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A LITHIC ANALYSIS OF SCHOOL LAND I (34DL64) A NORTHERN CADDO VILLAGE IN THE FOOTHILLS OF THE OZARKS

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A LITHIC ANALYSIS OF SCHOOL LAND I (34DL64) A NORTHERN CADDO VILLAGE IN THE FOOTHILLS OF THE OZARKS

A THESIS APPROVED FOR THE

DEPARTMENT OF ANTHROPOLOGY

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ABSTRACT

School Land I (34DL64) is a Harlan Phase (A.D. 1050-1250) Caddo village site set in the Arkansas River basin at the confluence of the Grand and Elk Rivers in Delaware County, Oklahoma. This site was originally excavated by the Works Progress Association (WPA) from 1939 to 1940. While the faunal and ceramic assemblages from this site have since been formally analyzed, the lithic assemblage has been unanalyzed until now. These assemblages are important because residential sites in this area are not well understood and there are very few opportunities to recover more data. This is further complicated by the fact that the WPA did not collect debitage and rarely used screens. This means that while there are 1769 lithic specimens studied here, only 36 of them are flakes. The research question of this thesis is: Will analyzing the lithic assemblage of School Land I confirm or deny the various interpretations of the site? Broadly summarized, these interpretations are that the site was only occupied from the Evans Phase (~A.D. 1000-1100) to the Spiro Phase (~A.D. 1350-1450), the most intensive occupation was the Harlan Phase (~A.D. 1100-1250), and this site may have ritual significance along with special-purpose structures. I have employed a biface breakage typology in conjunction with a formal tool typology, material type identification, and spatial analysis to answer this question and hypothesize why material assemblages have differences and similarities. These methods led me to the answer that human activities at the site are much older and more nuanced than previously thought and this pattern could extend to other sites in the region. Time depth at the site goes back at least to the Middle Archaic (5000-2500 B.C.) with the presence of the Calf Creek archaeological culture. Material evidence here indicates that the Harlan Phase occupation was the most intensive. This analysis also supports the ideas of previous researchers that ritual is integrated with domestic life at School Land I. Lithic evidence demonstrates that School Land I was originally used as a hunting area at varying degrees of intensity from the Middle Archaic up

until the Harlan Phase when people constructed eight rectangular houses. I also apply a life history approach in conjunction with other archaeological models of human behavior to formalize the interpretation of my results and speak on the differential use-lives within and among morphological categories and formal tools. These interpretations highlight how the Harlan phase inhabitants of School Land I chose this location not only because the site was in an ecologically advantageous position and because it was close to other sites like Reed but also to maintain connections with their ancestors. This assemblage may also be a reliable foundation for investigating more symbolic and social considerations at the site like gendered tool use and tattooing which are relevant to the site's mixing of ritual and domestic spaces.

CHAPTER 1: Introduction

In this chapter, I will briefly overview the site, this project, and ancestral communities. Secondly, I shall give an overview of how this thesis is structured. Third, I shall elaborate on my research questions.

School Land I

This site has eight confirmed structures. The WPA collected daub alongside faunal, ceramic, and lithic materials. These materials have been stored in the Sam Noble Oklahoma Museum of Natural History (SNOMNH). The precise location of School Land 1 is not exactly known (Hueffed 2023). The only location description for School Land I came from David Baerreis' field notes which describe the site at NE1/4 NW1/4 of Section 16, Township 25 North, and Range 24 East (Hueffed 2023). Using this, the general location of School Land has been inferred from historic aerial photographs (Figures 3.1 & 3.2) (Hueffed 2023).

Another site that was excavated simultaneously by the WPA with the same supervisor is School Land II (34DL65, Dl-Sc-II) ~500 m upriver and northwest of School Land I on the Elk River's southern bank (Hueffed 2023). The WPA recorded one rectangular structure feature with a single burial alongside ceramic, lithic, and faunal materials which they collected and may be representative of an occupation post-dating School Land I (Duffield 1969; Hueffed 2023). Faunal materials are all that have been analyzed in the School Land II collection.

Thesis Objectives

Most of what is archaeologically known about the pre-contact people of eastern Oklahoma between A.D. 1000-1650 and their ancestors comes from an understanding of ceremonial centers like Spiro and Reed (Brown 1996; Regnier et al. 2019). Residential sites like

School Land I make up a significant portion of this system in which many smaller villages are arrayed around these larger sites (Regnier et al. 2019). But these residential sites have rarely been archaeologically investigated, especially in the northern Caddo area. This area has a great deal of similarity with the southern area but differs in a few important ways, especially in periods deeper in time before the homogenization of many smaller communities from the Evans-Spiro phases. Some of these ways are architecture, material culture, and social structure. To understand these systems more holistically, understanding sites like School Land I is essential. One of my goals in this thesis is to contribute quantitative and qualitative data to what is known of the site now that the same has been done for the faunal and ceramic components.

The lithic assemblage can be a useful proxy in answering a broad range of research questions. The ones that I have asked are: Given the results from the faunal and ceramic analyses, will a lithic analysis confirm or deny current interpretations? Some current interpretations based on these analyses are that the School Land I site was only occupied roughly from the Evans Phase to the Spiro Phase, the Harlan Phase occupation was the most intensive, and the site had purposes that were more than purely domestic. This question was chosen to complement previous research and provide an opportunity for synthesizing some of it. My chosen methods can interrogate these data to answer this question and provide possible explanations for differences and similarities. This is because a formal tool typology in conjunction with depth data is an analytical avenue for approximate chronology. Breakages are an avenue for understanding differences and changes in human behavior. This thesis will convey the data from my investigations, and I will express my interpretations of what these data mean, especially when compared to data from the other material assemblages and other sites.

Cultural Background

One of the most relevant descendent communities for this research is the Caddo Nation which is currently seated in Binger, Oklahoma as a result of a long and complicated colonial history (see Chafe et al. 2018:3-5,134-182; Van de Logt 2016). The term Caddo is French in origin and is sourced from "Kadohadacho" (Kadohdà:chu') which was one of the three major groups of Caddo at this time (Chafe et al. 2018:3). The Kadohadacho were situated near the great bend of the Red River at the Arkansas-Louisiana border at the time of European contact (Chafe et al. 2018:3). The other two major Caddo groups are the Hasinai (Hasí:nay) centered near the Neches and Angelina Rivers in east Texas and a smaller group located further down the Red River (Na Shit'ush) (Chafe et al. 2018:3). The Caddo homeland is identified as the area ranging from eastern Oklahoma, east Texas, western Arkansas, and northwest Louisiana (Perttula 2017).

Archaeologically, Caddo is defined as, "an archaeological concept [that is] recognizable primarily on the basis of a set of long-standing and distinct cultural, social, and political elements that have temporal, spatial, and geographic connotations" (Perttula 1993:7). Materially, this manifests as systems of dispersed but sedentary settlements with a primarily horticultural or agricultural economy, an elaborate sociopolitical structure, and the practice of mound building (Perttula 2012). The northern and southern Caddo areas have differences between them including architecture, material culture, and social structure (Lambert 2017; Perttula 2017; Regnier et al. 2019). All ethnohistoric and ethnographic sources used in this thesis are related to the southern Caddo area (e.g. Sabo 2012; Swanton 1942; Vega 1993[1606]), sources like these do not exist for the northern area.

But it is important to remember that despite this region being archaeologically referred to as the northern Caddo area it was likely a dynamic cosmopolitan space. This is exemplified by

Ford's (2021) work which identified the Neosho period (~A.D. 1450-1600) in particular as one where there was a great deal of ethnic diversity in northeast Oklahoma. This is highly relevant for at least the descendent communities of the Wichita and Affiliated Tribes and the Osage Nation (Ford 2021). Baugh (2009:9) identifies two late precontact sites in the region as Kirikir'i-s (Wichita): the Mode #1 site (34DL30) and the Jug Hill site (34MY18). There is also potential evidence in earlier periods that has not been explored in this fashion. It is a prevalent theme in existing literature that the people living in northeast Oklahoma had strong cultural ties with Plains groups to the west in the Archaic periods (Chowdhury et al. 2021; Duncan 2021; Oliver 2023; Ray and Lopinot 2021) and "Hopewellian" groups to the east (Harrington 1960; Moorehead 1931; Purrington 1971). These eastern connections are outdated and highly speculative, but I am displaying them here until further research is done on cultural connections in the Archaic and Woodland periods. Shott and Ballinger (2007:168) identify both the Ozarks and the Ouachita Mountains as areas where some Dalton bands procured their toolstone. This suggests some sort of cultural connection with Southeastern groups between the Late Paleoindian into the Early Archaic. Suffice to say, there has been a lot of nuanced movement in the Ozarks regardless of period.

This interplay can be further evidenced by a discussion of the differences between Caddo and Caddoan. The most accurate way to archaeologically refer to these people is as Caddo (Perttula 2012; Regnier 2017). Caddoan has entirely different connotations in that it is primarily a linguistic term used to refer to the speakers of the Caddoan language family including the Caddo, the Kitsai, the Wichita, the Pawnee, and the Arikara (Chafe et al. 2018). These languages share the same root but are very different (Chafe et al. 2018). If the reader wishes to learn more about Caddo culture in its modern context, they can find the Caddo Culture Club and the Caddo

Language Revitalization Program on the Caddo Nation's website. This brief background will be elaborated on further in Chapter 2 for the parameters that are specifically relevant to School Land I and the larger region.

Outline of Chapters

Chapter 2 provides a regional background about the Arkansas River Valley, the Ozarks, and what is known about the ancestors of the Caddo, Wichita, and Osage in the times ranging from the Middle Archaic to the Neosho Phase. Human occupations in the region have much more time depth but discussion of them in depth is beyond the scope of this study. Other texts discuss these older periods in much more depth (Ray 2007, 2016; Shott and Ballenger 2007; Stackelbeck 2010). I discuss the Spiroan phases in more depth because they are more well-understood archaeologically. I also give general descriptions of the environmental, geological, and climatological settings.

Chapter 3 focuses on the area of study and provides a more developed description of nearby sites like Spiro, Reed, and Lillie Creek. Here, I also detail the more specific setting of School Land I in relation to the Grand and Elk Rivers. In this chapter, I will also discuss the archaeological history of the site centered around the perspectives of the WPA, Lathel Duffield who did the faunal analysis, and John Hueffed who did the ceramic analysis.

Chapter 4 details the methods I used to analyze the collection. These are: a biface breakage typology, a formal tool typology, material type selection, and inferred morphology. I also discuss how this analysis went in terms of successes and failures and my attempt to identify limits on my perspective.

Chapter 5 conveys the results of this analysis. These results are presented in terms of my methodological categories as well as in terms of space and stratum. I comment on a wide variety of patterns, and I am focused on identification as opposed to further discussion.

Chapter 6 is when I discuss these patterns in more depth and apply theoretical observations to attempt to make sense of them. Primarily, this comes in the form of a life history approach in which I use a staged concept of tool production, use, maintenance, and disuse to make inferences about the behavioral patterns behind these phenomena.

Chapter 7 is the final chapter and fulfills a similar role to this introductory chapter in that it broadly discusses the structure of this thesis and my findings. These materials have provided the opportunity to discuss activities that were performed at the site in substantially older periods than originally expected. This has changed how I have thought about the site and others in the region.

Chapter 2: Regional Background

Present-day Oklahoma is commonly known as a meteorologically dynamic region. The state is colloquially defined as being within 'tornado alley' and pop-culture phenomena like the movie 'Twister' (1996) are centered in Oklahoma. This variability can also be seen in annual rainfall which can range between 43cm at Kenton in the western panhandle and 142cm in southern LeFlore County near the state's eastern border (Albert and Wyckoff 1984). This state has dramatically different ecoregions within relative proximity to each other. The elevation of Oklahoma ranges from its lowest point of around 110m above sea level (asl) in the state's southeastern corner to the state's highest point at Black Mesa in the panhandle sitting at about 462m asl (Albert and Wyckoff 1984). Temperatures in the state can also vary greatly with many regions commonly being below 0ºC in the winter to as high as 43ºC in the summer (Albert and Wyckoff 1984).

Geology

School Land I is situated within the Ozark Plateau geomorphic province (Albert and Wyckoff 1984). The Ozark Plateau occupies an area of approximately 65,000 square kilometers that crosses the states of Arkansas, Missouri, and Oklahoma. The Ozark Plateau is made up of desiccated limestones, cherts, shales, and dolomites formed during the Cambrian, Ordovician, and Mississippian periods (Figure 2.1) (Albert and Wyckoff 1984; Ray 2007). The plateau is primarily made up of limestones and shales (Ray 2007). Locally, these rock formations are overlain by a thin veneer of terrace gravels and alluvium (Ray 2007). The entire region of Oklahoma's Ozark Plateau lies within the drainage basin of the Arkansas River (Ray 2007). The Oklahoma portion of the Ozark Plateau has streams that drain west and south to the Grand

(Neosho) and Arkansas Rivers (Albert and Wyckoff 1984). The confluence of the Grand and Arkansas Rivers is just west of the Ozarks (Albert and Wyckoff 1984). The Grand River is a mature river with broad and fertile floodplains and the Elk River is a west-flowing tributary of the Grand River (Albert and Wyckoff 1984).

