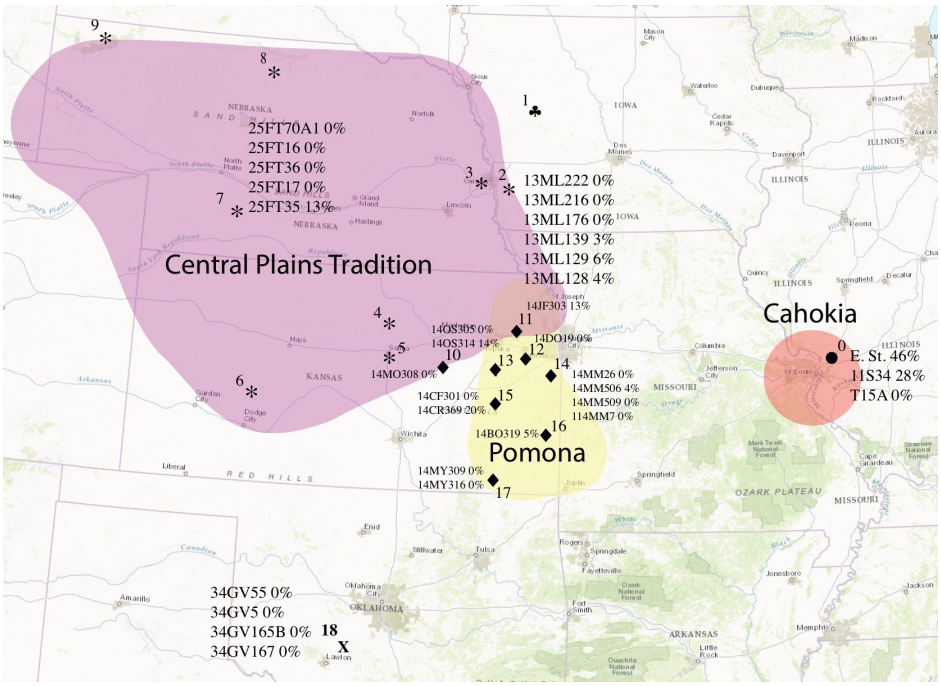

Figure 4.10. Cahokia Points AD 1150-1250

Table 4.24 Cahokia Points at CPT Sites AD 1150 - 1250

Map #	Site	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri Count	Cahokia multi %	Cahokia multi Count	Cahoki-an Total
0	East St. Louis	26.11	100	14.62	56	5.483	21	177
0	11S34	0	0	28.57	8	0	0	8
0	Tract 15A	0	0	0	0	0	0	0
2	13ML222	0	0	0	0	0	0	0
2	13ML216	0	0	0	0	0	0	0
2	13ML176	0	0	0	0	0	0	0
2	13ML139	0	0	2.56	1	0	0	1
2	13ML129	0	0	5.56	1	0	0	1
2	13ML128	0	0	4.88	2	0	0	2
7	25FT70 A1	0	0	0	0	0	0	0
7	25FT16	0	0	0	0	0	0	0
7	25FT36	0	0	0	0	0	0	0
7	25FT17	0	0	0	0	0	0	0
7	25FT35	4.35	1	4.35	1	4.348	1	3
18	34GV55	0	0	0	0	0	0	0
18	34GV5	0	0	0	0	0	0	0
18	34GV165B	0	0	0	0	0	0	0
18	34GV167	0	0	0	0	0	0	0

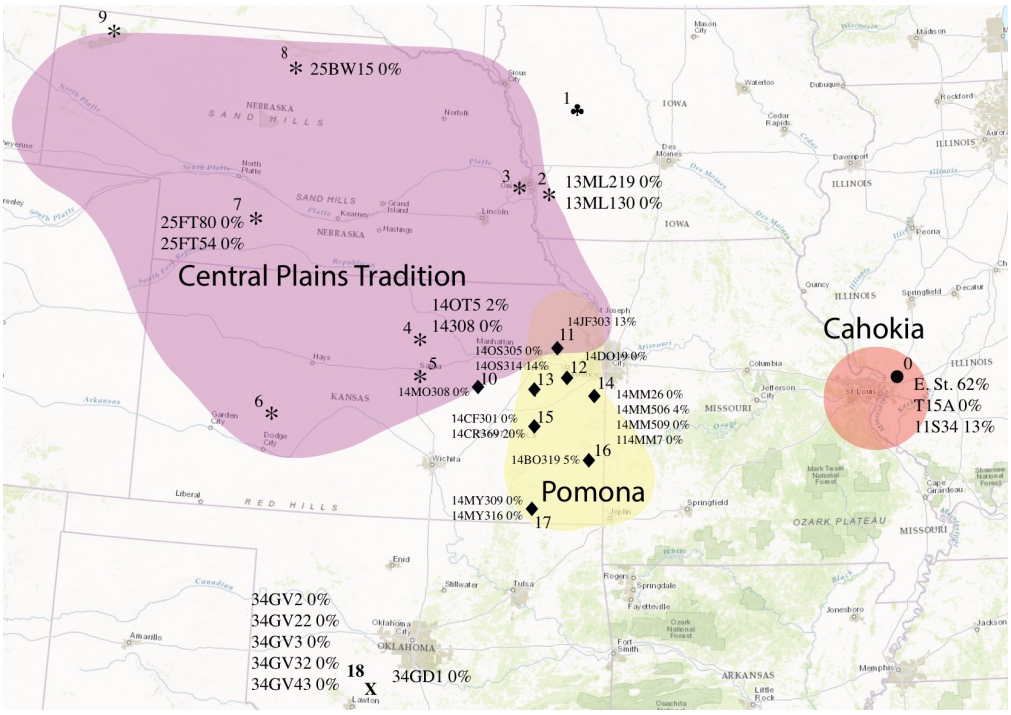

Figure 4.11. Cahokia Points AD 1250 – 1400

Table 4.25 Cahokia Points at CPT Sites AD 1250 - 1400

Map #	Site	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri	Cahokia multi %	Cahokia multi Count	Cahoki-an Total
0	East St. Louis	50	4	12.5	1	0	0	5
0	Tract 15A	0	0	0	0	0	0	0
0	11S34	0	0	13.043	3	0	0	3
2	13ML219	0	0	0	0	0	0	0
2	13ML130	0	0	0	0	0	0	0
4	14OT5	0	0	1.563	1	0	0	1
4	14OT308	0	0	0	0	0	0	0
7	25FT80	0	0	0	0	0	0	0
7	25FT54	0	0	0	0	0	0	0
8	25BW15	0	0	0	0	0	0	0
18	34GD1	0	0	0	0	0	0	0
18	34GV2	0	0	0	0	0	0	0
18	34GV22	0	0	0	0	0	0	0
18	34GV3	0	0	0	0	0	0	0
18	34GV32	0	0	0	0	0	0	0
18	34GV43	0	0	0	0	0	0	0

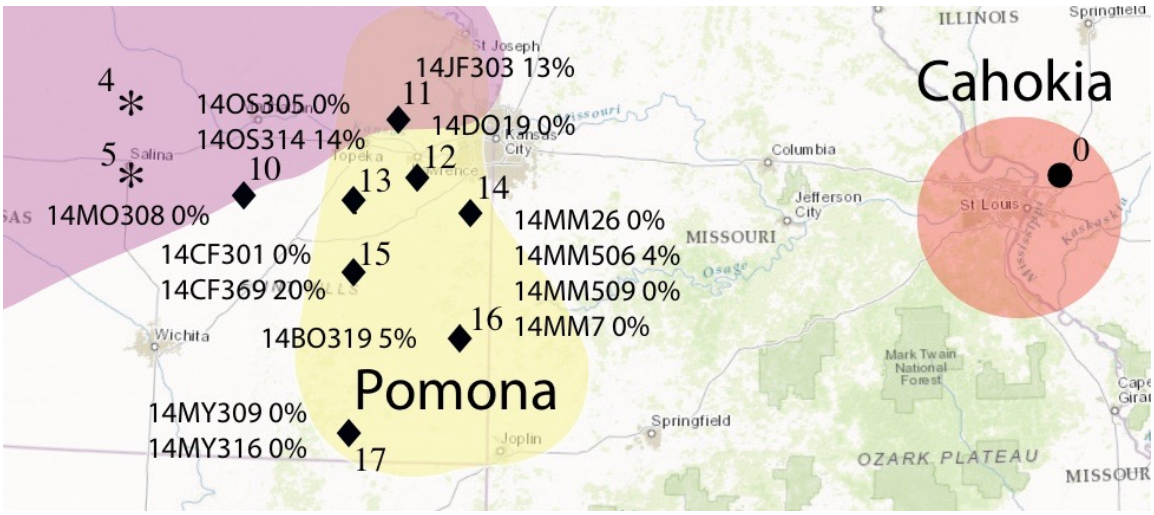

Figure 4.12. Cahokia Points at Pomona Sites

Table 4.26 Cahokia Points at Pomona Sites

Map #	Site	Cahokia Side %	Cahokia Side Count	Ca-hokia-tri	Ca-hokia-tri Count	Cahokia multi %	Cahokia multi Count	Cahokian Total
10	14MO308	0	0	0	0	0	0	0
11	14JF303	0	0	12.5	7	0	0	7
12	14DO19	0	0	0	0	0	0	0
13	14OS305	0	0	0	0	0	0	0
13	14OS314	0	0	14.28	1	0	0	1
14	14MM26	0	0	0	0	0	0	0
14	14MM506	0	0	4	1	0	0	1
14	14MM509	0	0	0	0	0	0	0
14	14MM7	0	0	0	0	0	0	0
15	14CF301	0	0	0	0	0	0	0
15	14CF369	0	0	20	1	0	0	1
16	14BO319	0	0	5.4	2	0	0	2
17	14MY309	0	0	0	0	0	0	0
17	14MY316	0	0	0	0	0	0	0

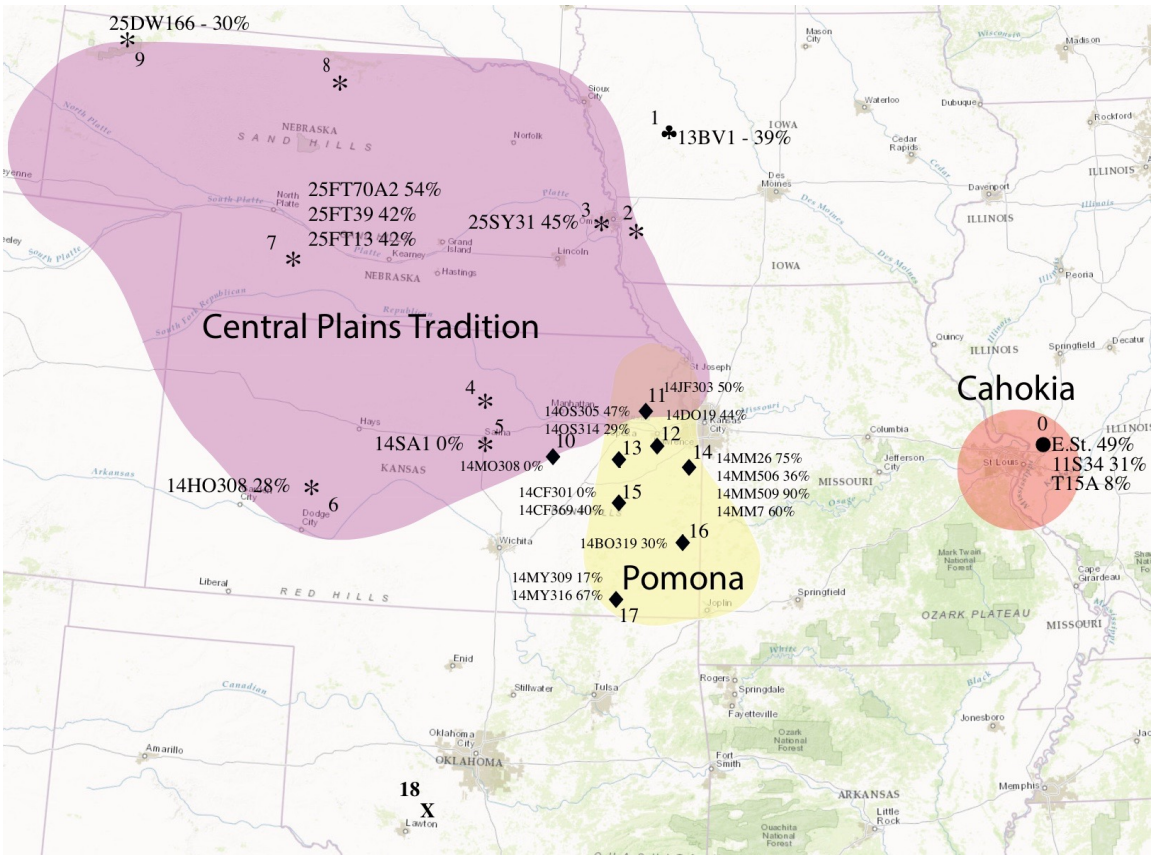

Figure 4.13. Unnotched Points AD 1050 - 1150

Table 4.27 Unnotched Points AD 1050 - 1150

Map #	Site	Unnotched %	Unnotched Count
0	East St. Louis	49.28	34
0	11S34	30.77	4
0	Tract 15A	8.33	1
1	13BV1	38.86	82
3	25SY31	44.88	57
5	14SA1	0	0
6	14HO308	28.13	9
7	25FT13	42.31	11
7	25FT39	41.67	5
7	25FT70 A2	54.17	13
9	25DW166	30.3	10

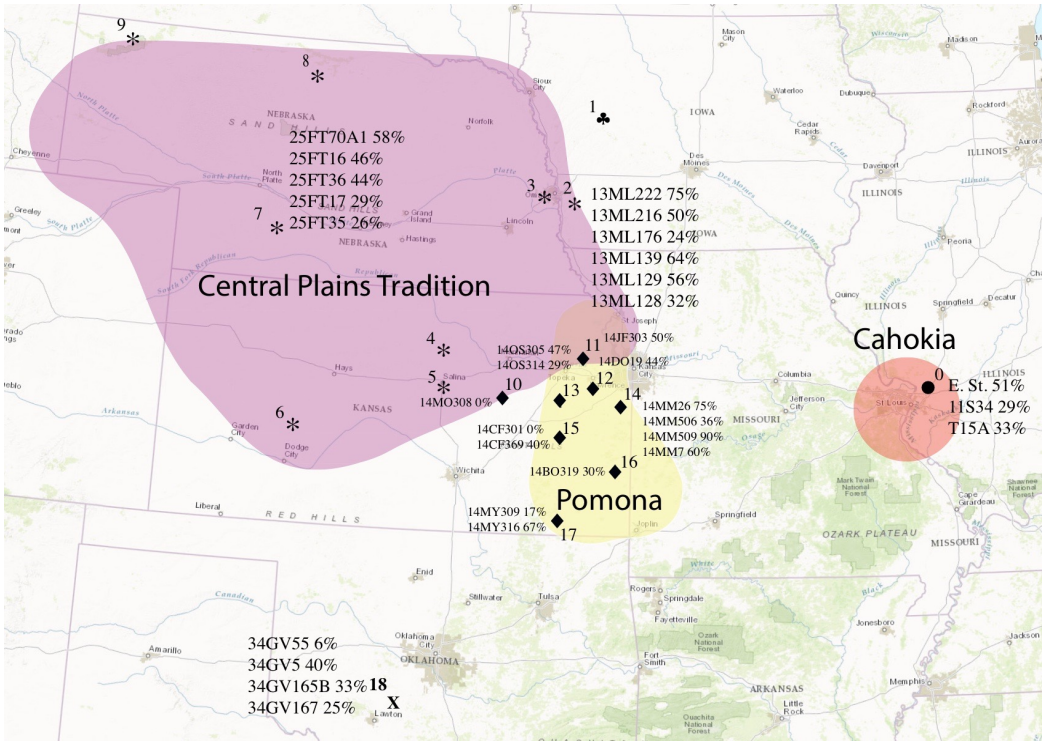

Figure 4.14. Unnotched Points AD 1150 - 1250

Table 4.28 Unnotched Points AD 1150 - 1250

Map #	Site	Unnotched %	Unnotched Count
0	East St. Louis	51.17	196
0	11S34	28.57	8
0	Tract 15A	33.33	1
2	13ML222	75	6
2	13ML216	50	2
2	13ML176	23.53	4
2	13ML139	64.1	25
2	13ML129	55.56	10
2	13ML128	31.71	13
7	25FT70 A1	58.33	7
7	25FT16	45.83	11
7	25FT36	43.75	7
7	25FT17	29.41	10
7	25FT35	26.09	6
18	34GV55	5.88	1
18	34GV5	39.47	15
18	34GV165B	33.33	3
18	34GV167	25	11

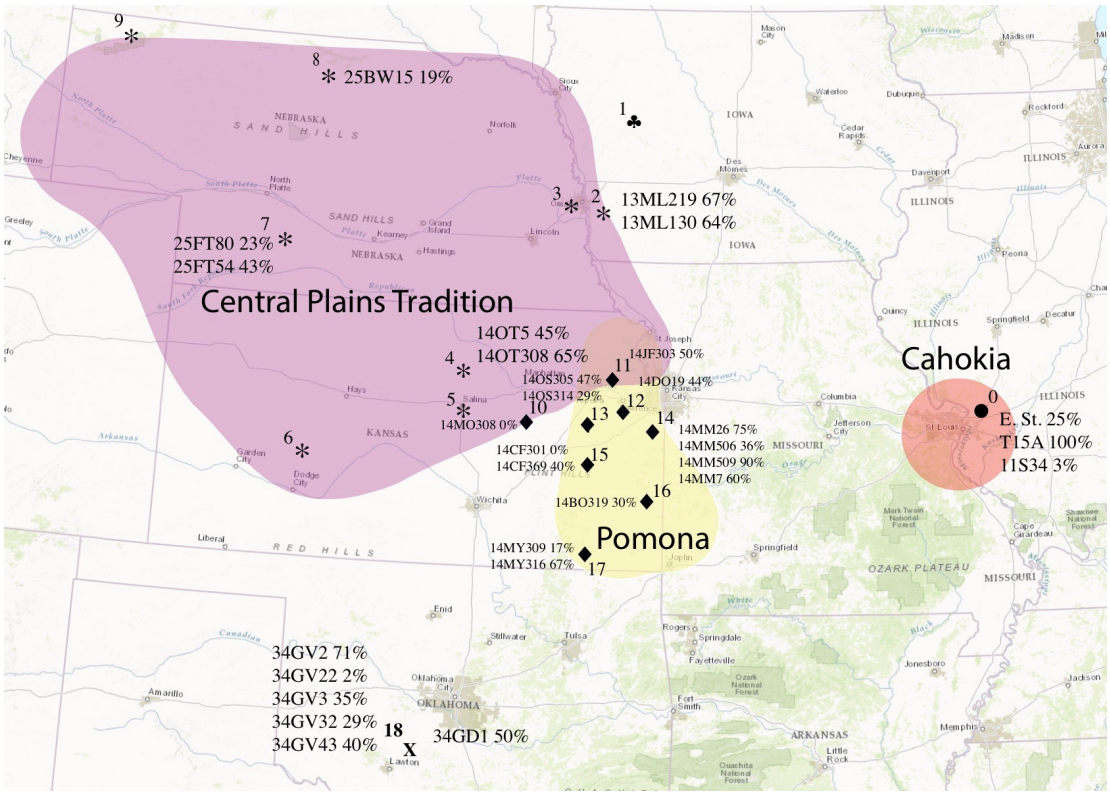

Figure 4.15. Unnotched Points AD 1250 – 1400

Table 4.29 Unnotched Points AD 1250 - 1400

Map #	Site	Unnotched %	Unnotched Count
0	East St. Louis	25	2
0	Tract 15A	100	1
0	11S34	30.43	7
2	13ML219	66.67	12
2	13ML130	63.93	39
4	14OT5	46.88	30
4	14OT308	64.71	11
7	25FT80	23.08	3
7	25FT54	42.86	3
8	25BW15	19.44	7
18	34GD1	50	56
18	34GV2	70.62	310
18	34GV22	1.52	1
18	34GV3	35.06	61
18	34GV32	29.41	5
18	34GV43	40.74	11