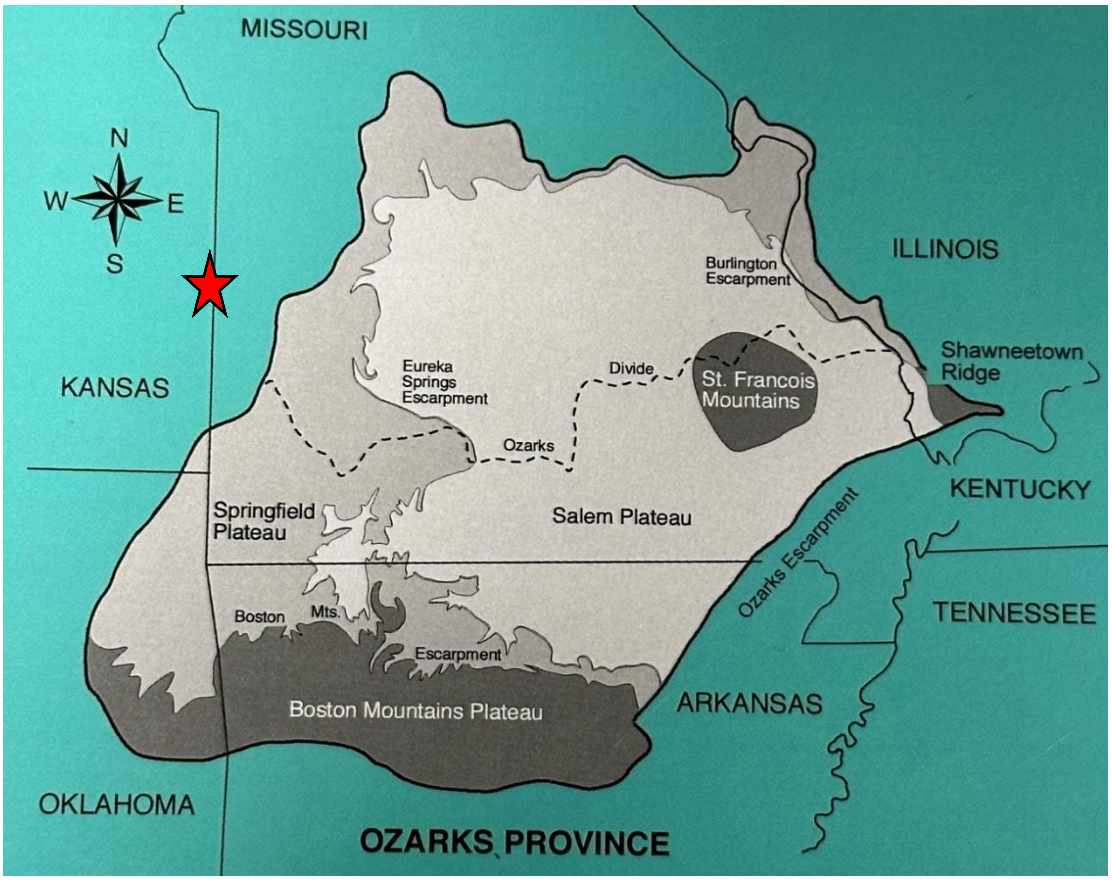

Figure 2.1: Major Geological Regions of the Ozarks. The red star marks the approximate location of School Land I. From Ray (2007:Cover)

Ecology

There are seven biotic districts in Oklahoma, the short-grass plains, mixed-grass, Osage Savanna, Cherokee Prairie, Mississippi, Ouachita, and Ozark districts (Albert and Wyckoff 1984). School Land I is in the Ozark district which extends along Oklahoma's northeast corner encompassing the Ozark Plateau in the north and the Boston Mountains in the south (Albert and Wyckoff 1984).

The Ozark Plateau Is dominated by dense oak-hickory forests (Albert and Wyckoff 1984). The western edge of the Ozarks is a forest prairie that marks the boundary to the Neosho Lowland geomorphic province to the west (Figure 2.2) (Albert and Wyckoff 1984). The most plentiful trees in these areas are blackjack oak, post oak, black hickory, and winged elm (Albert and Wyckoff 1984). Sugar maple, hop hornbeam, redbud, flowering dogwood, linden, white oak, and chinquapin oak flourish today in protected areas (Albert and Wyckoff 1984). Forests of silver maple, red birch, American elm, cottonwood, sycamore, linden, and several species of oak grow in riparian environments (Albert and Wyckoff 1984). Common animals in the Ozarks include deer, beaver, mink, fox, woodchuck, rabbits, skunk, muskrat, passenger pigeon, hawks, owls, sunfish, catfish, lizards, and snakes (Albert and Wyckoff 1984).

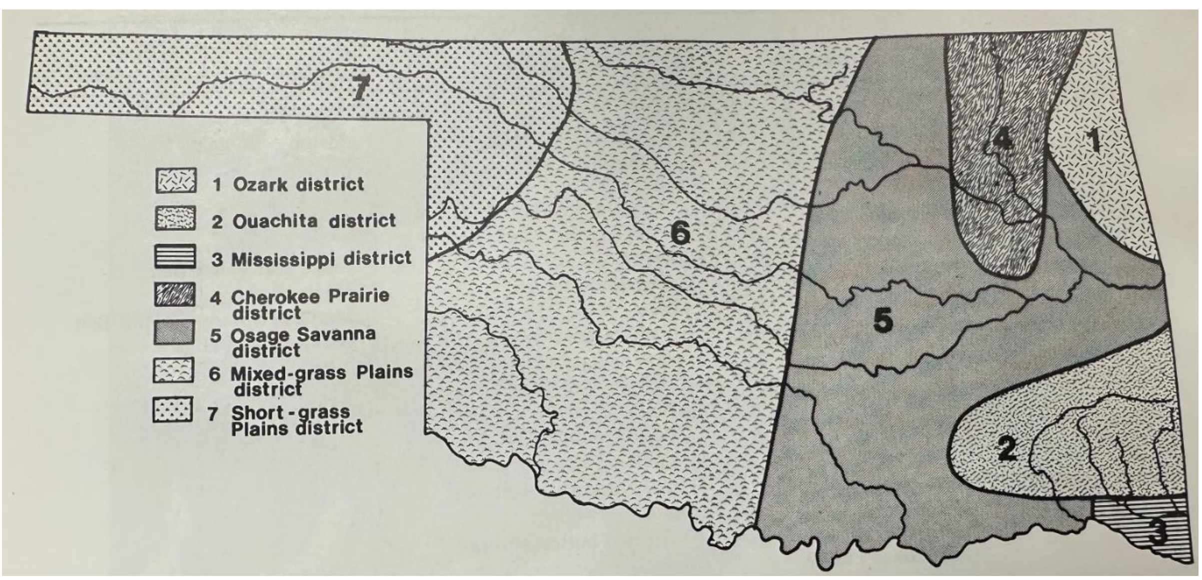

Figure 2.2: Oklahoma's Biotic Zones. From Albert and Wyckoff (1984:3)

Culture History

Human occupations in the region go back into deep time with archaeological knowledge limited to observing things like Clovis tools throughout the Ozarks (Ray 2016) and in significant quantities at sites like Big Eddy in Missouri (Stackelbeck 2010). Tool types representative of archaeological cultures like Dalton and San Patrice have also been widely documented in this region (Ray 2016). If the reader wishes to learn more about changes in chert use and formal tool types in these earlier periods of the Ozarks they should see Stackelbeck (2010) and Ray (2007, 2016). I shall be discussing the Middle Archaic to the Neosho Phase here because these periods are relevant to School Land I.

Middle Archaic (7930 - 5040 B.P. or 5980 - 3090 B.C.)

The earliest formal tool types in the School Land I assemblage are consistent with this period. Heat treatment is a practice to improve the workability of chipped stone and it is common in the Middle Archaic in the Ozarks and it has been observed most consistently with Keokuk and Undifferentiated Osagean materials (Ray 2007). Reeds Spring is another common material type sourced from riverbeds that does not usually need heat treatment (Ray 2007). The phenomenon most relevant for the School Land I lithic assemblage from this period is the Calf Creek horizon. Representative bifaces of the Calf Creek archaeological culture have been recorded in a wide range across the southern Plains of North America with the eastern boundary falling on the Ozarks (Chowdhury et al. 2021; Dickson 2021; Ray and Lopinot 2021; Wyckoff 2021). Despite being on the periphery there is still a large concentration of materials from this archaeological culture in this region (Ray and Lopinot 2021; Wyckoff 2021). Much of the recent work done on establishing a precise chronology for Calf Creek depends on understanding the chronology of bison (Lohse et al. 2021). While there has been a great deal of work on this in the southern and western concentrations of recorded Calf Creek bifaces (e.g. Carlson and Bement 2021), this relationship is not as well understood in the Ozarks. Bison are thought to be rare in the Ozarks in the Middle Archaic (Albert and Wyckoff 1984; Rogers 2006). Present data demonstrate that Calf Creek technology spread rapidly across the Southern Plains and the Ozarks although its origins are not known at this time (Lohse et al. 2021).

The Calf Creek horizon has a great deal of chronological overlap with the Grove Focus in northeast Oklahoma. Defined by Baerreis (1951), this archaeological culture is thought to have had a significant presence in the western Ozarks in the Middle Archaic (Wyckoff 1984). While this is a period that should be studied more, it is presented as having three subperiods; A, B, and C which correspond to the Middle Archaic – Late Archaic transition (Baerreis 1951). Baerreis (1951) states that the differences he observed between the periods are due to a gradual increase in sedentism over time. Baerreis (1951) identifies sedentism as a cause rather than a result. Even in 1984, Wyckoff expressed frustration in how "this construct has become so general in nature that it and its three periods often limit research that might enhance explanations of local diversity and regional ties" (1984:135). I am displaying the inadequacies of this concept because I am defaulting to it until better replacements are found. But in all fairness, Baerreis' (1951) work was done before many of the modern theoretical techniques and methodological advancements we take for granted today were even conceptualized.

As Wyckoff (1984:135) suggests, this work should account for the specificity and variety of archaeological materials in the area, and ideally, it would be able to answer questions of whether this is one culture with internal variety or several separate cultures. One example is understanding the dynamics of Calf Creek people's interactions with people living in the Ozarks. Baerreis (1951) assumes a gradual increase towards sedentism in the region but lacks specificity with no heed paid to seasonality, the scale of mobility, or the type of mobility (e.g. Binford 1980).

Some of the more significant sites in the region from this period are the Tom Brooks Shelter and Calf Creek Cave in northwest Arkansas (Dickson 2021), Caudill, Guffy, Evans, McConkey, Smith, and Cooper sites in Delaware County, Oklahoma (Ray and Lopinot 2021; Wyckoff 1984), and the Big Eddy site in Missouri (Lopinot et al. 2005). Whether by way of selection bias (Mandel 1995) or if this period had a 'boom' in activity in comparison to the Early Archaic in the region, there has been a substantial number of archaeological materials recorded. Furthermore, this boom may even be more pronounced than it appears because of how much archaeological work was done by the WPA in the western Ozarks that has since sat relatively untouched in museums until now, like the School Land I collection.

One final but important feature of what is known of the behavior relating to the people who lived in the western Ozarks in pre-Columbian times is their use of rock shelters. There is evidence of people interacting with and living in these rock shelters from at least Archaic to Neosho times (Fritz 1986a; Lentz 2015). These rock shelters offer some of the best chances at gaining further understanding of these people because of the likelihood for material culture to undergo desiccation, furthering their preservation (Fritz 1986b). These shelters may provide a very biased view in the sense that they could be satellite occupations in the Middle Archaic. The soils in this region and across the Southeast are often considered highly acidic (Albert and Wyckoff 1984) which severely limits the archaeological record and creates a preservation bias for stone tools. In some Ozark rock shelters, floral, faunal, and even textile remains can be observed (Fritz 1986b).

There have been a few archaeological investigations of these areas and one of the first comes from Mark Harrington (1960) with his '*The Ozark Bluff Dwellers*.' While this concept of the 'bluff dweller' is determinably antiquated, Harrington provides one of the most comprehensive perspectives. This position is antiquated because it overtly assumes that these cultures were using these rock shelters as primary occupation areas in the Middle Archaic. He describes the people that used these rock shelters as having cane baskets, coiling textiles, making chipped stone and shell hoes, being fond of atlatl throwing spears, and creating pottery that shares themes with later Caddo wares (Harrington 1960).

While these materials are currently distributed in collections throughout various museums, there have been some successful archaeological investigations utilizing them. One exists in the form of a recent thesis from Lindsay Lentz (2015). This thesis utilized a very sensitive portion of the Cooper IV collection, human remains, with the stated support of the Osage, Caddo, and Wichita Nations to gain paleodemographic information on this period (Lentz 2015). Lentz (2015) analyzed the remains of 50 people from periods ranging from the Middle Archaic to the Neosho Phase.

Late Archaic 5300 - 2485 BP or 3300 - 200 BC

The last of the Archaic periods saw the presence of the Kings and Smith-Etley components at the Big Eddy site (Lopinot et al. 2005; Ray 2016). These formal tools are notably less heat-treated than most of the Middle Archaic formal types in the region (Ray 2016). Aside from this, there are no notable changes ascribed to the people living in this area at this time from their Middle Archaic ancestors in existing archaeological material. Little is known about the mobility, kinship systems, and relationships with other social groups that people had at this time in the Ozarks.

Far more is known about the Fourche Maline archaeological culture immediately to the south. Groups called Fourche Maline by archaeologists are identified as Late Archaic to Middle Woodland in age. They made double-pitted axes, contracting stem bifaces, and midden mounds with burials (Bell 1980). There is some disagreement as to whether the Fourche Maline culture emerged in the Late Archaic (Bell 1980) or the Early Woodland (Leith 2011). It is possible these people inhabited lands as far north as what is now southeastern Kansas (Lambert 2017), so they could be an important component for understanding the School Land I site.

There may be substantial differences between different Fourche Maline groups. An example of this can be observed with the differential cultural value of dogs. Fourche Maline groups in what is now Arkansas are described as being averse to dogs (Schambach 2002) while their counterparts in eastern Oklahoma interred dogs in their midden burial mounds (Bell 1980).

It is unclear what this inclusion means but it seems probable that the eastern Oklahoma communities of Fourche Maline had a high degree of affinity with these dogs. There is also possible linguistic evidence for this in the Caddo language with the word Tayshá meaning wolf, dog, coyote, friend, and ally in certain contexts (Chafe et al. 2018:233,317). From a forward-thinking perspective (e.g. Kassabaum 2021), it may be worth investigating if this variability in the meaning of Tayshá is a modern manifestation or the agglomeration of different Caddo communities in the present day. This means that there could have been strong divides on how ancestral Caddo saw dogs and wolves. This duplicity could also be a byproduct of the trickster narrative device present in many coyote stories (Chafe et al. 2018).

Work done by Gayle Fritz found possible evidence of Late Archaic gourd domestication in rock shelters near Phillips Spring, MO (Fritz 1990:7). This site was originally excavated by the University of Arkansas from 1929-1934 (Fritz 1986a). Plant domestication appears to have begun in the area around this time with gourds followed by an eventual transition to corn dominance in the Late Woodland (Fritz 1990:7). Corn does not become a significant foodstuff at Spiro until much later (Brown 1996; Regnier et al. 2020). This work demonstrates that the eventual transition from hunting, gathering, and foraging to horticulture and agriculture in the region was older and more nuanced than previously believed (Harrington 1960). Research like this demonstrates the potential of these collections, but there is a great deal more work to be done analyzing them.

Early and Middle Woodland: 2965 – 1330 BP or 1015 B.C. – A.D. 60

Woodland period people of the Ozarks are described as mobile hunter-gatherer groups. These include the Mulberry River Culture, Fourche Maline, Mill Creek, and Mossy Grove cultures around A.D. 800-850 (Figure 2.3) (Early 2000; Perttula 2012; Perttula 2017). Some archaeologists conflate the Mulberry River and Fourche Maline cultures (Schambach 2002) and more work will have to be done to determine this. Figure 3.3 shows that School Land I and the rest of Delaware County fall inside the boundary of the Mulberry River Culture.