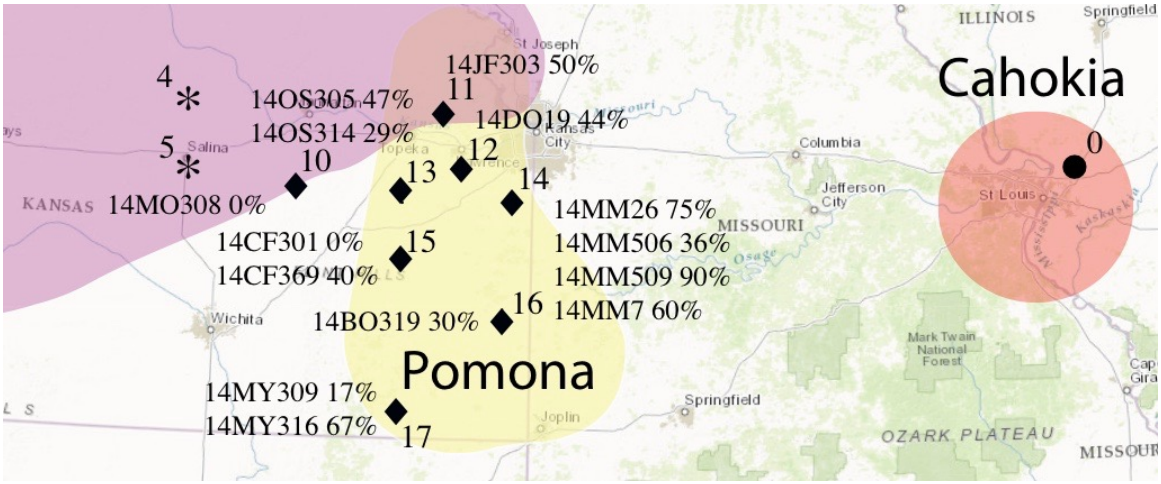

Figure 4.16. Unnotched Points at Pomona Sites

Table 4.30 Unnotched Points at Pomona Sites

Map #	Site	Unnotched %	Unnotched Count
10	14MO308	0	0
11	14JF303	50	28
12	14DO19	43.75	7
13	14OS305	46.67	7
13	14OS314	28.57	2
14	14MM26	75	3
14	14MM506	36	9
14	14MM509	90	9
14	14MM7	60	3
15	14CF301	0	0
15	14CF369	40	2
16	14BO319	29.73	11
17	14MY309	16.67	1
17	14MY316	66.67	4

Point Distribution Summary

In the first part of this section I proposed a number of questions I wanted to answer with my data set. The first questions revolved around the distribution of corner-notched points through time and space and, from these descriptive statistics, a tentative answer is available. Overall, we see corner-notched points were gradually replaced by side-notched points. At sites further to the east, closer to the American Bottom Mississippian center of Cahokia, corner-notched points were more fully replaced by side-notched points than they were at sites further to the west. The exception to this is the Pomona region. The Pomona people continue to make corner-notched points in the Plains Village period.

Corner-notched points appear in higher percentages in the western portions of the Great Plains, while they drop out almost completely in the east. During the early CPT, a low percentage of corner-notched points was relatively evenly distributed across the Great Plains. By the middle period there was an almost complete disappearance of corner-notched points in the eastern portion of the Great Plains. In the final time period corner-notched points had completely disappeared from the sites in the American Bottom. On the central Plains, the sites in the eastern portion have no corner-notched points. Yet sites in the northwest still maintain a low percentage of corner-notched points, like 25BW15 in northern Nebraska.

Side-notched points are fairly ubiquitous in all of the CPT, even in the earliest time periods. However, there is a pattern of higher percentages of side-notched points in the eastern portions of the Great Plains, decreasing from east to west. This corresponds with the increase of corner-notched points in the western Plains. It appears that while side-notched points did appear suddenly on the Great Plains during the CPT we can see the movement of these points east to west. There is also an increase in overall percentage of basally notched and multi side-notched

points through the CPT. Total percentages of basally notched and multi side-notched points increase in the middle and late time spans. I argue that the proportions of side- to corner-notched points is associated with Cahokian influence and Great Plains people either trading with Cahokia or attempting to emulate Cahokia style projectile points.

My data show that some people on the Great Plains were capable of making Cahokia side-notched points. In the American Bottom, Cahokia points become the most common point after AD 1100. After the expansion or boom at Cahokia, these points do spread westward onto the Great Plains. In the earliest time period there are only two sites on the central Great Plains with Cahokia style points: 14HO308 and 14SA1 in southern and central Kansas respectively. 14HO308 has two Cahokia tri-notched points and 14SA1 has one. During the middle CPT there is an increase in the number of sites on the central Great Plains with Cahokia type arrow points. The highest concentration of this is in the Glenwood sites in western Iowa (13ML sites). Cahokia points are also found in the Medicine Creek area of Nebraska (sites numbered 25FT--). The distribution of Cahokia points drops considerable in the 3rd time phase, corresponding to the decline of Cahokia. This shows, in the microcosm that is my data sample, the link between these sites and the American Bottom Mississippians, particularly those living at Cahokia. What is most interesting to note, when sites from the latest CPT period are compared, there is a certain patterning in Cahokia style points to corner-notched points: sites that have more Cahokia style points have very low percentages or no corner-notched points.

Unnotched points are also ubiquitous in all sites and time periods in this study and make up the largest percentage of points in many collections. Because of the high quantities of un-notched points, it is more profitable to look for absence rather than presence of these points. There are only a few sites with few to no unnotched points. In the earliest time period there are

two sites that deviate from this pattern. Tract 15A in Cahokia, which only has 8 percent unnotched arrow points (n = 1 unnotched point). 14SA1 has zero unnotched points. In the middle time period all of the sites have unnotched points. The percentage of unnotched points increases during this time period. The highest percentage is 75 percent. Unnotched points drop off in some sites in the final time period. The highest percentage on the Great Plains is 67 percent. However, 25BW15 only has 19 percent. In the American Bottom, all of the points Tract 15A are unnotched points

The Pomona sites show a slightly different patterning that the rest of the CPT sites. Although the Pomona site chronology is imprecise, all Pomona sites include corner-notched points. In the Pomona region there is no real patterning in the distribution of sites containing greater or fewer corner-notched points. Corner-notched points appear to be evenly scatted throughout ranging from 67 to 7 percent of the sites' points. Side-notched points also appear throughout Pomona sites. The numbers of side-notched points are on average lower than corner-notched points, but they are still making and using these points. There is not, however, a lot of variation of side-notched points in Pomona sites. Multi-notched and basally notched points do not appear in high frequencies in these sites. There are Cahokia tri-notched points in the Pomona sites. There are only 12 points, which make up six percent of the total points from all of the sites. Five sites have Cahokia tri-notched points: 14BO319, 14CF369, 14JF303, 14MM506, and 14OS314. However, there is not the same patterning of corner to Cahokia points on Pomona sites, where we see lower percentages of corner-notched points in CPT sites that have Cahokia points. Instead, Pomona sites that have Cahokia points have relatively high averages of corner-notched points.

The overall patterning demonstrated in these descriptive statistics suggests that, temporally, side-notched points appear on the Great Plains following the rise of Cahokia in the American Bottom. Spatially, Great Plains sites further to the east, closer to Cahokia, contained more, and better-made, side-notched points in comparison to corner-notched points. While this patterning existed among the CPT and at the single IMM site included here, Pomona sites do not exhibit the same patterning in projectile point morphology. The figures and tables presented here demonstrate these patterns. In the next section I delve deeper into these patterns observed. As described in Chapter 3, diversity indices and correspondence offer another way to look at these data and see the potential correlations between sites, time periods, and projectile point morphology.

COMPARISON BETWEEN MORPHOLOGICAL TYPES

Here, I expand on the information gathered through descriptive statistics in the preceding section and present additional data from several statistical tests. These tests include diversity indices and correspondence analysis, and further reinforce the patterning observed above as well as provide additional information concerning potential explanations for the observed patterns. Explanations of the statistical tests performed were given in Chapter 3 (Methods), and while these are not the only tests that were run, the statistical tests presented here are the ones which provide the greatest chance of contributing insight(s) into the temporal and spatial distributions in projectile point morphology in the study area.

Diversity Indices

The results of the diversity indices are presented in Figure 4.17. These tests include all point types and sites included in my data set. To review, diversity indices compare the number of morphological arrow point categories (richness) with individual arrow counts in each category to determine how homogenous the sample is. I used two diversity measures which calculate diversity slightly differently. Simpson's index values range between 0 and 1; the greater the value, the greater the amount of diversity exists within the sample. In the Shannon-Weaver Equitability index 0 represents no diversity (e.g., all points belonging to a single category) and 1 represents the maximum possible evenness (e.g., an equal number of points from each category). The corresponding graph shows how the diversity of arrow point morphology changes through time.

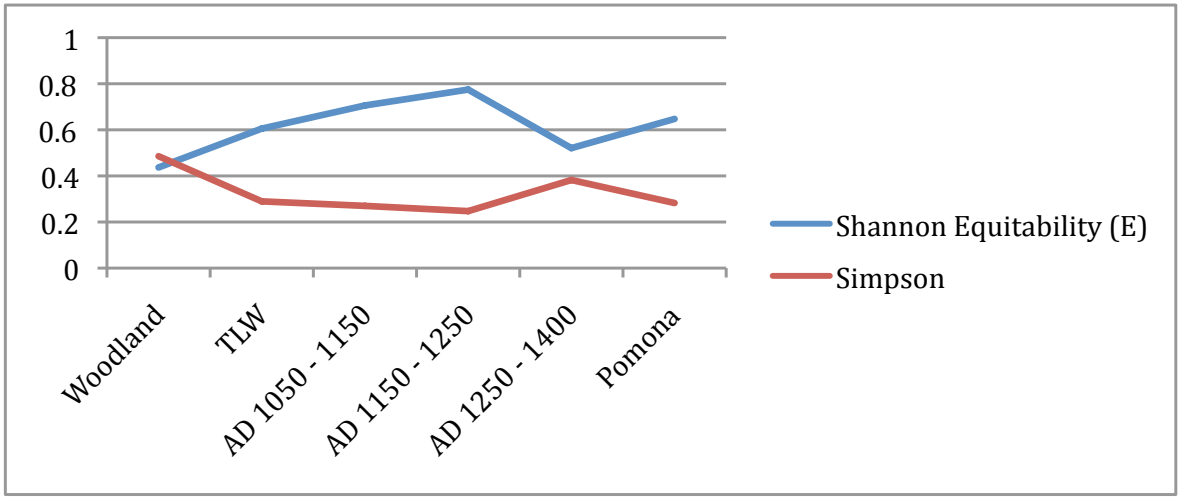

Figure 4.17. Diversity Indices

These indices show an overall pattern of increasing level of diversity in point types starting around the TLW and increasing until date code 3 (AD 1150-1250). This increase corresponds with the rise of Cahokia and the spread of new arrow morphology on the Great Plains. The diversity in point morphology drops rather dramatically in phase 3. Date code 4 (AD 1250-1400) corresponds with the decline and eventual collapse of Cahokia. This shows as Cahokia declines on the American Bottom there is an overall decrease in the diversity of point types across all the regions included in this study. These indices suggest that the rise and fall of point diversity correlates closely with the rise and fall of Cahokia. This shows the connectivity of the American Bottom and the Great Plains. The point morphology on the Great Plains appears to link back to cultural changes at Cahokia.

Correspondence Analysis

The second statistical test I ran included a number of correspondence analyses focusing on various time periods and regions. Correspondence analysis calculates the relationships between variables (here, projectile point morphological types and sites) and uses a set of points in a scatterplot along two perpendicular axes to graphically represent the cross-tabulations in the data. At the most basic level, the proximity between points in correspondence graphs demonstrates correlation—with close proximities meaning two sites or variables are more closely correlated than sites or variables which are further from one another (for more details, see Chapter 3—Methods).

Great Plains and American Bottom

The first correspondence scatterplot provides an overview of the Central Plains and American Bottom. This includes data from sites in both the American Bottom and the Central Plains. The Figure 4.18 includes all time periods and point collections from the American Bottom and Cahokia (AD 1050-1400). The data in this figure displays the overall pattern I expected across all temporal and geographical scales; corner-notched and stemmed points pull between the Woodland and Pomona sites. Both of these point types are associated with the Woodland period. It is interesting that the Pomona, which is correlated with central Plains farms, more closely corresponds in this figure with Woodland style points. The Pomona sites I look at for this study show an even number of side and corner-notched points and very limited evidence of Cahokia style points, and this graph shows that pattern. And for the Pomona's relatively close proximity to the American Bottom, there is no evidence of Cahokian pottery or reproduction (Roper 2006).

Code 2 (AD 1050 – 1150) and 3 (AD 1150 – 1250) sites are plotted in this figure closer to Cahokia side and multi notched points and all side-notched type points than to corner-notched and Woodland style points. Code three (AD 1250 -1400) pulls away from these types and is more closely associated with triangular unnotched points and unspecified side-notched points. This is a similar pattern seen in the previous diversity indices and those presented in the figures in the previous section (Chapter 4-Points in Time and Space); towards the end of Cahokia and in my last phase of the CPT there is a decrease in the diversity of point morphology and rise of unnotched points.

In this scatterplot the unspecified side-notched points pull the graph down. These are points that I could not classify further with the information provided. In the next Table (4.19) I removed this category of points. This table offers a better look at main cluster without the unspecified category. The scatterplots reorients some of the categories. In particular the different time periods move and align with new point categories. The site group AD 1200-1400 is now closer to side-notched points and unnotched triangular. And AD 1150-1250 is the closest to all of the Cahokia side-notched points styles.

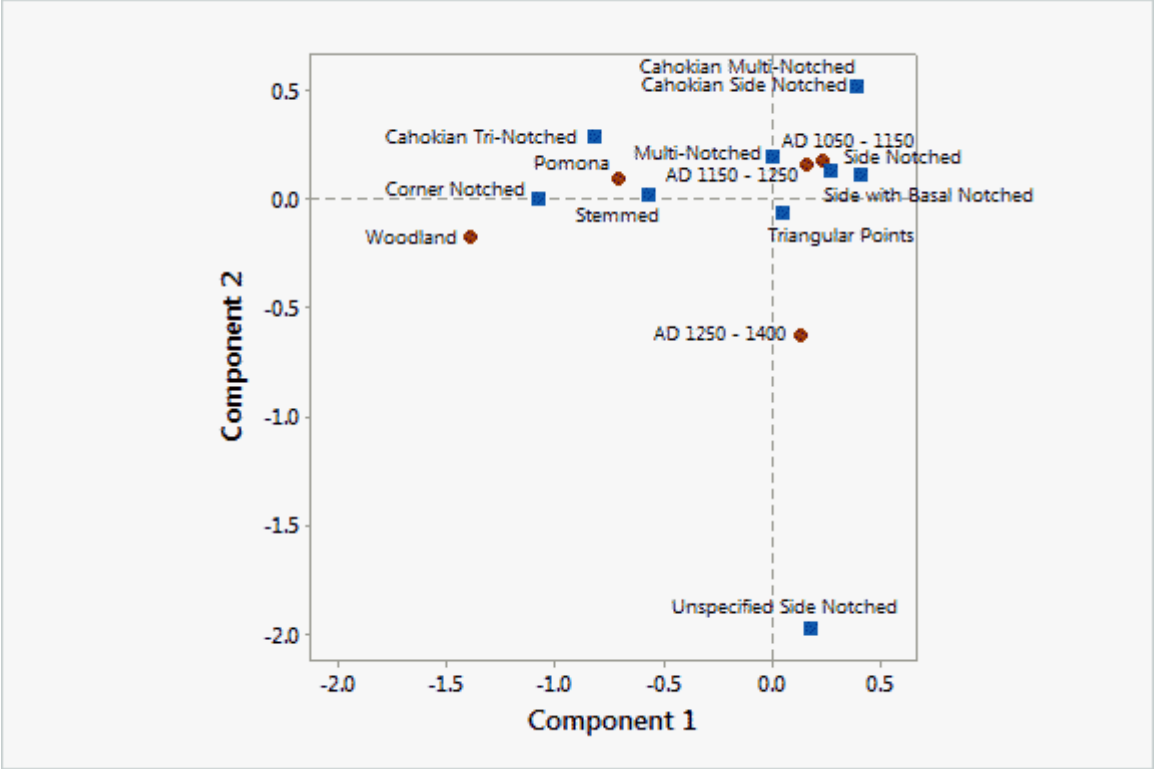

Figure 4.18. Correspondence Analysis of American Bottom and CPT Sites AD 1050 - 1400

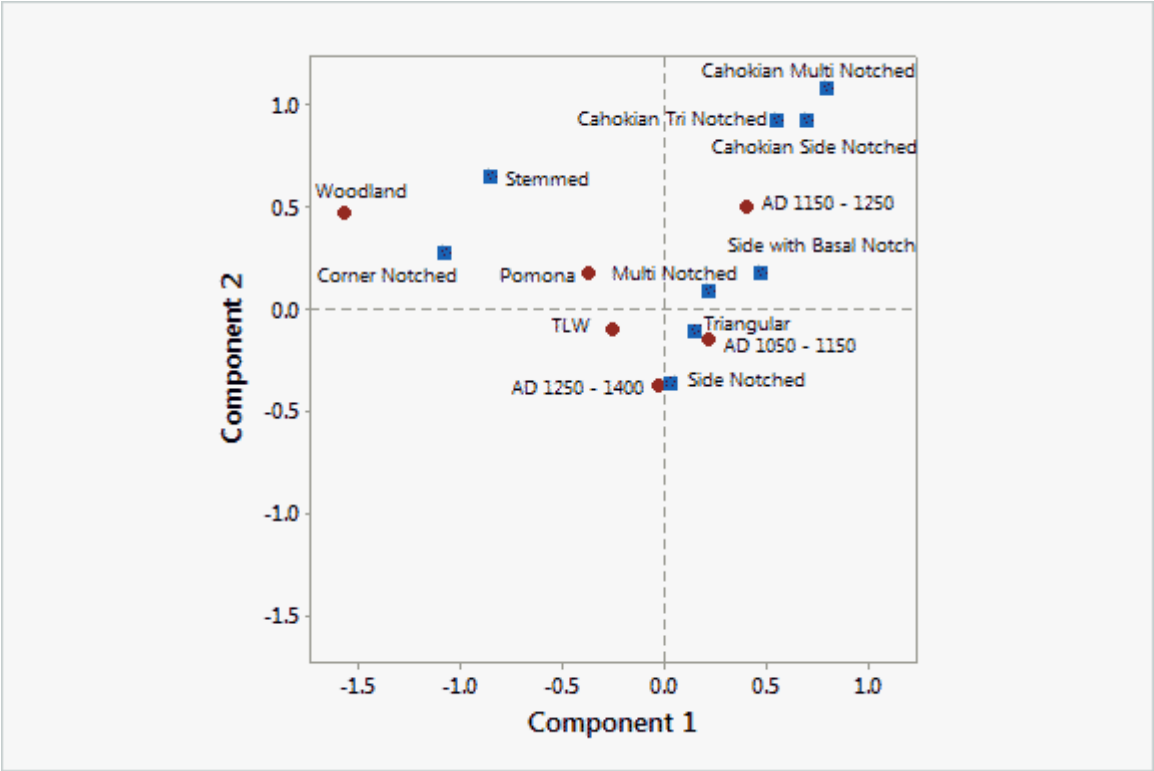

Figure 4.19 Correspondence Analysis American Bottom and CPT Sites AD 1050 - 1400 without Unspecified Side Notched points