The Early and Middle Woodland periods can be challenging to distinguish from each other in terms of debitage and tools because of mixing with newer components at type sites like Big Eddy (Ray 2007:345). General chert procurement and use is centered around Keokuk/Burlington and Jefferson City (Ray 2007:346). In these periods contracting stem points like Waubesa and Standlee emerge and become prominent (Ray 2007, 2016). These tools are directly comparable to Gary and Langtry types (Baerreis 1951; Bell 1958; Perino 1968). Contracting stem chipped stone tools are one of the diagnostic features of Fourche Maline culture (Bell 1980) which might be the same for their Mulberry neighbors to the north (Figure 3.3). Heat treatment plays a prominent role in Woodland times, as opposed to the Late Archaic, with some Middle Woodland assemblages in the Ozarks exhibiting a heat treatment percentage of as much as 98% (Ray 2007:346). Lastly, this period generally saw an increase in imported and exported cherts which indicates a more established stone trade system (Ray 2007:346).

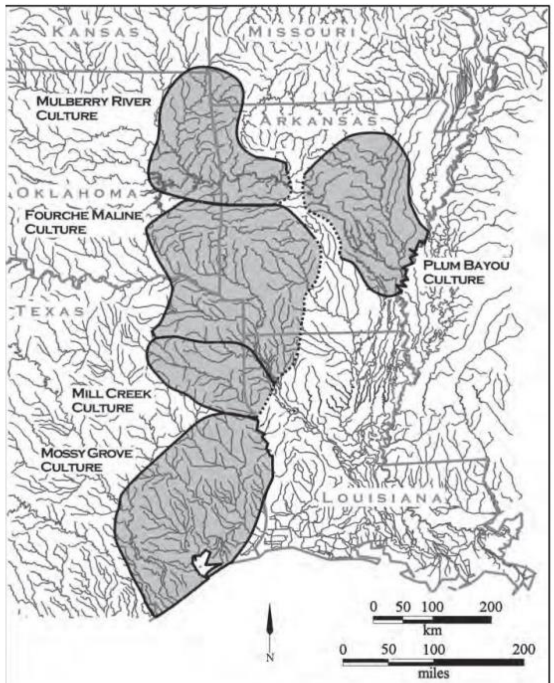

Figure 2.3: Map of Woodland period cultures along the Red River and Arkansas River basins. From Perttula (2017:44)

Caddo Emergence

It is now believed that the Caddo culture coalesced and emerged from these communities in the Late Woodland (Perttula 2017). The exact mechanisms for this change from different Woodland period cultures into a distinct Caddo culture between A.D. 800-900 are not well understood (Perttula 2017). However, it can be said that a distinct Caddo culture existed around A.D. 900, coinciding with the beginnings of the Mississippian period across much of the American Bottom (Regnier 2017). By the tenth century A.D., the Caddo culture was living in a series of sedentary and politically distinct settlements that are believed to have been influenced by four factors (Perttula 2012).

First is the increasing prevalence, elaboration, and maintenance of symbols embedded with religious and political authority centered on constructing earthen mounds (Perttula 2012). Second, the development of elite status positions within certain communities (Perttula 2012). Third, an increasingly sedentary lifestyle and the establishment of both residential villages and bureaucratic centers (Perttula 2012). Fourth, an expanding dependence on domesticated crops that developed into a horticultural economy with a focus on maize after the thirteenth century and a consequent increase in population (Perttula 2012). The incorporation of maize at Spiro happens in the latter portion of this transition (after A.D. 1350) (Brown 1996).

The Caddo cultural sphere can be separated into the southern Caddo of Louisiana, east Texas, and southwest Arkansas, and the northern Caddo of eastern Oklahoma, northwest Arkansas, and southwest Missouri (Dorsey 1905; Perttula 2017). The southern Caddo area is centered around the Red River basin while the northern Caddo area is centered around the Arkansas River basin (Figure 2.4) (Lambert 2017). This split has been drawn along geographic and cultural lines as observed in material culture (Regnier et al. 2019; Lambert 2017). These Caddo people lived in permanent settlements practicing horticulture and agriculture in what is now Louisiana, eastern Texas, western Arkansas, eastern Oklahoma, and southwestern Missouri (Perttula 2017). The Caddo culture area is often considered the westernmost extent of the Mississippian world that dominated the American Bottom at this time (Regnier 2017). While the Caddo culture had strong relationships with and was influenced by cultures in the Mississippian sphere, the Caddo have a distinct identity and cultural historical trajectory (Regnier 2017).

Ray (2007:346) describes many of the sites of this period as palimpsests in that their use is conflated with later periods in the lithic portion of the archaeological record. One of the most common point types from this period is the Scallorn type, which is common throughout the

Caddo area from the Middle Woodland until the Late Precontact (Ray 2016:31). Keokuk/Burlington and Jefferson City cherts are still common in the Ozark Late Woodland, but there is an even greater emphasis on imported cherts than the other Woodland periods (Ray 2007:346). One of the more prominent traits of Caddo culture in this period was an increasingly homogenized corpus in terms of stone tools (Ray 2007:346).

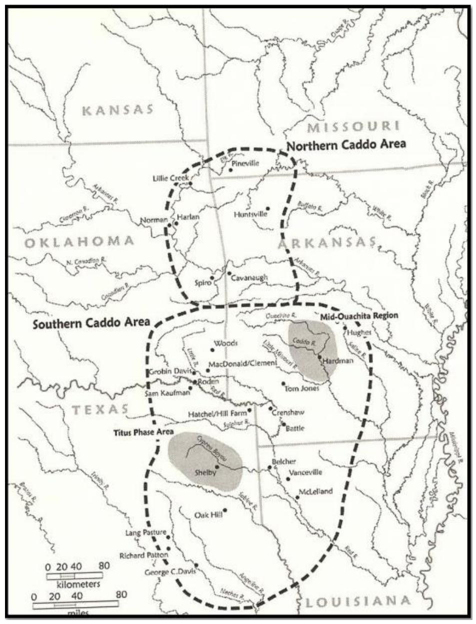

Figure 2.4: The Northern and Southern Caddo Areas from ~A.D. 900-1600 Adapted From Lambert (2017)

Spiro Chronological Phases

This chronological framework was originally developed in the 1940s but has since undergone several revisions and it is recognized that it varies by region (Perttula 2012). The regional chronology for eastern Oklahoma was defined by Brown (1996) (Figure 2.5) based on detailed seriation of grave lots and radiocarbon dates from Spiro and was later refined by Rogers (2011). Through his analysis, Brown recognized five phases: Evans, Harlan, Norman, Spiro, and Fort Coffee, along with four roughly corresponding grave periods: Spiro I-IV (Brown 1996).

Even though this chronology was specifically tailored for Spiro, it has been found to work just as well for northern sites that postdate A.D. 1100 such as Reed (Hammerstedt and Savage 2021; Regnier et al. 2019).

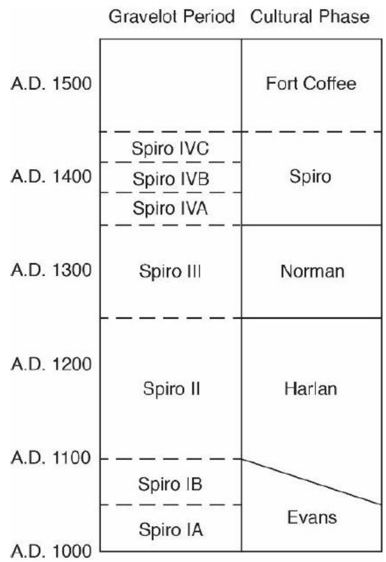

Figure 2.5: Caddo Chronology Developed by Brown (1996) Based on Spiro Gravelots and modified by Rogers (2011)

The ***Evans phase*** is described as lasting from about A.D. 950-1100 and is thought to be the formative Caddo period (Brown 1996; Regnier et al. 2020; Rogers 2011). The Evans phase is defined by the pre-mound burials beneath the Craig Mound at Spiro and other buildings beneath buried structure mounds at the site in Brown's (1996) grave lot chronology. Ceramic styles are also a diagnostic element of these Caddo phases. The diagnostic types and attributes for the Evans phase are the Coles Creek type, the French Fork Incised type, the Williams Plain type (Regnier et al. 2020:21), and the dominance of grog temper (Hammerstedt and Savage 2021:106).

In terms of lithic practices, this period is best represented by an increase in imported chert use with cherts like Mill Creek coming down from the north (Cobb 2000; Perino 1967; Ray

2007) and Novaculite coming from the Ouachita Mountains (Trubitt et al. 2004) into the Ozarks. Mill Creek chert use is correlated with an increased economic focus on formalized agriculture because of its use in implements of digging and cultivation (Cobb 2000; Ray 2007:347). Exported cherts also become a significant element with large quantities of Burlington chert from what is now Missouri being brought to Cahokia for application in domestic flake-tool industries (Ray 2007:347). Intriguingly, these exported varieties are usually very high-quality Burlington (Ray 2007:347).

The subsequent ***Harlan phase*** is dated between about A.D. 1100–1250 (Brown 1996; Regnier et al. 2020:21). A general trend of this phase is an intensification in the construction of burial, platform, and house mounds at sites like Spiro, Norman, and Harlan (Regnier et al. 2020). Diagnostic ceramic types include Iwi (Spiro)[1], Holly Fine Engraved, Hickory Engraved, Crockett Curvilinear Incised, and Pennington Punctate Incised (Brown 1996; Hammerstedt & Savage 2021:107; Regnier et al. 2020). Chemical sourcing has revealed that it was common for these ceramic types to be imported from the Red River (Lambert 2017; Regnier et al. 2020). Grog temper is typically dominant in vessels from this period (Regnier et al. 2020). Many of the outlying mound sites in the Arkansas River drainage were established during the Harlan phase (Regnier et al. 2020). The lithic technology of the Harlan phase is dominated by small points and bifacial spades and hoes (Ray 2007:347, 2016:8). Some example point types that emerged in this period are Reed, Harrell, and Cupp (Ray 2016:8). Chert use here in the region is described as similar to the Evans phase but with an even greater focus on imported cherts (Ray 2007:347).

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[1] This pottery type that was once referred to as Spiro Engraved is now called Iwi Engraved in an effort to decolonize Indigenous material culture. (Lambert et al. 2022).

From about A.D. 1250-1350 was the time of the ***Norman phase*** (Brown 1996; Regnier et al. 2020). Shell-temper became more common in this phase (Regnier et al. 2020). Some of the diagnostic ceramic types for this phase are Poteau Plain, Woodward Appliqué, and Braden Punctate (Hammerstedt & Savage 2021; Regnier et al. 2020). Some other trends are an increase in elaborate burial goods, the addition of stamped-sheet copper artifacts, undecorated marine shells, decorated stone earspools, the use of red and green clays, and pigments introduced as burial goods (Regnier et al. 2020). There are fewer diagnostic stone tools in this period with the most observable changes happening in terms of quantity as small points and agricultural implements make up a larger percentage of assemblages and imports still feature strongly (Ray 2007:348). There appears to be less socio-economic need for the larger formal tools emblematic of the Archaic and Woodland periods (Ray 2007:347-348).

The ***Spiro phase*** was the one in which the religious and socio-cultural capital that had gradually been invested into regional centers, like Spiro, culminated from about A.D. 1350–1450 (Brown 1996; Regnier et al. 2019:297, 2020). This phase also saw a change in architecture from square to rectangular buildings with two central support posts instead of four (Livingood et al. 2020; Regnier et al. 2020). Diagnostic ceramics of this phase are shell-tempered Woodward and Poteau Plains (Hueffed 2023; Livingood et al. 2020; Regnier et al. 2020). Diagnostic lithic types are Cahokia, Huffaker, and Morris (Ray 2016:8). These types are possibly more eccentric than their predecessors with more haft notches and serrated variations than in previous Caddo phases (Ray 2016:54,67,69,).

The ***Fort Coffee phase*** represents a major downshift in population concentration and a dissolution of concentrated social capital from about A.D. 1450-1600 associated with the perceived failure of the Spirit Lodge to remedy the pronounced droughts brought on by the Little

Ice Age (Brown 1996; Brown et al. 2020; Burnette et al. 2020; Regnier et al. 2019; Rohrbaugh 2012). At some point in and around this dispersal (Burnette et al. 2020), Caddo material culture comes to have more in common with that of their Plains neighbors like the Wichita (Regnier et al. 2020). There are many sites in the region from this period that are believed to be associated with the Wichita (Baugh 2009). Diagnostic features of this period are shell-tempered jars becoming dominant in ceramic assemblages (Rohrbaugh 2012), large outlying cemeteries expanding (Brown 1996), the incorporation of Plains-oriented stone tools like the formal Washita type (Bell 1958:98), and an increase in bison hunting and maize production (Regnier et al. 2020; Rohrbaugh 2012).

The final phase that will be discussed here is the **Neosho phase** which lasted from about A.D. 1400-1650 (Ford 2021:iv). This phase is highly regional because it is only applicable to Delaware and Mayes Counties, Oklahoma (Rohrbaugh 1984:281). One of the diagnostic ceramic types from this phase is Neosho Punctuate (Rohrbaugh 1984:284). Earlier research interpreted stronger relationships with northern groups like the Osage and the Kansa and less with the concurrent Fort Coffee phase to the southwest (Baerreis 1951, 1960; Freeman 1962; Hall 1951; Rohrbaugh 1984:284-285). Ford (2021:291) used ceramic sherds to demonstrate that Neosho communities maintained connections with both groups. Some additional qualities ascribed to these people are diverse settlement demographics despite small population sizes (Ford 2021). However, very little analysis has been done on lithic materials from this period in the Ozarks, with one of the only diagnostic qualities being the use of cherts like Reeds Spring as gunflints in the final stages of the period (Ray 2007:348-349). Hueffed (2023:75) identified shell temper as the most common temper at School Land I which has a range from the Harlan phase to the

Neosho phase. But it is important to note that shell temper is more common earlier at Reed than at Spiro, where grog is more prevalent (Brown 1996; Regnier et al. 2019).

Spiro Lifeways

The people of these periods cultivated several crops including gourds, squash, and beans (Early 2000; Fritz 1984, 1986b, 1990; Perttula 2012, 2017). These people also consumed a wide variety of wild plants like may grass, amaranth, chenopods, and sunflowers (Early 2000; Fritz 1984; Perttula 2012). Maize cultivation came perhaps as early as A.D. 400, however, it did not become commonplace in the Caddo diet until around A.D. 1300 (Perttula 2008, 2012; Wilson 2012). People in the Ozarks may have been domesticating plants as long as 4,000 years ago (Fritz 1990:392) which could have ramifications for differences in agricultural chronology between the northern and southern Caddo areas.

Both groupings of Caddo are known to have hunted a diverse array of fauna. Deer appears to have been one of the more prominent game animals at this time (Duffield 1969; Perttula 2012). Many other mammals played an important role in the Caddo diet such as rabbits, opossums, squirrels, gophers, beavers, coyotes, foxes, raccoons, and otters (Wyckoff 1980:451). Some of the birds include prairie chickens, turkeys, and egrets (Wyckoff 1980:451). Fish, mussels, and turtles also feature prominently as foodstuffs and cultural items at Caddo sites (Wyckoff 1980). Seasonality appears to have played a role in this as bears, ducks, geese, and bison were more common in winter (Perttula 2012:8, Wyckoff 1980:445).