Central Plains

The second set of correspondence scatterplots only includes data from the central Great Plains (figures 4.20, 4.21, 4.22). These graphs show similar patterns as the maps presented earlier in this chapter, but in a way that shows the relationship or degree of correlation between individual sites and point categories. In addition, due to the fact that the cross tabulations used in correspondence analyses provide more information as to the relationship between variables, these tests provide additional information into how these associations vary between time periods. The three graphs show a change is point morphology that mirrors the rise and decline of Cahokia.

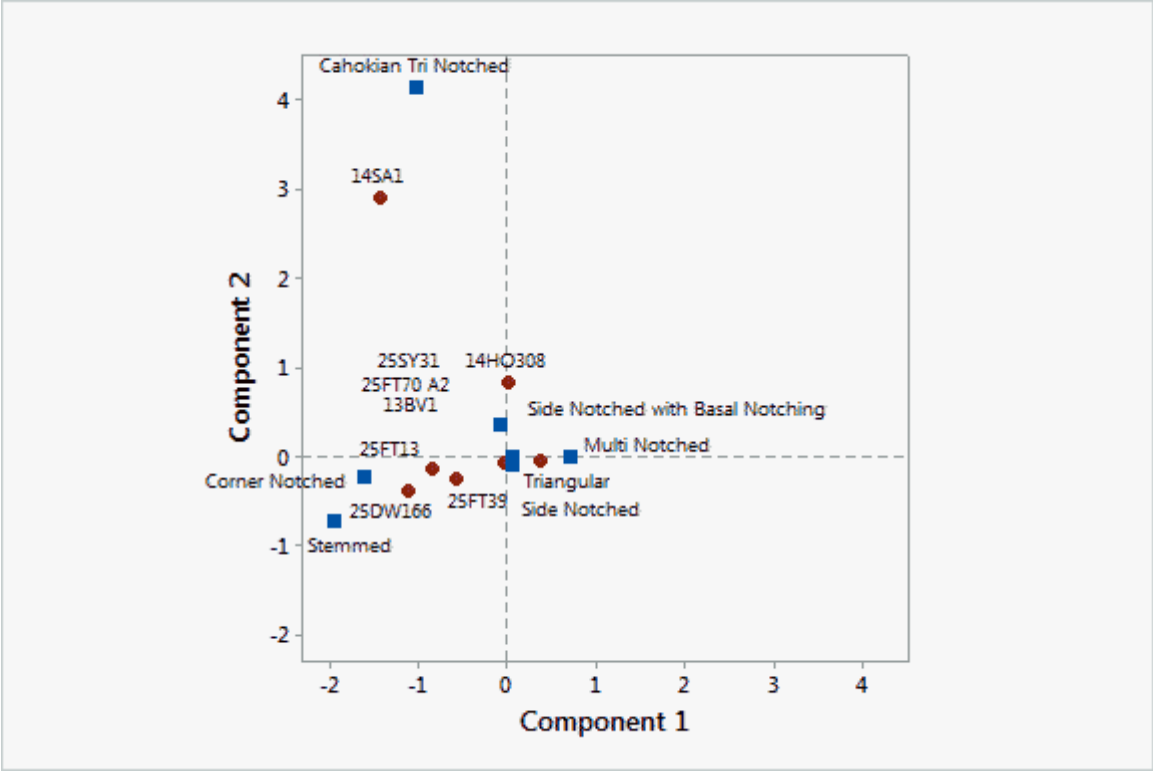

Figure 4.20. Correspondence Analysis CPT Sites AD 1050 - 1150

Figure 4.21. Correspondence Analysis CPT Sites AD 1150 - 1250

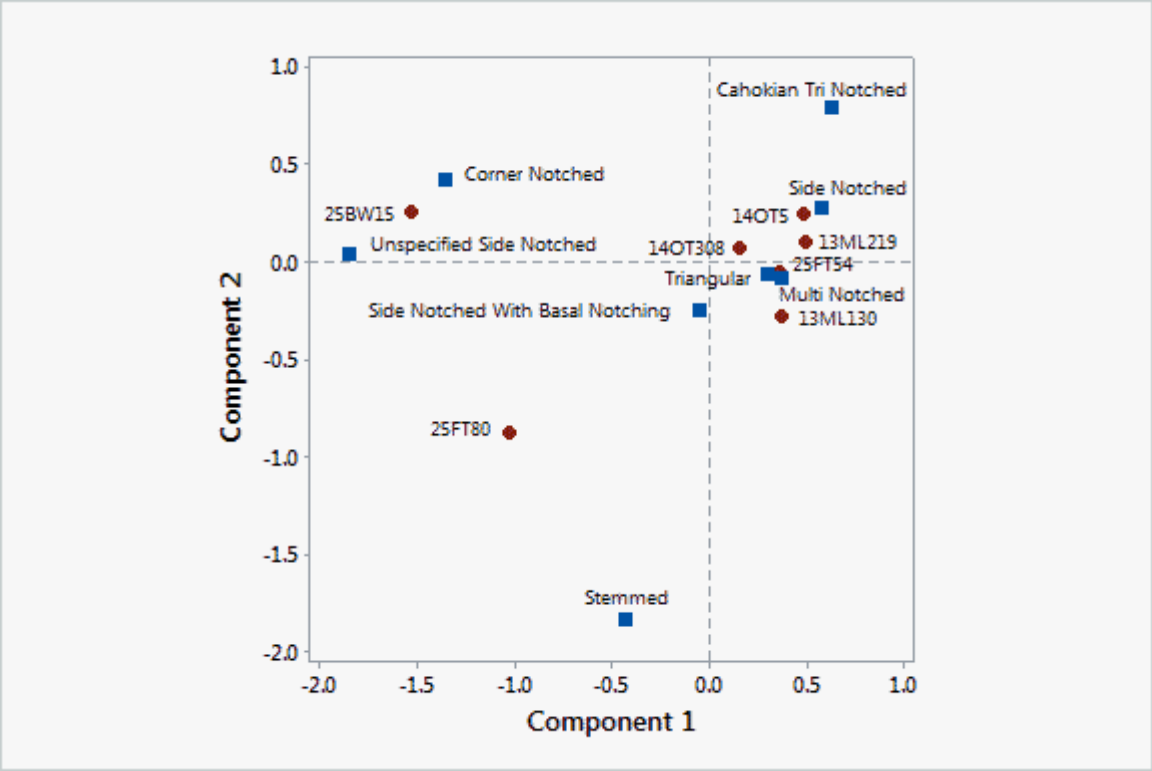

Figure 4.22 Correspondence Analysis CPT Sites AD 125-1400

These clustered scatterplots are complex, but when viewed together, show the slow movement away from corner-notched points through the three CPT time periods. In date code 2, the corner-notched category, although slightly off to one side it is in close proximity to the major grouping of sites. But in the latter two phases (date code 3 and 4) the corner-notched category, and to a great extent the stemmed category, pulls away from the major clustering of groups. However, in all three of the scatter plots the corner-notched category is located closest to CPT sites in the western Plains. We also see the movement of Cahokia notched points towards the sites in the date code 3 and their relative distance in the 2nd and 4th code. When the placement of Cahokia points is viewed within the context of the diversity indices presented above and the descriptive statistics presented in the previous section, the closer relationship between CPT site and Cahokia points during date code 3 (AD 1150-1250) helps to explain the relationship between

Cahokia and the Great Plains during this time period. The sites are clustered together in close proximity to Cahokia tri-notched points and side-notched points. However, in code 4 (AD 1250-1400) there is a rapid decline in this association. This corresponds with the cultural decline and abandonment happening in Cahokia. These graphs again illustrate the cultural influences from Cahokia on the Great Plains and how the two regions are linked.

SUMMARY OF RESULTS: IMPLICATION OF STYLE

So far in this chapter I reviewed the different ways I broke down my data set and what this different methods say about the distribution of arrow points across time and space. The maps of the different time phases show the changes in percentages of arrow points across the Great Plains through time. We see the almost total replacement of corner-notched points by side-notched points on the eastern Plains from ca. AD 1050 to 1150, while sites in the western Plains retain many corner-notched points. We also see the rise and fall in percentages of Cahokia side-notched points on the Great Plains. This pattern is closely correlated with the culture history of Cahokia (see Chapter 1). The period with the highest percentage of Cahokia notched points corresponds with the height of Cahokia during the Sterling phase (AD 1150-1250). The diversity indices and correspondence analysis solidify the patterning shown in the maps and suggest that Cahokia and the American Bottom Mississippians likely influenced the arrow points produced on the Great Plains. These results allow me to address the questions listed at the start of this chapter concerning the variation of point types across time and space on the Great Plains. The first questions asked where the highest percentages of corner-notched points were located and are corner-notched points completely replaced on the Great Plains or do some sites continue using them? Next I asked how the change from corner to side-notched points is seen through

time and space on the Great Plains. Finally I asked a number of questions about the distribution of Cahokia style points and the variations in side-notched points. Particularly does the patterning of Cahokia points lessen from east to west? In what time periods do we see the highest number of Cahokia points?