Bison were rarely hunted by people in this region until the Fort Coffee phase (Wyckoff 1980:500). Bison were not regular occurrences in eastern Oklahoma at this time (Carlson and Bement 2021). Climatic changes associated with the Little Ice Age in the 14th and 15th centuries

A.D. saw the expansion of a plains environment into eastern Oklahoma, with the woodland environment receding (Brown 1996; Brown et al. 2020). After this point, bison were able to grow in number and expand into new territory (Murray and Bryson 1977:33-41). This affected Caddo lifeways with bison being much more common in the late Caddo period ~AD 1450 (Wyckoff 1980:500). By this point, bison had also become a fundamental aspect of the northern Caddo diet (Wyckoff 1980:500).

Settlement Patterns

In the southern Caddo area, it is thought that people lived primarily in communities dispersed around civic-ceremonial centers led by civic leaders, priests, and other elites (La Vere 1998:12; Perttula 2017:48; Early 2000:126). But it is unclear if the same can be said for the northern area. These civic ceremonial centers were oriented around earthen platform mounds used as temple structures in religious and civic functions such as the burial of the political and social elite and ceremonies centered around local fire ontologies (Perttula 2012:8). These centers and the largest villages were primarily located along the nexuses of the Red, Arkansas, Grand, Little, Ouachita, and Sabine Rivers (Perttula 2012:8).

Caddo residential villages were typically dispersed and had a variety of scales ranging from isolated farmsteads (a single house), hamlets (two or three houses), and a few larger villages (four or more houses) (Perttula 2012:8; 15 Wyckoff 1980:234). These more domestic communities could be as much as 30km from the nearest civic-ceremonial mound center (Perttula 1993:93). Most habitation sites in the Arkansas Valley are relatively small with half of the recorded sites being 1.5 ha or less in size (Brown 1996:33). The largest recorded habitation site is the Horton site in Sequoyah County, Oklahoma at 8 ha (Shaeffer 1958; Wyckoff 1970). The next largest is the Littlefield I site at 4 ha (Brown 1996). Extensive excavations at Littlefield

I revealed the remains of at least 15 regularly arranged structures oriented in cardinal directions (Brown 1996:33).

Houses and Other Structures

These dispersed but sedentary communities were made up of structures that constituted various forms and utilized different construction methods (Perttula 1993, 2012). The shape and building practices of a structure were largely determined by whether this was a northern or southern Caddo community and the purpose of the structure (Perttula 2009). In the Southern Caddo region, homes were typically built from grass and cane in a circular shape without daub (Perttula 2009). In the Northern Caddo region, structures were typically rectangular and timber-framed with wattle and daub walls that were made up of upright poles placed in individual postholes or trenches (Thoburn 1931; Wyckoff 1980). The typical interior of northern Caddo structures consisted of larger center posts to support a thatched roof (Swanton 1996; Thoburn 1931; Wyckoff 1980)

The number of center posts depended on the shape of the structure. Circular structures had one center post, while rectangular structures had two, and square structures had four center posts (Swanton 1996). Ethnographic sources describe the circular houses of the southern Caddo region as having between two and ten families living in each house structure (Swanton 1996). Additionally, ethnographic examples state that those of higher status had larger houses (Swanton 1996). Circular structures were constructed of grass and cane, were about 60' (~18m) in diameter, 40-50' tall (~12-15m), and were sometimes described as similar in shape to a beehive (Swanton 1996). Circular structures were only constructed in the southern and central Caddo regions (Perttula 2009). While there were some rectangular structures in these regions, circular ones were dominant (Perttula 2009).

People living in the northern Caddo region appeared to have primarily built square or rectangular structures (Perttula 2009; Regnier et al. 2019; Wyckoff 1980). It is generally believed that rectangular structures are more recent than square ones, but there is likely some overlap (Hueffed 2023). Square structures were more pervasive than rectangular structures in the northern area (Regnier et al. 2019). From what is known about Caddo structures in the Arkansas drainage, the floor sizes ranged between 21.2-171.8 m^2 with a mean of 51.9 m^2 (Regnier et al. 2019). Hearths appear to be rare in structures in the Arkansas drainage, suggesting that they were usually placed outside (Rogers et al. 1982).

Political Structure

Like the discussion of other aspects of Caddo culture in these periods, much more is known about the southern area as opposed to the northern ones. This is largely due to early European accounts, such as the Terán map (Sabo 2012) and the De Soto expedition chronicles (Van de Logt 2016; Vega 1993[1606]). I am using southern examples in this section as a reference point but I do not wish to impart to the reader that the same is necessarily true for the northern area.

Southern Caddo civic-ceremonial centers were separate and independent of each other despite all being similar linguistically (Chafe et al. 2018) and culturally (Swanton 1996; La Vere 1998). In Caddo society at this time there were three socially prominent offices: the xinesí (priest), the caddí (secular leader or chieftain), and the canáhas (elders) (Chafe et al. 2018; Wyckoff & Baugh 1980). Xinesí's were associated with mounds and performed the duties of a religious leader (La Vere 1998; Wyckoff & Baugh 1980). The xinesí and the caddí shared power depending on context (La Vere 1998). This would have been dynamic and nuanced depending on local history and current events. Xinesí were considered sacred and played important roles in the ceremonies and rites that maintained the community's relationship with the gods (La Vere 1998; Wyckoff and Baugh 1980). These interpretations should be taken cautiously because it may be possible that accounts from conquistadors place undue emphasis on perceived structures of authority and are blind to more nuanced negotiations of power.

Current interpretations assume a hierarchy with the xinesí and the caddí positioned above the canáhas (Swanton 1996; La Vere 1998; Wyckoff & Baugh 1980). The canáhas were a council of elders who assisted the caddí in domestic settings that were spread around the community's central area (La Vere 1998:16). It was the responsibility of the caddí and the canáhas to perform governmental functions on a day-to-day level for their communities (Wyckoff & Baugh 1980)

Another role was that of a medicine person called a conná (La Vere 1998). There are accounts of conquistadors complaining that there were more conná than warriors (Vega 1993[1606]). People with this role handled the medicinal and spiritual well-being of their communities by way of prayer, rituals, and divination (La Vere 1998:18). These roles made them integral to their communities despite not playing official roles in political decision-making (La Vere 1998).

Relationship to Mississippian Traditions

Caddo culture has often been labeled as a subgroup of Mississippian culture in this period. Additionally, the Caddo area is often described as sitting on the western edge of the Mississippian world by archaeologists (see Perttula 2012:4). The trajectory of the Caddo cultural tradition saw it emerge independently from its Mississippian counterparts in the American Bottom (Perttula 2017; Regnier 2017). Caddo culture at this time shared many aspects with its Mississippian neighbors. These included the adoption of maize and the associated intensification of agricultural economies, shell-tempered pottery, platform and burial mound construction, and systems of ceremony and social authority with variations dependent upon local chronologies (Perttula 1996; Perttula 2012; Regnier 2017). However, Caddo traditions are not wholesale derived from Mississippian culture (Regnier 2017). The Caddo culture has its unique history and is perhaps best understood as going through a Mississippian period, or a period of great Mississippian affinity as opposed to being a Mississippian culture (Regnier 2017). Caddo tradition is its own and it adopted aspects of Mississippian culture at variable intervals (Regnier 2017).

Spiro

Archaeology has been practiced for over 100 years in the Arkansas River Valley (Holmes 1903; Orr 1946; Thoburn 1931) and its trajectory can be understood by beginning a discussion of how Spiro has been archaeologically investigated. Spiro is a mound complex site situated on the southern banks of the Arkansas River in what is now LeFlore County, Oklahoma (Regnier et al. 2020). Spiro comprises approximately 33 hectares and consists of the conjoined burial Craig Mound, the platform mounds Brown and Copple, 10 house mounds, and other non-mound structures (Brown 1996; Regnier et al. 2020). Spiro is highly relevant to School Land I. This is because 1) Spiro plays a crucial role in the chronology of the northern Caddo area as a whole (Brown 1996); 2) Spiro would have been one of the most important cultural landmarks for School Land I's inhabitants; and 3) it is possible that there is a gradual population dispersal away from School Land I at the end of the Harlan phase (Duffield 1969; Hueffed 2023) which would coincide with an increase in population and religious activity at Spiro as the site's leaders sought to restore a cosmic balance to the universe thereby solving the draughts that had been plaguing their society (Brown et al. 2020; Regnier et al. 2019). School Land I is but a piece in the puzzle of understanding why there was a dramatic increase in population concentration, and possibly authority, in regional centers following the Harlan phase. As mentioned previously, Spiro is important because it is far more studied, has more materials, and has materials that can be absolutely dated across the whole sequence of phases (Brown 1996).

Archaeological investigations began at Spiro with Joseph Thoburn, a Professor of History at the University of Oklahoma, site in 1918 (Livingood et al. 2020; Regnier et al. 2020). Thoburn took the first photos of Spiro in the winter of 1913-1914 (Regnier et al. 2019). These photos are the only known ones that depict Craig Mound, the largest in the complex, before its subsequent decimation (La Vere 1998; Regnier et al. 2019). This would prove invaluable in reconstructing the mound so that it could be included in the Spiro Mounds Archaeological Center (Regnier et al. 2019). However, it would not be until much later when the program was in a financial position to consider further excavations (Regnier et al. 2020). Further, many of the artifacts taken by the Pocola Mining Company, which paid the landowner to loot the site, were sold all over the world to various institutions and private collectors (Brown 1996; Regnier et al. 2019, 2020). This was further complicated by the fact that the miners were the first to gain access to the center of the largest cone of Craig Mound where they made an unprecedented discovery (Brown et al. 2020).

The looters had inadvertently stumbled upon a hollow chamber within the center of Craig mound that was lined and sealed with wooden poles (Brown 1996). Within this hollow chamber were large amounts of preserved prestige goods of considerable artisanship such as engraved shells, shell beads, plain copper sheets, baskets, woven garments made from animal hair and feathers, cedar masks, and a significant human mortuary element (Brown 1996; Brown 2012). This piqued the attention of many, with one newspaper comparing it to the discovery of King Tutankhamun’s tomb in Egypt with an article titled “ A “King Tut” Tomb in the Arkansas Basin”

(MacDonald 1935). After some deliberation by subsequent generations of archaeologists, this chamber has since been named the Spirit Lodge (Brown 2012; Brown et al. 2020). The Spirit Lodge is important because it is believed that this is the specific mechanism by which leaders at Spiro sought to address the droughts associated with the coming of the Little Ice Age (Brown et al. 2020; Burnette et al. 2020).

Reed

The Reed site is another civic-ceremonial mound center in the Arkansas River basin but it is less than 4km from School Land I. This site was briefly investigated by the Oklahoma Geological Survey in 1922 (Regnier et al. 2019:245). Reed was most likely the regional center for School Land I based on what is known about Caddo social organization in the Harlan phase (Hueffed 2023; Livingood et al. 2020; Regnier et al. 2019). One of the most substantial forms of evidence for this hypothesis is that Reed and Huffaker have significant human mortuary elements (Livingood et al. 2020; Regnier et al. 2019:247,255). Additionally, Reed shows evidence of the Calf Creek archaeological culture (Regnier et al. 2019:260), which it shares with School Land I. Thoburn described the quality of the Geological Survey's original work as poor, even for the time, so understandings of the site were limited (Regnier et al. 2019:245).

The WPA would later excavate twelve individual sites that were part of the Reed complex per their methodology (34DL1-11, 34DL14) (Regnier et al. 2019). The nearby Huffaker site (34DL12/13) (Baerreis 1954, 1955) is also thought to be part of this complex (Livingood et al. 2020; Regnier et al. 2019). The Reed site covered at least 15 to 20 hectares, however, this is challenging to judge because of the level of the aforementioned destruction by previous investigations and subsequent looting episodes (Purrington 1971; Regnier et al. 2019:245).

This site's major features are a large platform mound, a conjoined burial mound, and some associated habitation zones (Livingood et al. 2020; Purrington 1971; Regnier et al. 2019:246). Just as with School Land I, Reed's location at the border of the western prairie and the eastern woodlands allowed access to different biotic regions which would have made the site an appealing location (Hueffed 2023; Regnier et al. 2019). The radiocarbon dates that have been taken suggest that the most significant occupations and new constructions at the site were during the Harlan and Norman phases (Regnier et al. 2019:278). These dates show that Reed shared this increase in construction with School Land I.

Because of the overlap with School Land I, it is also worth discussing a section of Reed (34DL2) that had multiple structures (Purrington 1971; Regnier et al. 2019:250-251). This section of Reed was about 168 m northwest of what is believed to be the main mound group (Regnier et al. 2019:250-251). There is a possible house mound in this section that shows evidence of 13 different structures, some with superimposed outlines (Regnier et al. 2019:250). These structures were observed in two clusters corresponding with DL1-10 and DL 11-14 (Regnier et al. 2019:250-251). Ten of these structures were square and three were rectangular (Regnier et al. 2019). Four of these 13 structures showed evidence of extended entranceways, with most of them facing east, south, or southeast but only one, House 3 (DlHt1), faces north (Regnier et al. 2019:250-251). This configuration has some similarities with School Land I.

Lillie Creek

Another site that warrants discussion here because of spatiotemporal proximity is the Lillie Creek site (Livingood et al. 2020; Regnier et al. 2019:279-295). The WPA excavations of Lillie Creek were rushed due to the completion of the Pensacola Dam (Regnier et al. 2019). The WPA faced additional complications due to a lack of experienced workers and limited access to the site (Regnier et al. 2019:279). This caused the site to only be investigated for two days, despite a heroic attempt to access the site by boat (Regnier et al. 2019:279). Known features of the site include a mound structure, a sub-mound structure, adjacent structures predating the mound, stone tools ranging from Archaic to later Caddo phases, archaeobotanical evidence of corn and nut consumption, a predominance of white-tailed deer hunting over bison, and decorated pottery diagnostic of later Caddo phases (Regnier et al. 2019:279-295). This site will be important in later discussions because it shares many themes in common with School Land I.

Conclusion

This chapter provides a brief overview of the climatic, environmental, and cultural historical background of what is known about School Land I. Some important takeaways regarding the former elements show that the site was in an ecologically and politically appealing area over a long period (Albert and Wyckoff 1984; Ray 2007; Regnier et al. 2019). The Springfield Plateau is an ecologically diverse area in the Ozarks that would have enabled facilitated access to multiple biotic zones and high-quality charts (Albert and Wyckoff 1984; Ray 2007). The latter elements display that Caddo culture shares lineage with Archaic and Woodland groups such as the Mulberry River Culture, Fourche Maline, Mill Creek, and Mossy Grove cultures (Early 2000, Perttula 2012, Perttula 2017). While we know where people of the Spiroan periods were living, we cannot necessarily say the same for the Archaic and Woodland periods.