We see the highest percentages of corner-notched points are located in the western portions of the Plains. And we see the continued used of corner-notched points even in the last time period (AD 1250-1400). The sites with corner-notched points also have little to no evidence for Cahokia points, further reinforcing the idea that side-notched points on the Great Plains, even those that are morphologically distinct from Cahokia side-notched points, are associated with interaction with the American Bottom. In the eastern Plains there are fewer corner-notched points overall, and higher percentages of Cahokia side-notched points. This is especially true in the second time phase (AD1150-1250) during Cahokia's peak. Side-notched points are the dominant point type in the eastern Plains sites. This may indicate people in these sites attempting to emulate Cahokia style points locally rather than import or trade for them. In these same sites, ones with higher percentages of Cahokia side-notched points, there is more diversity in side-notched points in terms of basal and multi-notching. The patterning of Cahokia side-notched points is highest in sites on the eastern Plains where there are other indications for Cahokia interaction. These patterns are shown in both the maps and the diversity indices and correspondence analysis graphs, as well as through raw percentages of projectile points present at various sites.

The patterning documented here has several potential implications. As discussed in Chapter 2 (Theory), style can serve multiple functions. The data presented here have shown an association between the spread of side-notched projectile points and the influence of the

American Bottom Mississippians. Explanations for this spread include trade and migration of Mississippian people onto the eastern Plains, but I find the most persuasive explanation to be that CPT people living on the Plains chose to start making and using side-notched projectile points in order to be part of the developments occurring at Cahokia. Style, while restricted by functional uses, serves as a means of signaling personal and group identity. I argue side-notched on the Great Plains are an attempt to emulate Cahokia side-notched points. The variation we see in side-notched points on the Great Plains are caused by differential levels of skill (see Chapter 2). If the increase in side-notched points at eastern Plains sites ca AD 1150-1250 is associated with local emulation of Cahokia side-notched points, then the variation we see may be the result of variations in skill level of flint knappers or other restraints such as available raw materials.

Alternative Explanations: A Case Study in Point Variation and Subsistence

While I find explanations rooted in theoretical discussions of style, enculturation, and human decision making to be the most persuasive, other explanations are possible. One alternative explanation for the documented transition from corner- to side-notched projectile points is technological change. This change in arrow point type could also reflect in change in hunting patterns between the Woodland period and the CPT. Robert Bozell (2013) reviewed a change in bison hunting intensity on the central Great Plains. Bozell found a marked difference between these two periods, with Woodland people relying more on bison hunting. The density of bison bones varied from east to west on the Great Plains; moderate bison bone density in the west and low in the east (Bozell 2013). However, in the CPT this reliance on bison appears to drop off, although it varies widely from site to site. The CPT sites used in Bozell's study show

more diverse faunal assemblages and a lower density of bison remains. Bozell offers a number of explanations for this change in hunting practices, including environmental change, the nature of the archaeological record, and human choice. Bozell concluded that the environmental explanation for this change makes the best sense with the current data. During the CPT the climate went from a wetter climate to a cool and dry environment. This cool-dry climate meant poor forage growth for the bison food supply and resulted in "small, fast-moving, unpredictable herds" (Bozell 2013:154). For this reason, the people of the CPT had less bison to hunt and had to rely on other local animals for much of their meat. This could have also been a conscious decision on the part of CPT people. Bozell cited Osborn (1987) who argued that people in the eastern portion of the Central Plains tradition deliberately focused more attention of deer, even through bison were readily available. For whatever the reason, there was at least a partial shift in hunting strategies from the Woodland to the CPT which may mean the change in projectile point type could reflect a need to change the point type to better suit the need.

In order to look at point variation and prey choice to address the possible influences prey choice may have exerted on projectile point morphology during my study time periods, I focused on four sites located in the central Great Plains. Three of these sites are from the CPT: 25HN36, 25FT35 (Mowry Bluff), and 25BW15 (McIntosh). The fourth site is a Plains Woodland site, 25GO2 (the Wallace site) (see Figure 4.23 for map of sites). These sites were chosen based on the diverse nature of their faunal collections and on the fact that those collections have been carefully studied. The faunal data from the three CPT sites were collected from Amy Koch (2004). Koch tabulated the NISP for a number of sites to compare with the McIntosh faunal collection. I should note the Wallace faunal information is in MNI and not NISP. Despite this

shortcoming, because I focus here on the percentages rather than raw counts, the sites can be compared, although not without some caveats. I focus on comparison between the percentages of small mammals, deer/pronghorn, and bison/elk.

Figure 4.23. Sites included in Case Study

As shown in Tables 4.31 and 4.32, the sites sampled for this case study contain a diverse assemblage of both faunal and point collections. The points included in this case study are only arrow tips. We see a rather diverse data set in both the faunal and point collections. Small mammals appear to be the most dominant prey choice for all the sites. However, it may not be useful to look at this category to study arrow point selection. I discuss in chapter 2 the variation in arrow tip selection and it seems that people use stone tipped arrows the most when hunting

large game (and warfare). It may be the most of the animals in the small mammal category were hunted using organic tipped arrows or possibly traps or snares. Therefore I focus on the larger game categories of deer, pronghorn, and bison.

Table 4.31 Faunal Distribution Percentages within Case Study Sites

Site	Small Mammals	Deer/ Pronghorn	Bison/Elk	Analysis Category	Sources	Phase
25GO2	17	69	6	MNI	Winfrey 1991	Woodland
13PM91	67	10	8	NISP	Benn 1990	Woodland
14PA303	31	30	20	NISP	Hoard and Bozell 2016	Woodland
25FT35	39	9	13	NISP	Koch 2004 and Falk 1969	CPT
25BW15	3	1	16	NISP	Koch 2004	CPT
25HN36	39	32	1	NISP	Koch 2004	CPT

Table 4.32 Point Distrubtion at Case Study Sites

Site	All Side	All Cahokia	Corner	Stemmed	Unnotched	Total	Phase
25GO2	0	0	38	2	4	44	Woodland
Percentage	0	0	86.36	4.55	9.09		
13PM91	3	0	0	0	5	8	Woodland
Percentage	37.5	0	0	0	62.5		
14PA303	0	0	60	0	6	66	Woodland
Percentage	0	0	90.91	0	9.09		
25FT35	11	3	1	2	6	23	
Percentage	47.83	13.04	4.35	8.7	26.09		CPT
25BW15	21	0	8	0	7	36	CPT
Percentage	58.33	0	22.22	0	19.44		
25HN36	7	0	0	0	0	7	CPT
Percentage	100	0	0	0	0		

Table 4.33 summarizes the faunal data and frequencies of side- and corner-notched points in Tables 4.31 and 4.32, taking the ratio of bison/deer and antelope as an overall measure of bison dependence. There is no obvious relationship between dependence on bison or deer and

antelope and point styles: for example, 25BW15 is bison-dominated and produced a high percentage of side-notched point, 25HN36 is deer/antelope dominated and produced only side-notched points, and 25GO2 is deer/antelope dominated and produced almost entirely corner-notched points. If hunters used side- and corner-notched points to take different prey, these data do not show it.

Table 4.33 Summary of Faunal and Projectile Point Data

Site	% Bison	% Deer/Antelope	Bison/Deer and Antelope	% Corner Notched	% Side Notched
25GO2	6	69	0.09	86.4	0
13PM91	8	10	0.8	0	37.5
14PA303	20	30	0.7	90	0
25FT35	13	9	1.4	4.4	47.8
25BW15	16	1	16	22.2	58.3
25HN36	1	32	0.03	0	100

Shaft Abraders and Point Change

Based on the data presented above, the technological requirements of bow hunting may have played as large a role in changes of projectile point morphology as style. Stone arrow points are relativity simple to make if you know what you are doing. Arrow shafts, however, are more expensive in time and resources.

Figure 4.24. Shaft Abraders from 13ML176. Photo taken by Erin Hughes at Iowa State Archeologist Office

Sinopoli (1991) talks about how involved the process of making arrow shafts are, noting arrows on average can take two to three days to make. At the same time we see the replacement of corner-notched with side-notched projectile points in the Great Plains, there is a corresponding increase in the manufacture and use of shaft abraders (also referred to as grooved abraders, u-shaped abraders, slot abraders, and shaft polishers). Donald J. Blakeslee (1999) proposed that the influx of shaft abraders after the transition from Late Woodland to Central Plains tradition is due to the morphological difference between the hafting elements required for corner notched and side notched arrow points. Blakeslee (1999:127) explained that corner-notched points do not require a precise diameter of the arrow shaft, "as there will likely be a place along the corner notch where it will be possible to tie the point tightly to the shaft." Because of this, these points did not require the arrow shafts to be smoothed down to a single uniform size. However, side notched projectile points do not allow for a wide variation in notch width or shaft diameter, thus requiring arrow shafts to be relatively uniform in size and explaining the increase of shaft abraders after the Late Woodland on the Great Plains that appears to co-occur with the shift to side notched projectile points (Blakeslee 1999). Based on my research thus far, Blakeslee is the first person to talk in any detail about the effects of changing projectile point types on the production of the whole arrow, although a few have very briefly mentioned this correlation (see Roper 2006; Kivett and Metcalf 1997).

In order to look at the relationship between side-notched points and shaft abraders, I calculated the coefficient of variation for shaft abraders to all side-notched points. Using the statistical program SPSS, I calculated the ratio of shaft abraders to all side-notched points (side-notched, basal, and multi notched points). Then calculated the mean and standard deviation for Phase 1, 2, and 3 CPT sites in the different geographic regions. The coefficient of variation (CV)

was calculated by dividing the standard deviation by the mean and multiplying the quotient by 100 (CV = (σ / μ)* 100). Coefficient of variation describes the relative variability of shaft abraders and side-notched points. I chose to run this test including all side-notched points because of the hypothesis put forth by Blakeslee and this category offered the largest sample to compare with. I attempted to run the same test with Cahokia style points on the Great Plains, but the sample size was too low to get a reading from.

Table 4.34 Regional Manufacture Ratios AD 1050 - 1150

Region Codes	Mean	N	Std. Deviation
American Bottom	9.154	1	n/a
Eastern Plains	0.276	1	n/a
Central Plains	0.25	1	n/a
Western Plains	0.592	5	0.879
Total	1.580	8	3.135

Table 4.35 Regional Coefficients of Variation AD 1050 - 1150

Region	Coefficient of Variation
American Bottom	n/a
Eastern Plains	n/a
Central Plains	n/a
Western Plains	148.48

Table 4.36 Regional Manufacture Ratios AD 1150 - 1250

Region Codes	Mean	N	Std. Deviation
American Bottom	4.5	1	n/a
Eastern Plains	0.241	6	0.282
Western Plains	0.690	5	0.523
Southern Plains	0.186	4	0.062
Total	0.633	16	1.101

Table 4.37 Regional Coefficients of Variation AD 1150 - 1250

Region	Coefficient of Variation
American Bottom	n/a
Eastern Plains	117.29
Western Plains	75.85
Southern Plains	33.14

Table 4.38 Manufacture Ratios AD 1250 - 1400

Region Codes	Mean	N	Std. Deviation
American Bottom	1.957	1	n/a
Eastern Plains	0.149	2	0.025
Central Plains	0.629	3	0.933
Western Plains	0.039	2	0.054
Southern Plains	0.021	6	0.034
Total	0.310	14	0.649

Table 4.39 Coefficient of Variation AD 1250 - 1400

Region	Coefficient of Variation
American Bottom	n/a
Eastern Plains	16.87
Central Plains	148.44
Western Plains	141.27
Southern Plains	162.94

I cannot compare all of the regions throughout time because of small sample sizes, but the measurable samples shows an interesting pattern. In phase 2 (AD 1150-1250) the overall variability of the shaft abrader to side-notched point ratio decreases from the eastern Plains to the western and southern Great Plains. The high CV (117%) in eastern Plains sites at this time

occurs at the same time as Cahokia's peak. This suggests that there was greater intersite variation in arrow production in the east than elsewhere, a pattern consistent with the possibility of higher levels of household or community specialization or inequality between communities. This occurs at the same time we see the highest number of Cahokia points on the Great Plains, suggesting that there could have been specialization in arrow point manufacture as well, with Cahokia points perhaps representing the products of the most-skilled artisans. However, patterns in the following period are not consistent with this.

In Phase 3 (AD 1250-1400) the CV drops considerably in the eastern Plains. This may be a reflection of Cahokia's decline and eventual collapse and its effects on the people on the eastern Plains. If the shaft abraders on the eastern Plains are an indication of arrow productions linked to Cahokia this decrease during Cahokia's decline is not a coincident. However, while the CV decreases in the eastern Plains, the variability increases in the all of the other regions.

If my argument about specialization is correct, this pattern suggests that specialization largely disappeared in the eastern part of the Central Plains and increased elsewhere. People did not produce Cahokia points in these areas, though, and the absence of these points, then, could imply that they were not just the result of great skill but were, instead, intentional products meant to reproduce Cahokia-style points.

Although limited in scope due to the small sample size, what these tests demonstrate is that the adoption of side-notched points on the Plains was more complex than simply a technological or stylistic choice. Because the distributions of high shaft abrader ratios and high percentages of side-notched projectile points are both concentrated in the eastern Plains, the introduction of side-notched projectile points and the accompanying necessary changes to arrow shaft production on the Great Plains appear to both have occurred around ca. AD 1100 as a result

of Cahokian influence. These changes were likely not simultaneous, and may have occurred at slightly different times in different areas, but represent two changes that may have had different motivations but both became interconnected within an arrow.

There may or may not be noticeable differences in the manufacturing costs (in time and raw material) between corner- and side-notched projectile points. I spoke with a colleague and skilled flint-knapper Robert Rohe about the differences in production of side- and corner-notched projectile points. Rob said that corner-notched points are "slightly more forgivable than side-notched" (Rohe personal communication 2014). He explained when you create the side-notches on a biface you are putting pressure on the middle of the biface and therefore you increase the chances of snapping the biface during production. During the production of notches you have a limited choice in finger placement, which means you end up placing more pressure near the proximal portion of the biface. Rohe said " I think I've snapped more points with my securing fingers being too far towards the front than I have while actually trying to notch" (Rohe personal communication 2014). He went on to say corner-notched points the notches are closer to the distal portion of the biface and therefore you have more room to for your finger placement along with the pressure you have to place for the notches.

However, when I spoke with another prominent flint knapper, Larry Kinsella, he offered an opposing opinion. He told me that in general, side-notched projectile points are easier to make than corner-notched points. He said that the side-notched points he produces tend to be broader and that notches are easier to put in to place. Conversely, corner-notched points tend to be thinner and the "ears" of the notches are easily snapped off (Kinsella personal communication 2014).

These two conversations, while a small sample, demonstrate some of the variability between different flint knappers and their personal preferences when making arrow points. The differences between the manufacture of corner and side-notched points depends on the flint knapper. I argue the transition from corner- to side-notched points was a solely stylistic choice where people chose to adopt new projectile point morphologies emanating from the American Bottom. When the entire tool (the arrow) is viewed together, we see that this transition required more than a choice by flintknappers; it also required new methods for making the arrow shaft and a new type of groundstone technology—shaft abraders. These new methods and new technology likely also originated in the American Bottom, but would have been more complicated to emulate and required more specific knowledge than the change in notch location would have required. For CPT people living in the western Great Plains, far from Cahokia and its influences and knowledge, the entire "package" of a new projectile point type and the requisite changes to arrow shafts may have been more difficult to acquire and been associated with fewer benefits, leading people to be more reluctant to change point types. In short, what may have seemed a simple and obvious choice in the eastern Plains which served to align oneself with the American Bottom may have seemed a complicated and less worthwhile choice further away due to the complex interrelations of style and technology present in a single arrow.

SUMMARY OF RESULTS

Throughout this thesis, I argue that the change to side-notched points during the CPT is a result of cultural influences from Cahokia. This chapter offers evidence for this cultural influence. First I presented an overview of the changes in arrow points through time in the American Bottom and across the Great Plains. I presented a series of maps to illustrate the

difference in point distributions through time and space on the Great Plains. These maps show that while CPT people continued to use corner-notched points into the late CPT (AD 1250-1400), the sites on the eastern Plains saw an almost total replacement of corner-notched points with side-notched. Co-occurring with this replacement is an increase in the number of Cahokia points on the Great Plains. These changes correspond with the increase in power in the American Bottom and Cahokia's peak around AD 1100/1150. Through all the temporal phases I analyzed, the number of side-notched points and diversity of side-notched types increases. I argue that this trend and timing is because the people on the central Plains were attempting to make Cahokia style-notched points.

The data I have gathered provides evidence for connections between Cahokia and the Great Plains during the CPT. Graphs of diversity indices suggest a connection between Cahokia's development and decline and the types of arrows made in the American Bottom and the Great Plains due to the fact that projectile points become increasingly more diverse from the TLW through the rise of Cahokia, and become markedly less diverse after the decline of Cahokia. Correspondence analysis provides another view of the association between point types and sites in the different time periods. The correspondence scatter-plots show a strong association between the sites I analyzed and Cahokia style points during phase 2 (AD 1150-1250). In contrast, Pomona sites were plotted in close proximity to sites dating to the Woodland phase and corner-notched points. Overall these tests show a pattern of change on the Great Plains that correlates with changes in the American Bottom.

While my analysis demonstrated an overall pattern of adoption of side-notched points corresponding with the development and decline of Cahokia, I also noted differences among the CPT sites, with higher percentages of side-notched points at eastern than western CPT sites. I

argued that one possible answer to this variation is based on the different technological requirements of arrows with side- as opposed to corner-notching. The presence of more groundstone tools, specifically those called "shaft abraders," at sites with higher quantities of side-notched points suggests that the transition required learning how to make arrows in a different way. This suggests that other implications are present for the transition from corner- to side-notched arrow points, and shows that the adoption of side-notched points on the Plains was more complex than simply an isolated technological or stylistic choice.

5 Summary, Implications, and Future Directions

The subject of this thesis started with a rather simple question: why are there so many corner-notched points at the King site (25DW166)? The King site dates to the 12th century and has produced maize and gardening tools (Bamforth personal communication 2015); the people who lived there manufactured Central Plains Tradition pottery (Laundry 2012). During the 2014 excavations at the King site (25DW166) we found a number of projectile points, the majority of them corner-notched. After yet another corner-notched point came out of the excavation Dr. Bamforth expressed that it was interesting we were only finding corner-notched points when CPT sites generally have side-notched points. The King site highlights the problem I address here: we know that there was an overall transition from corner- to side-notched points on the Central Plains, but we do not know how that transition occurred, how it varied in time and space, or what caused people to change the ways they made arrow points.