However, by ~A.D. 900 a distinct Caddo culture is recognizable (Perttula 2017). These Caddo people hunted a variety of animals for food, with a focus on whitetail deer (Duffield 1969; Perttula 2012; Wyckoff 1980). They also practiced agriculture and cultivated several crops including maize, gourds, beans, and squash along with a variety of wild plants (Early 2000; Perttula 2012; Perttula 2017). The general regional layout for Caddo habitation in Harlan times is mound centers and associated residential villages (La Vere 1998; Early 2000). In the northern Caddo region, structures were either square with four center posts or rectangular with two center posts (Perttula 2009). All of these factors provide important context when it comes to analyzing School Land I. Further, having information on changes in material type selection and biface types over time will have been of great benefit in analyzing and interpreting the lithic assemblage from this site.

Lastly, this background demonstrates the importance of School Land I. Regional centers like Spiro and Reed have received archaeological inquiry but the residential and domestic areas surrounding them have received less attention (Regnier et al. 2019, 2020). Understanding these residential sites could answer the vital questions of who, why, and how people moved to places like Spiro and Reed. Implications from that could shed light on Caddo identity in the period especially relating to homogenization and individuality as many smaller groups converged into one. Evidence of specialized temporary-use structures exists at Spiro (Hammerstedt et al. 2019) that could be the dwellings of these migrating peoples. What were the circumstances that caused these migrations and what were the lives of these people like in a new setting?

Chapter 3: Area of Study

This chapter will describe the actual space that School Land I is thought to have occupied at the time of the WPA excavations. All the known individual features will also be discussed in this chapter based on notes from WPA supervisor David Baerreis, descriptions from Lathel Duffield (1969), and the modern contributions of John Hueffed (2023). Additionally, I shall discuss relevant radiocarbon dates and how they have shaped the chronological interpretation of the site. The name for the School Land sites comes from the fact that the land was owned by a school district at the time of WPA excavations (Duffield 1969). The WPA assigned “DlSc-I. & II” “Dl” for Delaware County, “Sc” for school land, and a Roman numeral to differentiate between other potential sites in the same area.

Location

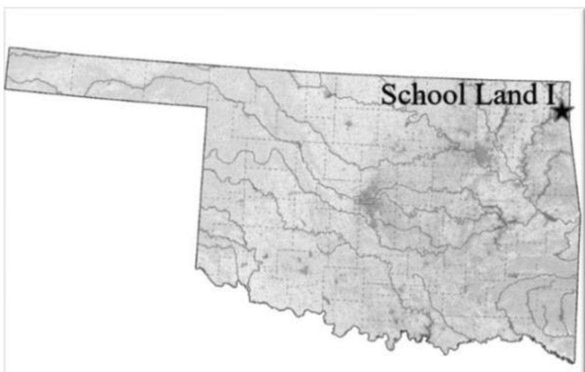
School Land I was located in northeast Oklahoma approximately 1.7 km south of the Delaware/Ottawa County border and approximately 10 km west of the Oklahoma/Missouri state border (Figures 3.1 & 3.2). School Land I originally sat on a floodplain 3.2 km south of the meetings of the Elk and Grand Rivers (Hueffed 2023; Regnier et al. 2019).

The Reed site (Figure 3.3) sat on the southeast corner of this intersection (Hueffed 2023)and it is important in discussing School Land I because of spatiotemporal proximity and overlap. While their approximate location is discussed here, I go into more depth on their significance in Chapter 2. The Elk and Grand Rivers appear to have played an important role in settlement strategies for both Reed and School Land I.

School Land I was ~3.4 km linearly east of Reed and on the same side of the river, making it within convenient walking distance (Figure 3.3). The precise location of School Land

1 is not exactly known (Hueffed 2023). The only location description for School Land I came from David Baerreis' field notes which describe the site at NE1/4 NW1/4 of Section 16, Township 25 North, and Range 24 East (Hueffed 2023). Using this, the general location of School Land I has been inferred from historic aerial photographs (Figure 3.3) (Hueffed 2023).

Another site that was excavated simultaneously by the WPA with the same supervisor is School Land II (34DL65, Dl-Sc-II) ~500 m upriver and northwest of School Land I on the Elk River's southern bank (Hueffed 2023). The WPA recorded one rectangular structure feature with a single burial alongside ceramic, lithic, and faunal materials which they collected (Duffield 1969; Hueffed 2023). These faunal materials are all that have been analyzed in the School Land II collection.



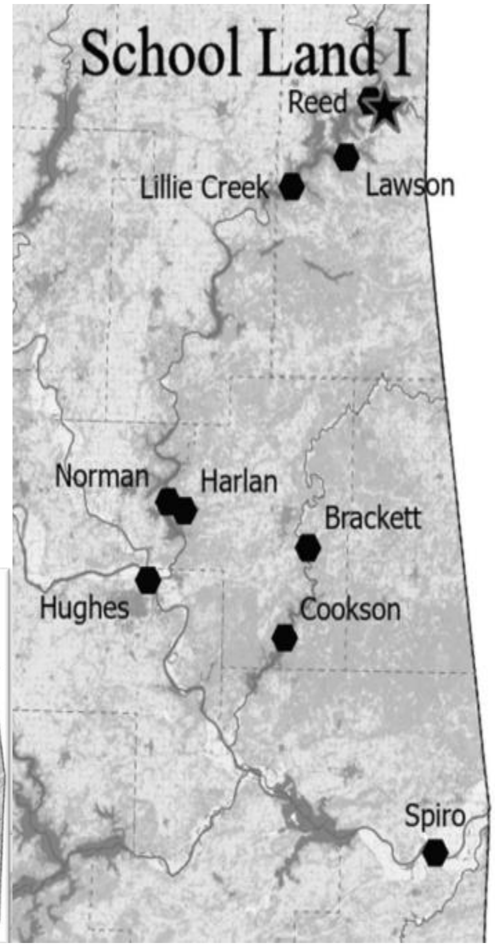


Figure 3.1 (left): School Land I's Placement in Oklahoma. Figure 3.2 (right): School Land I's Placement Relative to Other Northern Caddo Sites. Both are from Hueffed (2023:29).

Figure 3.3: Aerial Photography of Reed and School Land I Areas. From Hueffed (2023:31)

The Works Progress Administration (WPA) at School Land I

The earliest investigations of School Land I were carried out by the WPA and led by field supervisor David Baerreis from 1939-1940. While the WPA did not conduct any further analysis of the materials they collected, it is important to understand who they were and what archaeological methods they used.

The story of the WPA begins on October 24, 1929, following a devastating crash in the stock market. This would later be seen as the starting point for the Great Depression (Means 2013). US unemployment, which was at 1.5 million people at the time of the crash, would increase dramatically to over 12 million people in the following three years (Means 2013: 3). A series of programs arose in response to this that would come to be known as the 'New Deal.' New Deal programs employed the unemployed by creating work relief agencies to create a labor force for large infrastructure projects (Means 2013). This included the creation of the Civilian Conservation Corps (CCC) the Federal Emergency Relief Administration (FERA), the Civil Works Administration (CWA), and the Works Progress/Projects Administration (WPA) (Means 2013:5). All these agencies were active in Oklahoma at varying capacities (Regnier et al. 2019).

The WPA is the only relevant agency for School Land I. It was created on April 8, 1935, and operated until June 30, 1943, roughly coinciding with the USA's entry into WWII (Lyon 1996). The WPA employed over 8 million total workers on nearly 1.5 million projects that spanned 3,000 counties across the US (Means 2013:6). In Oklahoma, the WPA employed 119,000 men and women between 1935 and 1937 (Regnier et al. 2019:38). November of 1938 saw the peak of WPA archaeological employment in Oklahoma, with 259 people on roster (Regnier et al. 2019:38). WPA programs in Oklahoma were mostly associated with building roads, but they were also involved in other projects, including dam construction (Regnier et al.

2019:4). The WPA in Oklahoma also built schools, fire stations, courthouses, hospitals, National Guard armories, sidewalks, and drainage features (Regnier et al. 2019).

WPA Archaeological Methods

The WPA conducted several excavations in Oklahoma oriented around mitigating potential damage from these infrastructure projects (Regnier et al. 2019). Most of these field crews were not trained archaeologists (Lyon 1996; Means 2013; Regnier et al. 2019:38). Typically, the only trained archaeologists on site were field supervisors (Regnier et al. 2019:42). These supervisors were usually young college students like David Baerreis, Kenneth Orr, Phil Newkumet, Lynn Howard, and Joe Finkelstein (later Bauxar) with various levels of training in anthropology or history (Regnier et al. 2019:42). In many cases, these young men did not even have a degree and were only able to claim an anthropology class or two as relevant experience (Means 2013; Regnier et al. 2019:42). In Oklahoma, most of the field supervisors were affiliated in some way with the University of Oklahoma (Regnier et al. 2019).

Typical WPA organization saw field supervisors reporting to project directors (Means 2013; Regnier et al. 2019). Each state had one project director who reported to the main WPA offices in Washington D.C. (Means 2013). The project director for Oklahoma was Forrest Clements (Regnier et al. 2019). Before this point, he was focused on medical and physical anthropology, not archaeology (Regnier et al. 2019:24). He was eventually drawn into archaeology and the WPA by attending archaeological conferences (Regnier et al. 2019:24).

Clements encouraged field supervisors to follow a set list of field methods (Regnier et al. 2019). They stipulated that the sites with obvious features and those that were potentially in danger were excavated first (Regnier et al. 2019:205). Many of these sites were initially reported by local landowners (Regnier et al. 2019). When the WPA received a lead, the potential area would be surveyed and followed up by digging small test pits if the investigators thought it was worthwhile (Regnier et al. 2019:205). If the location met their criteria, which could be arbitrary and ambiguous, permission from the landowner would be sought so that a full excavation could follow (Regnier et al. 2019). This is somewhat like the three-phase system currently practiced in cultural resource management archaeology. Additionally, Oklahoma was not using the Smithsonian trinomial site numbering system at the time but a two-letter county abbreviation, followed by a site name abbreviation, and a Roman numeral designation (Regnier et al. 2019).

If test pits had been dug earlier as part of the process, a grid system would have been built around these pits (Regnier et al. 2019). The initial grid size was based on the perceived site size and density of artifacts (Regnier et al. 2019:205). Smaller sites set up grids at 5-foot intervals (1.52 m), while larger sites or less dense sites were set up at 10-foot (3.05 m) intervals (Regnier et al. 2019:205). A 10-foot interval system was used at School Land I (Hueffed 2023), likely because of how large the site was. WPA supervisors frequently changed grid sizes without documentation, which has confused many subsequent researchers (Hueffed 2023:34; Regnier 2013:29; Regnier et al. 2019:105). Grids always began in the southwest corner with a stake labeled "1:1" (Regnier et al. 2019:204-5). Stakes were then put in place at the designated intervals established for that site forming rows and columns along the north and east axes (Regnier et al. 2019:204-5). After the grid was established, excavation could begin. Arbitrary 4" or 6" levels were dug using shovels (Regnier et al. 2019:101). It is assumed that School Land I was excavated at 6" levels based on other excavations led by David Baerreis (Regnier et al. 2019:106). However, this lack of clarity has ramifications for any statement regarding depth at the site.

Back dirt was either discarded elsewhere or it was leveled across the site with a mule team post-excavation (Regnier et al. 2019:101). Excavated soil was not usually screened for artifacts (Regnier et al. 2019:101). Artifacts were typically only collected when an excavator could spot them (Regnier et al. 2019:101). A single photograph does exist that depicts what may be a screen in the foreground of a bluff shelter excavation in Delaware County (Hammerstedt and Regnier 2023:49). The kind of artifacts in the School Land I do not necessarily indicate thorough screening. But there may be more nuance to this because some projectile points in the collection are less than 2 cm long. The artifacts that were noticed were then recorded by the correlating location within the grid and level system and an arbitrary 'sack' number was assigned (Regnier et al. 2019:101). A typical description in David Baerreis' notes is '#200 N5 E10' with some specimens sharing the same sack number if they were found in the same grid.

Field supervisors and foremen were responsible for documenting the projects under their purview (Regnier et al. 2019:102). This took the form of Archaeological Data Sheets, Burial Data Forms, Survey Forms, and Profile Data Sheets (Regnier et al. 2019:102). Archaeological Data Sheets were used to record feature information (Regnier et al. 2019:102). Profile Data Sheets were used to record levels when mapping the site (Regnier et al. 2019:102). Photographs were also supposed to be taken of every feature excavated (Regnier et al. 2019:103), and many of the structures at School Land I were photographed. All measurements were recorded using the Imperial system, save for tenths of feet which were used instead of inches (Regnier et al. 2019:104).

Field supervisors and foremen were also responsible for keeping artifact catalogs and daily logs concerning their excavation. They also drew profile maps, site plan maps, and plan maps of features, houses, and burials (Regnier et al. 2019:102). One thing that was not recorded was a detailed spatial record of any of the excavated houses. This has made it challenging to distinguish between which artifacts were inside houses and which were in their immediate periphery (Hueffed 2023). It was common for the only available information for these structures to come from a discussion of posthole patterns and associated features (Regnier et al. 2019:102-103).

Faunal and Ceramic Analyses

Decades after the WPA excavations, Lathel F. Duffield (1969) analyzed the faunal assemblage. Most recently, John Hueffed (2023) analyzed the ceramic assemblage. I am now analyzing the lithic assemblage in this same pattern.

Duffield's analysis was the first conducted on any of the artifacts from School Land I. He identified and quantified all the faunal remains collected by the WPA in terms of bone type, animal species, and maturity when possible (Duffield 1969). These data enabled Duffield to present hypotheses on local ecology, dietary preference, seasonality, and cultural patterns, such as butchering and animal age preference (Duffield 1969). Two plan-view maps of the School Land I site were also produced from this research (Duffield 1969:48). The first shows the structures and the number of bones found in each unit along with the portions of the site that were excavated by the WPA (Figure 3.4). The second map shows the site's structures within the WPA's excavation system. Duffield (1969:49) constructed these maps from the WPA field notes and drawings along with their inventory list. Duffield's map has been incredibly useful to Hueffed (2023) and I, it is pictured below in Figure 3.4.

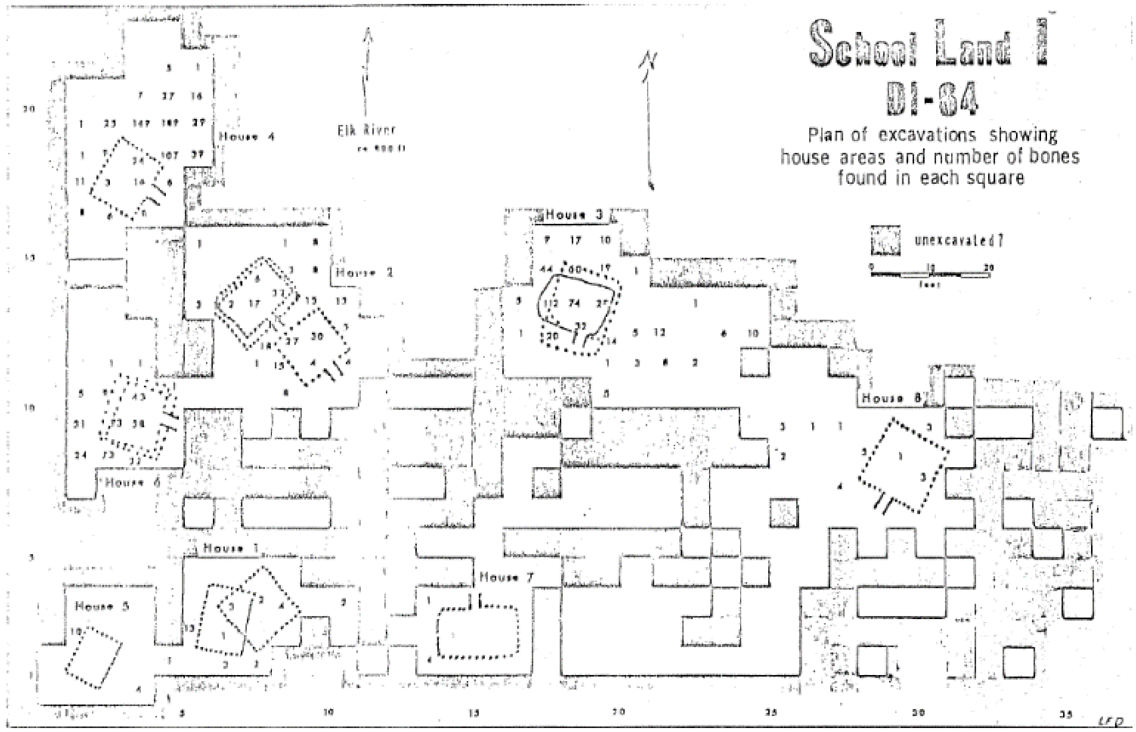


Figure 3.4: Excavated Units, Faunal Remains, and Mapped Structures at School Land I. From Duffield (1969:49)

Excavations at School Land I began in November 1939 and finished in June 1940. By the time the WPA had finished, they excavated about 282 units. This number is based on extrapolation from Duffield’s maps by Hueffed (2023) because it is not presented outright in the WPA notes. Excavations were led by David Baerreis who did not have a bachelor's degree at the time (Regnier et al. 2019:28). He would later obtain his B.A. from the University of Oklahoma and a PhD from Columbia with a dissertation topic centered in northeast Oklahoma (Baerreis 1951; Regnier et al. 2019:28).

Table 3.1: Radiocarbon Dates for School Land I

Lab #	Context	Intercept (BP)	+/-	From (BP)	To (BP)	%
WIS-257	Structure 3 Area	790	55	1051	1295	95.4
WIS-258	Structure 6 Area	710	55	1215	1395	95.4
WIS-259	West of Structure 8	900	50	1024	1223	95.4
WIS-290	Structure 8 Area	870	60	1035	1260	95.4
Beta-292993	Structure 4	820	40	1058	1278	95.4
Beta-292994	Structure 8	750	30	1221	1287	95.4
						OxCal 4.1 Calibration

The available radiocarbon dates for School Land I can be seen in Table 3.1. David Baerreis sent the first four charcoal samples to a lab at the University of Wisconsin in the 1960s (Bender et al. 1968). Radiocarbon dates from this lab in the 1960s are generally inaccurate by a few hundred years in either direction (Regnier et al 2019:344). The last two samples were submitted by Amanda Regnier and Scott Hammerstedt of the Oklahoma Archeological Survey to Beta Analytics in 2018 and are much more reliable. While they are currently unpublished, they gave their permission to have them displayed here.

The date range given for the Wisconsin samples was ~A.D. 1024 – A.D. 1395. The date range given for the Beta Analytics samples was ~A.D. 1051 – A.D. 1395. I am still including the Wisconsin samples here because there are so few samples overall and the date range is remarkably close to the Beta Analytics samples. Overall, the dates suggest a chronological placement in late Evans and throughout the Harlan phase. However, it should be mentioned that while these samples are extremely useful for understanding the structures, they can only chronologize human activity at the site relating to these structures.

In total, there were at least 13 structures in eight locations. One of the more striking features of these structures is their extended entranceways that point toward an open area that is possibly a plaza (Figure 3.4). Plazas have been an element in Southeastern cultures since at least the Archaic (Kidder 2004; Randall 2015). There are plenty of relevant examples in the late pre-contact period, some of the key features are that 1) plazas are vital to social relations 2) plazas are typically leveled, either intentionally or by being trodden upon and 3) plazas are independent monumental constructions that require a large labor investment (Lacquement 2020). When considering these factors, it is important to state that the specific topography of the School Land I plaza is unknown and most of it was unexcavated (Figure 3.4). Perhaps it can be assumed that the plaza was level based on aerial photography, but this photography also makes it clear that the area was plowed (Hueffed 2023:31). It should also be mentioned that plazas in residential areas likely had different functions than those in mound centers.

Another important observable factor on Duffield's (1969) map that may be vital for understanding the social organization of School Land I is the presence of extended entranceways in seven of the 13 structures. While five of the seven entranceways point toward the south or southeast, there is one (Structure 8) that points to the southwest and another that points north (Structure 7). There appears to be a Structure 9 that points north as well, but it is very poorly documented and is situated far enough away from the rest of the structures that I believe that it does not belong in the potential plaza configuration. The two most likely reasons for these entranceways are: *1)* House 8 is related to mortuary practices in some way. This is because westward-facing structures are thought to signify death with the setting sun and east-facing structures face the rising sun symbolizing life (Dorsey 1905; Kay and Sabo 2006). Or *2)* This implies some kind of social differentiation with all the entranceways pointing toward Structure 7.

Northern facing structures do not have known symbolic meanings in Harlan phase Caddo culture (Dorsey 1905). While the exact type of governance(s) and corresponding levels of authoritarianism are unknown for the northern Caddo, there is a possibility of a panoptic phenomenon. With proximity to sites like Spiro and Reed, the whole site may be associated with ritual specialization. While a chiefdom (e.g. *caddí/xinesí* (Dorsey 1905; La Vere 1998)) is one possibility, it is equally possible that this is representative of a more heterarchical government style (e.g. *canáhas* (Dorsey 1905)) where the community has invested both socially and materially into the institution behind Structure 7 and not any one person. It could also be possible that the plaza itself could instead serve this purpose. In either form, there may be a reciprocal and multitudinous gaze present in the layout of the village, making it panoptic. The plaza could be a site for surveillance and norm enforcement while the structures facilitate relative privacy.

Rebuilding also appears to have played a significant role at the site as many structures have superimposed posthole patterns consistent with an initial structure being dismantled but followed by a new structure in the same place as the previous one (Hueffed 2023). This may signify occupational time depth in which the peak occupation of School Land I in Harlan times was an intensification of already existing social structures. It is not necessarily clear what the implications are for the differential use-lives of these structures but I am assuming that more rebuilding episodes means more intensive and/or long-lasting occupations. These structures are each described below.

Structure 1: This structure was located southwest corner of the excavation grid (Figure 3.5). It has two superimposed structures, labeled 1A and 1B. There is some overlap but neither structure appears to have had an extended entranceway. Structure 1A was rectangular and appears to have been oriented with its long sides positioned north/south. A fire pit was identified by the WPA in the southwest corner of this structure. Its dimensions were about 7.4 m x 5.8 m (Hueffed 2023). Structure 1B was square and appears to have been oriented northeast/southwest.

1B's dimensions were about 6.7 m x 6.4 m (Hueffed 2023). The WPA photographs of these structures can be seen below in Figure 3.5.

Figure 3.5: WPA Photograph of Structure 1 (A&B) (SNOMNH)

Structure 2: This structure was located just north/northwest of the plaza (Figure 3.6). The WPA documented two superimposed structures, structures 2B and 2C, and a third iteration, 2A, just southeast of the two superimposed structures. Structure 2, specifically 2A and 2C, is identified as one of the structures with an extended entranceway possibly directed at House 7. The proximity of these structures also makes it extremely unlikely that they were used at the same time, therefore appearing to have gone through three rebuilding episodes. All three of these episodes had this structure facing southeast. 2A was a square structure with four center posts. The sides of 2A measure 6.7 m x 6.4 m (Hueffed 2023); the slightly longer sides were oriented northwest/southeast. Structure 2B was square with four center posts. The sides of 2B measure 7.0 m x 8.0 m (Hueffed 2023), with the slightly longer side oriented in a northeast/southwest direction. Structure 2C was slightly rectangular and had four center posts. The dimensions for 2C were 5.4 m x 8.0 m (Hueffed 2023) and the longer sides were in a northeast/southwest direction. The WPA identified another fire pit close to the center, a cache pit near the eastern corner of Structure 2B/C, and an ash heap near the center of the structures.

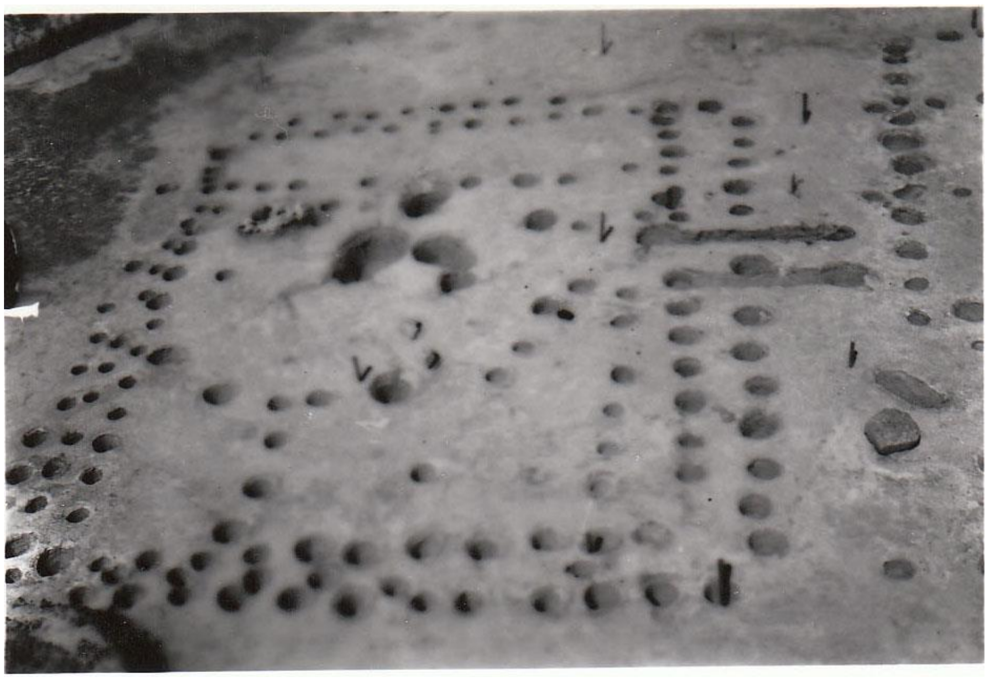


Figure 3.6: Structure 2 (A, B, &C) (SNOMNH)

Structure 3: This structure was situated just north of the plaza (Figure 3.7). Structure 3 also appears to have had a rebuilding episode, with 3A and 3B being superimposed on top of each other. They have an unknown number of center posts, but five medium-sized post holes were recorded. The WPA recovered large amounts of burned daub from this structure which they described as “wattle heap[s]” (Hueffed 2023:44).

3A is unique because it is the only structure known in the Arkansas Valley to be built using wall trenches rather than single-set posts (Hammerstedt, personal communication 2024). A wall trench typically has one or more walls that use a trench to facilitate the upright placement of poles (Pauketat and Alt 2011). This differs from posthole structures because a separate posthole is needed for each pole (Pauketat and Alt 2011). 3A is also one of the structures with an extended entranceway opening towards the plaza and Structure 7 in the south. Additionally, its entranceway was not positioned centrally. The dimensions of 3A were approximately 7.4 m x 5.76 m with the longer sides oriented east/west (Hueffed 2023).

Structure 3B was a rectangular structure that appeared to be oriented around a north/south axis. It is possible that it also possessed an entranceway, but this is unclear. The dimensions for 3B were approximately 7.4 m x 9.3 m (Hueffed 2023).

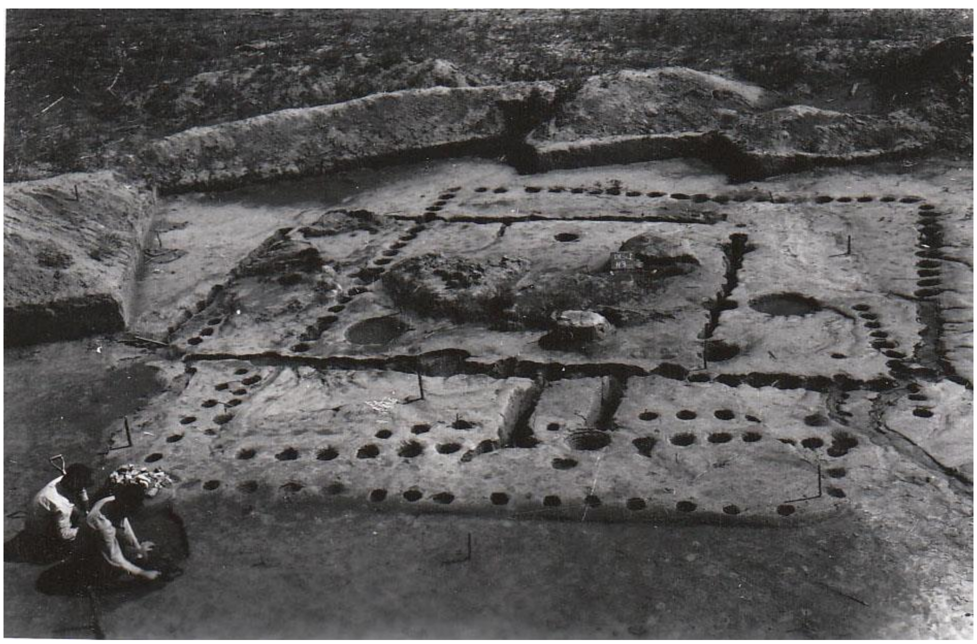


Figure 3.7: Structure 3 (A & B) (SNOMNH)

Structure 4: This structure (Figure 3.8) was located in the northwest area of the site and also possesses an extended entranceway facing south toward the plaza and House 7. This structure was square and did not appear to have any superimpositions. It did have six center posts within its walls. The dimensions were approximately 6.7 m x 6.1 m (Hueffed 2023).