The change from corner to side-notched arrows during the Central Plains tradition is well recorded in archaeological literature. The side-notched arrow point is one of the hallmarks of the CPT. However researchers have not delved into the reasons for *why* this changed occurred. I hypothesized that the change to side-notched arrow points during the CPT is linked to cultural influences from the Mississippian polity Cahokia. The evidence I present here supports this interpretation. My research showed that the change in arrow points on the central Great Plains correlates with cultural changes in the American Bottom over time and on the Plains landscape. In this chapter I summarize the previous chapters, talk about the implications for this research, and discuss future research.

SUMMARY OF CHAPTERS

The first chapter of this thesis covered the culture history of the American Bottom and the Great Plains. I showed the connections between these two regions, dating back to the Middle and Late Woodland periods. Right after Cahokia's "Big Bang" there was a major change in lifeways throughout the Great Plains and a new point style appeared on the Central Plains. Farming on the Great Plains started in the eastern margins of the Plains and spread westward through the river systems. I cover the cultural variation seen throughout the Plains Village period and Central Plains tradition. Finally, I discussed the evidence for Cahokia's interaction with the people of the Great Plains.

In chapter two I cover the ideas of style and function, with a focus on how these ideas transmit information about identity. In this chapter I also focus on all the different factors affecting arrow and arrow point variation. We see, unsurprisingly, that the arrows and arrow points are constrained by their intended purposes. This in turn can account for some of the variation we see in the archaeological record. Differences in skill level among flint knappers also cause variation in arrow points. Here I suggest much of the variation we see in side-notched points on the Great Plains is due in part to variation in skill, the available raw materials, and down-the-line exposure to Cahokian points.

Chapter three covers the various methods I used to collect, organize, and analysis my data. All of my analytic categories were created to organize the data in a way that allowed me to best examine the change in time and space on the Great Plains. My organization also allowed for easy comparisons with the American Bottom. In this chapter I covered the criteria I used to select sites for collection analysis. My analysis examined well-dated sites with domestic

structures. All of the arrow points used in my data set came from excavated features to avoid accidentally including points from earlier or later periods.

The data results were covered in detail in chapter four. Here we see how the patterning of points changed through time and space on the Great Plains and the American Bottom. The changes in point types of the Great Plains appear to correlate with cultural changes at Cahokia. The frequency of Cahokian side-notched points on the Great Plains peaked during Cahokia's golden age (AD1150-1250) and the percentages declined with Cahokia. This shows the extent of the cultural influences on the Great Plains from Cahokia. The diversity indices show how variations in point types increases during Cahokia's rise in both the American Bottom and the Great Plains and decreases after Cahokia's initial collapse. The descriptive statistic I discuss demonstrated the change in arrow point morphology corresponded with Cahokia's development.

In this chapter I also look at other possible explanations for the patterns we see in arrow points. The first looked at comparison of point types and prey choice: both Woodland and CPT hunters sometimes emphasized bison and sometimes emphasized deer and antelope, and it is possible that different kinds of points were best-suited to each of these animals. However, there is no evidence that this is the case. If hunters did select points based off prey choice it was not clear in my case study.

I also discussed the possibility that a shift to side-notched points had implications for the production of the arrows that carried them. Shaft abraders appear on the Great Plains during the Plains Village period, and Blakeslee (1999) stated shaft abraders are necessary because side-notched points, unlike corner-notched points, need standardized shaft diameters to mount to an arrow. That is, relying on side-notched points involved the adoption/creation of new methods for making arrow shafts, making new ground stone technology, and greater investment in the most

expensive part of the tool. I suggested that variation among households or communities in the intensity of arrow manufacture might be visible in the ratio of shaft abraders to arrow points and that such variation might represent the development of more specialized craft production. Specialized production in turn, might produce greater skill, which could account for the presence of Cahokian points; such points might not be deliberate emulation of Cahokian styles. Analysis of variation in this ratio, though, produced ambiguous results. During the period of Cahokia's fluorescence, the ratio is more variable in the east, where Cahokian influences were strongest, consistent with this possibility. However, during the period of Cahokia's decline, this ratio is much more variable in the west, where Cahokian points are absent. If there was some degree of specialization in arrow manufacture on the Central Plains, it did not necessarily result in the manufacture of Cahokian-style points. This suggests that the presence of such points is more likely to be deliberate emulation of that style than the accidental result of increases in production skill.

IMPLICATIONS FOR RESEARCH

The major takeaway I want to come from this research is that we need to look at reasons for why arrow points change rather than simply stating that change occurred. The process of stylistic change is itself important, and can tell us much about larger technological and cultural issues. I believe the findings of this thesis could push the boundaries for Cahokian influence, particularly if we start to look at less overt evidence for interaction. We see Cahokian-style artifacts, primarily pottery, on the Great Plains and this is where we draw lines for Cahokian influence. But this thesis shows Cahokian influence likely had a much greater reach across the

central Great Plains in influencing the types of point people made, and it underscores the absence of Cahokian influence on the Southern Plains (where Caddoan Mississippians were more important). It also suggests that there is a link between maize agriculture and Cahokian interaction: the persistence of Woodland arrow points in Pomona sites parallels the limited evidence for use of maize at those sites. This research also shows that the central Plains were connected and affected by cultural change in regions beyond the Plains.

FUTURE DIRECTIONS

This thesis showed that the stylistic shift from corner- to side-notched points on the Central Plains was complex, with people in some regions making the shift more slowly and less completely than others and emulating Cahokian styles more than others. While this conclusion is clear, there are limits on the data available to me, and refining my arguments will require a large enough dataset to examine patterns of point production and use on a household-by-household basis, rather than site-by-site.

Perhaps the most important limit on my data is chronological. Many sites in my study are either undated or dated too imprecisely to include here. This is especially true for the Pomona sites, but it is true throughout the Central Plains (Roper [2014] discusses this in detail). Expanding my dataset will require an extensive program of radiocarbon dating of existing collections. Furthermore, it will be necessary to date individual structures within sites, as it is increasingly clear that the clusters of houses labeled "sites" on the Central Plains often represent sequential occupation of a location by different households rather than a cluster of houses occupied simultaneously (Roper 2006; Blakeslee 1999). Expanding on my analysis to look at

individual households will require being able to distinguish change over time (in cases like the first of these) from variation within communities (in cases like the second of these).

In this thesis I included point collections from ten Woodland sites, which I lumped into one Woodland time period. Expanding the Late Woodland sample (which will require the same kind of chronological effort as expanding the CPT sample) will make it possible to focus in more closely on the transition from the Late Woodland to CPT to see if there are examples of flintknappers experimenting with new notching styles.

Finally, I want to collect more metric data on the arrow points included in this study, for two reasons. First, the issue of production skill and Cahokian points remains ambiguous. Wilke et al (2002) see evidence for fairly intensive blade production in individual households in CPT sites in eastern Nebraska and northern Kansas and it is possible that this represents specialized production at the household level: one of these houses also produced evidence of blade production while the other (14OT5, included here) did not. Gathering data focused on this specific topic will help to sort out the role that knapping skill may play in the patterns I document here. Second, though, one surprising aspect of my dataset is the large numbers of unnotched points in many sites. In some cases, these may include unfinished points; in others, though, they likely are simply unnotched. Blakeslee (1999) suggests that we can distinguish these on the basis of metrics, and doing this would help to see the role of unnotched but finished points in the corner- to side-notched transition at the same time that it provided additional information on patterns of point manufacture in time and space.

My research is by no means done. I outlined a few ways I plan to expand and strengthen the arguments made throughout this thesis. This thesis is just the first step towards understanding

the change from corner to side-notched arrow points and the variation seen throughout the Central Plains tradition.

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APPENDIX A: SHAFT ABRADERS COUNT

Woodland Site	Shaft Abraders	Date Code	Region code
14CT332	0	0	1
25CC28	0	0	1
25RW28	0	0	3
34CL46	0	0	4
34LN76	0	0	4
34PT28	0	0	4
34SM20	0	0	4
34SM29	0	0	4

American Bottom Site	Shaft Abraders	Date Code	Region code
Range	128	1	0
Range	50	1	0
East St. Louis	0	1	0
11S34	119	2	0
Tract 15A	N/A	2	0
East St. Louis	N/A	2	0
11S34	126	3	0
Tract 15A	N/A	3	0
East St. Louis	N/A	3	0
11S34	45	4	0
Tract 15A	0	4	0
East St. Louis	0	4	0

Southern Plains Village Site	Shaft Abraders	Date Code	Region code
34GV165B	1	3	4
34GV167	7	3	4
34GV5	9	3	4
34GV55	4	3	4
34GD1	9	4	4
34GV2	0	4	4
34GV22	0	4	4
34GV3	8	4	4
34GV32	0	4	4
34GV43	0	4	4

APPENDIX A CONT.: SHAFT ABRADERS COUNT

Plains Village Sites	Shaft Abraders	Date Code	Region code
25SY31	35	2	1
14SA1	1	2	2
14HO308	0	2	3
25DW166	0	2	3
25FT13	51	2	3
25FT39	12	2	3
25FT70 A2	N/A	2	3
25FT70 A1	N/A	3	3
13ML176	2	3	1
13ML128	2	3	1
13ML129	14	3	1
13ML139	0	3	1
13ML216	1	3	1
13ML222	2	3	1
25FT16	31	3	3
25FT17	36	3	3
25FT35	8	3	3
25FT36	12	3	3
13ML130	8	4	1
13ML219	3	4	1
14OT308	29	4	2
14OT5	8	4	2
25BW15	2	4	2
25FT54	0	4	3
25FT80	1	4	3

Pomona Sites	Shaft Abraders	Date Code	Region code
14BO319	0	5	1
14CF301	0	5	1
14CR369	0	5	1
14DO19	3	5	1
14JF303	0	5	1
14MM26	0	5	1
14MM506	5	5	1
14MM509	0	5	1
14MM7	3	5	1
14MO308	0	5	1
14MY309	0	5	1
14MY316	0	5	1
14OS305	0	5	1
14OS314	2	5	1