Figure 3.8: Structure 4 (SNOMNH)

Structure 5: This structure was located in the southwest area of School Land I. It was slightly rectangular, had two center posts, and did not appear to have had an entranceway (Hueffed 2023). It appears to be oriented slightly northeast/southwest with no side directly facing the plaza (Hueffed 2023). The dimensions were approximately 6.4 m x 5.1 m, with the longer sides oriented northeast/southwest (Hueffed 2023). The WPA did not photograph this structure.

Structure 6: This structure (Figure 3.9) was positioned in the western portion of the site, and it consisted of two superimposed structures with an extended entranceway facing the plaza and Structure 7. Structure 6A was a near-square structure with four center posts. While 6A has no discernable entranceway, the overlap with 6B may obscure this. 6A's dimensions were approximately 7.0 m x 6.4 m (Hueffed 2023). Structure 6B was rectangular and its dimensions were approximately 7.3 m x 6.4 m (Hueffed 2023). Lastly, the WPA photographed a "buttress" (Figure 3.10) associated with this structure but had no mention of it in Baerreis' notes.

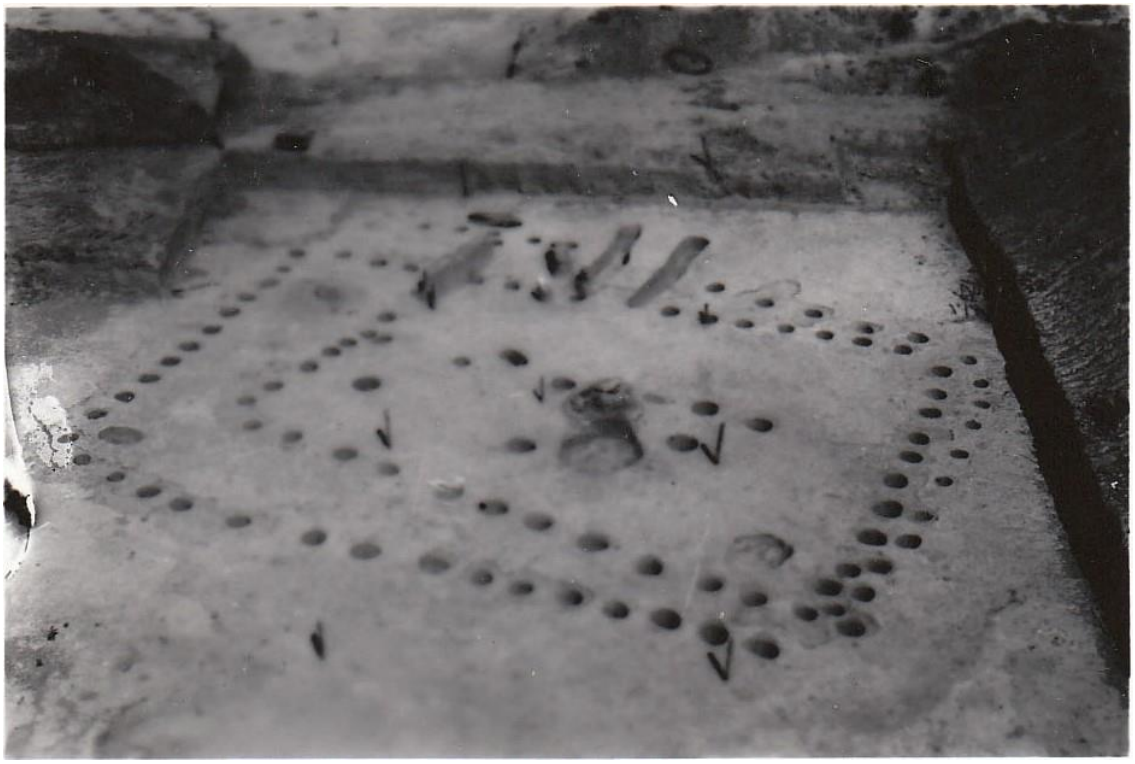


Figure 3.9: Structure 6 (A & B) (SNOMNH)

Figure 3.10: Buttress Associated with Structure 6 (SNOMNH)

Structure 7: This structure (Figure 3.11)was located just south of the plaza. It had no superimpositions, was rectangular with two center posts, had an extended entranceway, and was the only structure with an entranceway that pointed north, toward the plaza. The WPA identified a cache pit just outside, to the north of Structure 7, and just west of the entranceway. The dimensions were approximately 9.0 m x 5.8 m (Hueffed 2023).

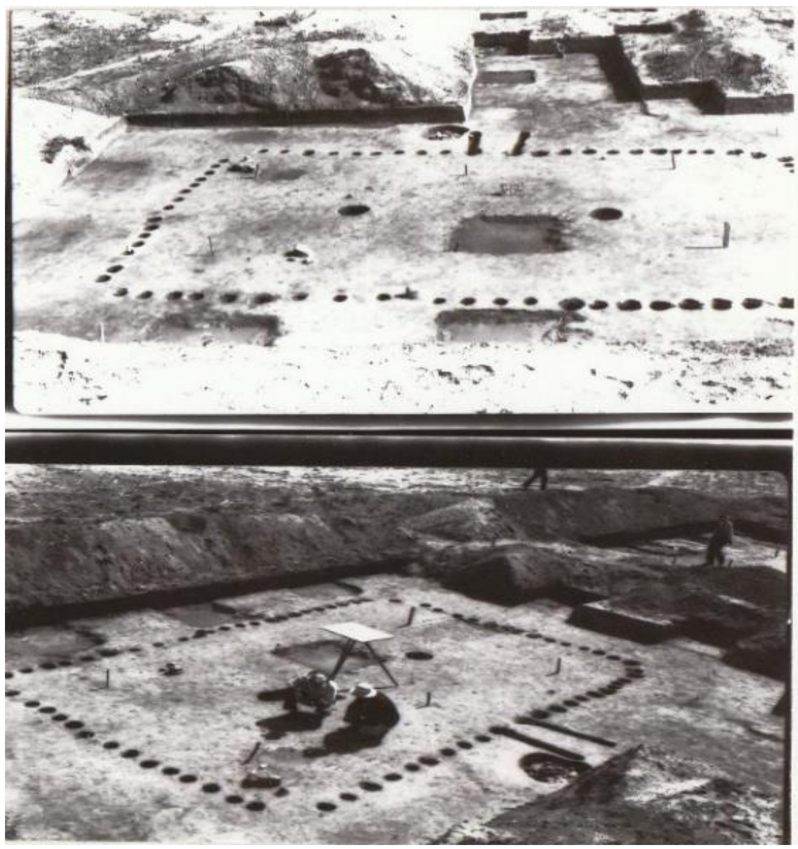


Figure 3.11: Structure 7 (SNOMNH)

Structure 8: This structure was located just east of the plaza, the only one in that area of the site. It had no superimpositions, was square with four center posts, and had an extended entranceway. The WPA recorded a pit near the structure's northern corner and a fire pit close to the southeast wall. Hueffed (2023:51) states that he believes this structure is unique because its entranceway does not face the plaza. However, I disagree because I believe that the plaza extends to the area immediately in front of Structure 8 for reasons that will be elaborated upon in Chapters 5 and 6. But this structure's entranceway opens southwest which does appear to be less common among the structures. Its dimensions were approximately 7.6 m x 7.7 m (Hueffed 2023). The WPA did not photograph Structure 8.

Structure 9: Hueffed (2023) should be credited with the verification of this structure because previously Dr. Hammerstedt and I had been under the impression that there were only eight structures as indicated on the Duffield (1969) map. The only evidence for a ninth structure was a WPA drawing (Figure 3.12) (Hueffed 2023:51). The WPA drawing was clearly labeled as "DlSc 1" and "H-9" (House 9) was written underneath, and "H-9" was written a second time near the center along with a date of "6-26-40" (Hueffed 2023:51). It is unlikely that this depiction is inaccurate because of the number of times DlSc1 and H-9 were written on the document. However, it is entirely unclear why this information was so obscured and why Duffield (1969) did not account for this structure. This diagram states that this structure was positioned between 26:10 and 26:11 putting it quite far to the north at ~21 m from its nearest structure (Structure 4) (Hueffed 2023). No artifacts were recorded as having come from this structure. The WPA did not record any artifacts north of row 22 (Hueffed 2023). This structure remains a mystery for now.

Structure 9 is described as being made up of two superimposed structures, each with an extended entranceway and what looks like six center posts. Hueffed (2023:51) named the structure whose entranceway faces northwest Structure 9A and the structure whose entranceway faces west Structure 9B. Structure 9A was square-like and appears to have had four center posts (Hueffed 2023). 9A's dimensions were approximately 7.6 m x 6.6 51 m (Hueffed 2023). Structure 9B was rectangular and appears to have had two center posts (Hueffed 2023). The dimensions of Structure 9B were approximately 6.4 m x 4.8 m (Hueffed 2023). Because there were no artifacts collected from the vicinity of this structure, it will not be discussed again until the latter portions of this thesis.

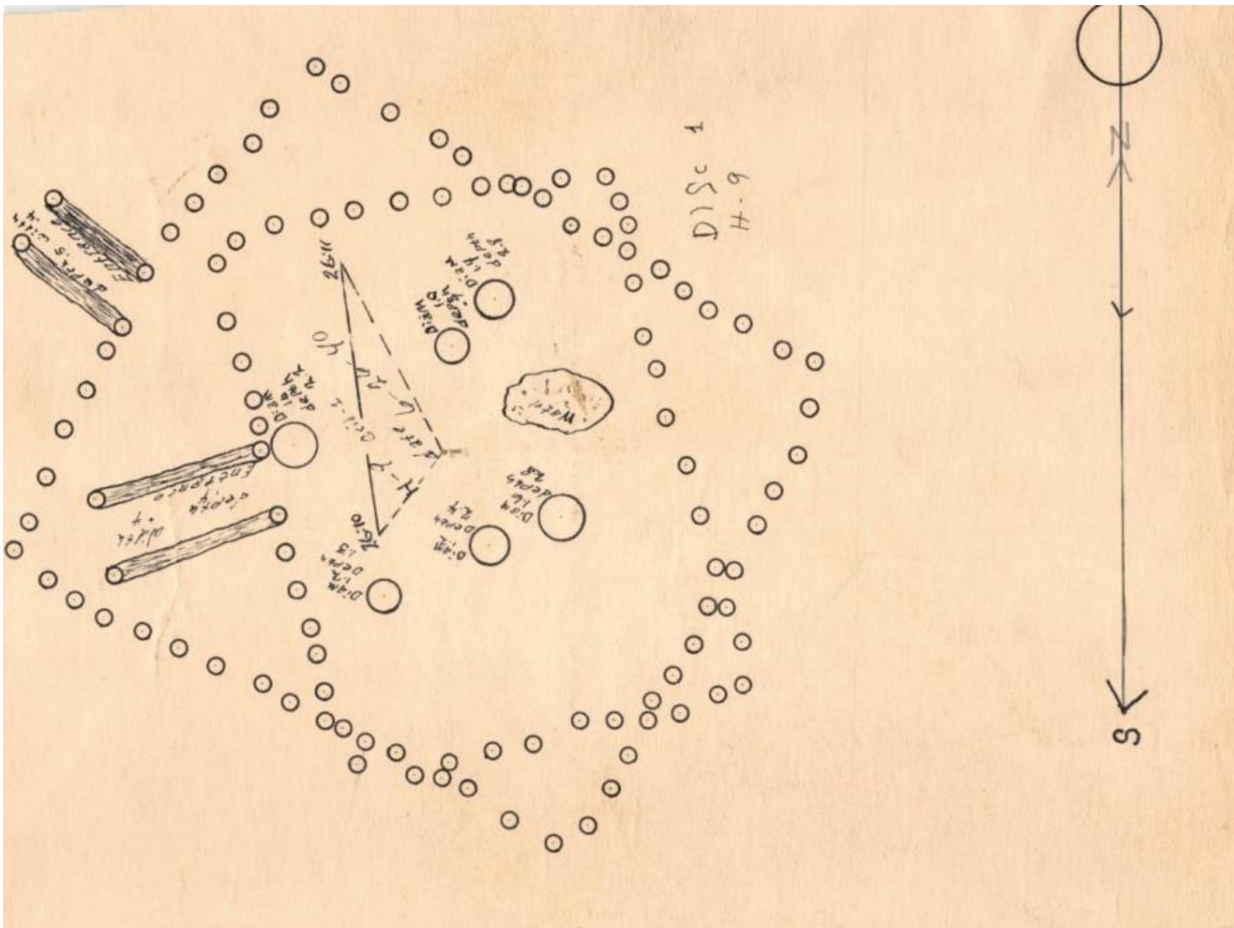


Figure 3.12: WPA Drawing of Structure 9. (SNOMNH)

Conclusion

There appears to be a consistent pattern among many structures with minor differences in rebuilding episodes, entranceway presence/orientation, and the bewildering element of Structure 9 (Table 3.2). To compare this site with recent work done on eastern Oklahoma Caddo houses (Regnier et al. 2019:311), Hueffed (2023) calculated the floor size of the School Land I structures (Table 3.2). Structure 3B was the largest with an area of 68.3 m^2, and Structure 8 was the second largest area of 58.1 m2 (Hueffed 2023:52). Structure 5 was the smallest with an area of 32.8 m2 (Hueffed 2023). The average calculated area of all the structures was 44.3m^2 with a range of 32.8 to 68.3m^2. Regnier and colleagues (2019:311) did a study of 78 Caddo structures and found that their mean floor size was 51.9m^2 with a range of 21.2 to 171.8m^2. While these floor averages are comparable to those at School Land I, the houses at the site appear to be smaller on average than their counterparts across the region.

Structure	Entrance Direction	Long Wall Length (~m)	Long Wall Orientation	Short Wall Length (~m)	Short Wall Orientation	Structure Area (~m^2)
1A	Unknown	7.4	N/S	5.8	E/W	42.6
1B	Unknown	6.7	NW/SE	6.4	NE/SW	43.0
2A	Southeast	6.7	NW/SE	6.4	NE/SW	43.0
2B	Southeast	8.0	NE/SW	7.0	NW/SE	56.3
2C	Southeast	8.0	NE/SW	5.4	NW/SE	53.5
3A	South	7.4	E/W	5.8	N/S	42.4
3B	Unknown	9.3	N/S	7.4	E/W	68.3
4	Southeast	6.7	NE/SW	6.1	NW/SE	40.9
5	Unknown	6.4	NE/SW	5.1	NW/SE	32.8
6A	Unknown	7.0	N/S	6.4	E/W	45.1
6B	East	7.4	N/S	6.4	E/W	47.1
7	North	9.0	E/W	5.8	N/S	51.6
8	Southwest	7.7	SW/NE	7.6	NW/SE	58.1
9A	Northwest	7.6	NW/SE	6.6	NE/SW	50.2
9B	West	6.4	E/W	4.8	N/S	30.7

Table 3.2: Summary of Structure Dimensions at School Land I. From Hueffed (2023:52)

Chapter 4: Methods

This chapter will discuss the methods of analysis used in categorizing the stone tool assemblage present at School Land I. The strategies I used in interacting with the Works Progress Association (WPA) collection are also discussed in Chapters 3 and 5 alongside discussions of WPA methods. The collection currently belongs to the Sam Noble Oklahoma Museum of Natural History (SNOMNH) at the University of Oklahoma.

Chipped Stone Analysis

All fragments of chipped, ground, and ornamental stone were measured by length, width, and thickness. Breakage types in bifaces, raw material type, inferred morphology, and formal tool type were recorded when a reasonable observation could be made. The types of chipped stone specimens present in this assemblage consist of flakes, utilized flakes, biface fragments, formal bifaces, informal bifaces, and un-typable bifaces (Figure 5.1, pg. 87).

There is a selection bias surrounding this assemblage because of the 1769 total specimens analyzed, only 36 are flakes. This is a result of WPA collection methods, particularly an explicit focus on diagnostic formal tools at the expense of other lithic materials and a lack of consistent screening (Regnier et al. 2019). This makes methods like mass analysis (Bradbury and Carr 2009) and flake attribute analysis (Andrefsky 2005) categorically unfeasible. My primary methods here are more akin to a bifacial attribute analysis informed by reduction sequence/chaîne opératoire (Shott 2003). Keeping this in mind, it is important to acknowledge that there is only so much information that can be gleaned from this assemblage.

Chipped Stone Raw Material Types: Ozarks

Keokuk/Burlington

Burlington is one of the most prominent cherts in the Ozarks and its Keokuk variety is one of the most prominent chert types in northeast Oklahoma (Ray 2007). The parent material for this kind of chert is fossiliferous limestone (Ray 2007). Because of the similarities between Keokuk and Generic Burlington (Ray 2007), I have combined them in this analysis. It is beyond the scope of my research questions to distinguish between them. I feel further justified in doing this because the Keokuk variety has become a frequent synonym with all Burlington in existing literature (Ray 2007). Further, enhanced distinctions are perhaps best made by either someone with specialized geological training or with the aid of chemical sourcing equipment. I employed a Dyno lite digital microscope and a 365nm ultraviolet flashlight to assist in identifying materials.

Varieties of Burlington other than Generic and Keokuk include High Ridge, Mozarkite, and Graydon (Ray 2007). While the cortex on subterranean samples is frequently less than 1mm, the cortex on above-ground samples is frequently more than 8mm (Ray 2007). These above-ground samples also typically present a weathered or worn appearance. This cortex is visually described as white, light gray, or light brown (Ray 2007).

Ray (2007:194) provides Munsell shades of white to light gray with mottles and streaks of gray, brownish gray, and brown sometimes being present for the Keokuk variety of Burlington. Banding is quite rare in this variety but can still occur, which can cause it to be confused with other chert varieties, usually Peoria (Ray 2007). Some additional features for distinguishing this variety from other chert types are that it frequently has a low luster when it has not been heat treated, and it is highly fossiliferous (Ray 2007:194). The most common fossils present in this variety are crinoids, with unbroken plant stem segments also being possible inclusions (Ray 2007). This can sometimes cause the presence of substantial gaps within the stone (Ray 2007) which can be an unwelcome surprise for a prospective knapper. It is also likely for Keokuk to contain incipient fracture planes (Ray 2007). While diagnosing these planes can be challenging, it is one of the eleven types of biface failures that Johnson describes in his experiences with an assemblage from Yellow Creek, a site in northeast Mississippi (Johnson 1979, 1981). The material types are different at Johnson's site but I mean to articulate that there are certain material types more likely to contain IFPs depending on the assemblage.

Keokuk can sometimes have blue shades which can make it challenging to distinguish from Reeds Spring (Ray 2007). This is another Ozark chert type discussed below. Some of the most fruitful ways to make this distinction is patterning, as Reeds Spring has a very different kind of mottling or splotching, and the presence of fossil inclusions which are much more prominent in Keokuk specimens (see Ray 2007:371-372). Additionally, Reeds Spring typically has a higher gloss and a more fine-grained composition (Ray 2007)

After heat treatment, both Keokuk and Generic Burlington undergo a dramatic increase in gloss which is especially pronounced on the interior flaked surfaces of a tested specimen (Ray 2007). Other changes are characterized by a finer texture which improves knapping quality, an increased undulating response to being struck via hard hammer direct percussion, and typically a reddish change in color as the stone's ferrous properties are brought to the surface (Ray 2007). Keokuk requires a large time investment to heat treat to the desired result. Current recommendations are about 315.5°C (600°F) for 72 hours (Benefield and Duncan 2021; Ray 2007). Some methods even include a ladderlike approach to heat treatment with a gradual increase and decrease in temperatures (Benefield and Duncan 2021; Ray 2007). These requirements have a long list of implications beyond technology, including cultural practices like institutions of learning, that should be explored in more detail.

Burlington has been one of the primary cherts selected for use in the Ozarks and the American Bottom from the Paleoindian period to the Neosho (Ray 2007). Burlington in the archaeological record does not have a strong divide in terms of ceremonial versus utilitarian function. It is a frequent choice in tools of either variety (Ray 2007). This is displayed in the chipped stone assemblage of Cahokia, where Generic Burlington makes up 71% of the ceremonial specimens and is the primary toolstone in household flake-tool economies (Ray 2007:202). This is an area where the presence of flakes would have been vital. The presence and particularities of household flake-tool economies can not be evaluated In the area near School Land I, Keokuk Burlington makes up significant portions of the assemblage from the Jug Hill site (34MY18), the Albertson Shelter (3BE174), and the Dry Ford site (3NW507) to name just a few examples (Ray 2007).

Reeds Spring

Generally, Reeds Spring appears visually as a blue-gray fine-grained chert of high-knapping quality (Ray 2007). One of its more diagnostic features is its marbled or splotchy patterning which can change to red, pink, and white if thermally altered (Ray 2007). The most relevant varieties for this thesis are Lower and Middle. Ray specifies the Munsell colors for Lower being variants of gray, dark gray, light bluish gray, bluish gray, dark bluish gray, very dark gray, black, brown, grayish brown, light yellowish brown, light brownish gray, and light gray (Ray 2007:175). For the Middle variety, Ray specifies Munsell shades of white, light gray, gray, dark gray, very dark gray, light bluish gray, bluish gray, dark bluish gray, grayish brown, dark grayish brown, light brownish gray, pinkish gray, brown, light olive brown, and very pale brown (Ray 2007:176). Here it is important to note that each tool reduced from Reeds Spring contains several of these shades. This can be overwhelming at first but can also get easier as an analyst gets more exposure.

This chert type was officially referred to as Boone Chert up until 1978 and is one of the more common chipped stone tool material types in northeast Oklahoma (Ray 2007). Reeds Spring was referred to as Boone well into the 1980s (Ray 2007) which continues to have significant impacts on current archaeological research in the region. Boone is still used by some to refer to other chert variants in the region (Banks 1984, 1990; Lewis 2024). This creates a great deal of confusion as Boone is a material category that has been used in many different capacities over a long period. Further, since much of this stone comes from the Boone formation it is even more confusing. Adding to these complications is the fact that Keokuk/Burlington can sometimes be referred to as Boone (Ray 2007:195).

It seems quite plausible that the source for some of this confusion is the rock itself. The sheer variability of Reeds Spring has led some in the past to specify as many as 27 different varieties (Klinger et al. 1993). To simplify this and make it more accessible to non-specialists, Ray (2007) lists eight different kinds of Reeds Spring. They are Lower Reeds Spring, Green Reeds Spring, Middle Reeds Spring, Biogenic Reeds Spring, Speckled Reeds Spring, and Banded Reeds Spring (Ray 2007:174-177). I have not distinguished between them because it is beyond the scope of the research questions I am asking and these determinations should be made by someone with more geological training and/or specialized equipment. I have only distinguished Reeds Spring from other major categories of chipped stone. Yet distinguishing between these different types of Reeds Spring could be useful for future research to gain more specific insights into the relationship past peoples had with the landscape.

Upon being thermally altered, Reeds Spring can either have no change in color, luster, or texture or it can change dramatically (Ray 2007:178). Typically, it is the lighter shades of Reeds Spring that are more likely to undergo color changes as opposed to the darker shades (Ray 2007). However, when a color change does happen it seems to fall along the lines of reds and pinks becoming more vibrant as the ferrous parts of the stone's chemical composition are brought to the surface. Reeds Spring is rarely heat treated intentionally in comparison to other raw materials like Burlington/Keokuk because Reeds Spring already possesses a glass-like form (Ray 2007). This form is ideal for knapping, making further thermal alteration unnecessary.

Reeds Spring is found primarily in the Springfield Plateau region of the southwestern Ozarks (Ray 2007). Many outcroppings are accessible for people living in the School Land I area because this stone is common in eroded alluvial environments (Ray 2007). Additionally, it is much more likely to be used for tools like projectile points as opposed to chipped stone hoes because of its glassy but fragile composition (Ray 2007).

When it is available, Reeds Spring is typically either a primary or secondary resource (Ray 2007). Ray provides the example of the Afton biface type of which the majority of tools in the regional assemblages he has surveyed are made from Reeds Spring (Ray 2007). This is likely related to the fact that pronounced thinness is one of the diagnostic features of the Afton type (Ray 2016).

Undifferentiated Osagean (UO)

A generic type, UO has a high degree of fossil (Ray 2007) and pyrite (Lewis 2024) inclusions. Cherts of this variety are usually white and opaque but can vary widely (Ray 2007). This is one of the more geologically controversial material types in the region because Ray (2007:213) identifies it as coming from the Osagean Series while other authors, like Lewis (2024:8), identify it as coming from the Boone formation and call it Boone chert. Ray (2007:216) weighs in heavily on this, "The term Boone, however, is inappropriate and should be abandoned as a descriptive chert type because it is too general, and until recently, has included easily differentiated dark-colored chert from the Pierson and Reeds Spring Formations." Because of this and the fact that Boone can also be used to refer to Keokuk/Burlington, I have chosen Ray's (2007) route on this matter.

While Ray identifies two different kinds of UO, they are divided by region and the relevant variety for School Land I is Springfield Osagean (Ray 2007). It is quite plentiful in the Ozarks with deposits of this chert type being up to 30 m thick (Ray 2007:215). While this type can have a wide range of colors, Ray (2007) describes light-colored cherts from the Pierson, Reeds Spring, Elsey, or Keokuk/Burlington formations as being typical for UO. Munsell colors range from white, light gray, light brownish gray, and gray with dark gray and very dark gray occurring infrequently (Ray 2007:215). The cortex for this variety is typically white or light gray and very thin (Ray 2007).

In Ray's (2007) experimental segment, he heat-treated 11 pieces of UO, nine of which were Springfield Osagean and the remaining two were Salem Osagean. Of these, six of the highly patinated Springfield specimens underwent significant changes from paler colors to much more vibrant shades of pink and red (Ray 2007). Other results from this experiment saw the specimens increase in glossiness and grain (Ray 2007). Similar to Burlington, Ray found that UO can adopt a blackened appearance from being burned (Ray 2007). The results of these experiments echoed the archaeological record in the region where sites with UO as a component in their lithic assemblages are usually heat treated at a rate of 25-50% (Ray 2007:218). In summary, UO was a common choice for knapping because it is plentiful, it occurs in large nodules, and it responds well to heat treatment (Ray 2007:219).

Peoria

This chert type is extremely localized because it is currently understood as coming from one quarry in northeast Oklahoma (Ray 2007, 2013). Although it is sometimes called Tahlequah Chert (Banks 1984:81-82, 1990:27-28), this is inaccurate because the Tahlequah portion of the Moorefield Formation is further south (Ray 2007:225). Analysis has determined that Peoria chert is geologically related to the Keokuk-Burlington and Warsaw Formations (Ray 2013). Ray (2007:226) provides Munsell shades for the colors of white to light gray with light gray, light brownish gray, and light yellowish-brown mottles and streaks. These patterns occur linearly which is different from the splotchy patterning of Reeds Spring (Ray 2007).

Peoria chert has a dull luster, it can be banded, and is devoid of fossils (Ray 2007:226). The knapping quality of this material ranges generally from fair to good without being heat-treated (Ray 2007). In limited experimental testing with Peoria chert Ray (2007) found that the sample changed color from white to pink alongside a dramatic improvement in luster and texture in terms of knapping quality. Regional Plains Village cultures, corresponding with the Fort Coffey and Neosho Phases (~A.D. 1450-1650) are the most users of Peoria, with little evidence that earlier groups used it intensively (Brown 1984; Ford 2021; Ray 2007).

Chipped Stone Raw Material Types: Ouachita Mountains

Big Fork

Big Fork is one of the chert types present in the School Land I collection from the Ouachita Mountains. This chert type is described as being dark gray to black with dull white grains appearing periodically depending on the sample (Banks 1990; Lewis 2024). It is very similar to other materials sourced from the Ouachita's in color but typically has a lower grain and gloss (Lewis 2024). Big Fork is present very rarely in the School Land I assemblage and there is currently no experimental data regarding how it responds to heat treatment.

Novaculite

This is a sedimentary chert type with quartz parent material (Holbrook and Stone 1978) that often gives the stone a 'sugary' texture and appearance (Lewis 2024; Trubitt et al. 2004). It is considered a high-quality knapping stone because of its gloss and fine grain size causing it to flake amicably without heat treatment (Lewis 2024; Trubitt et al. 2004). This is reflected in its etymology which is sourced from the Latin 'novacula' which means razor-stone (Holbrook and Stone 1978). Novaculite is usually unicolor with shades of black, light tan, brown, gray, and white (Lewis 2024; Trubitt et al. 2004). However, some elliptical patterning can be seen on this chart type when viewed under a microscope (Lewis 2024; Trubitt et al. 2004). Additionally, heat-treating this stone is challenging in that it requires even higher temperatures than Keokuk while providing little to none of the comparative benefits (Trubitt et al. 2004). Also occurring in the Ouachita Mountains, Novaculite is most commonly found in what is now Arkansas (Holbrook and Stone 1978).

Red River Jasper

Said to be understudied (Dowd 2011), this chert type embodies many of the same characteristics of other more well-known kinds of Jasper (Dowd 2011; Lewis 2024). This material can be red, yellow, and brown, (Dowd 2011). This material type is likely sourced from the John's Valley Formation of the Ouachita Mountains and was likely accessed via the Red River, which receives outflow from the Kiamichi River (Dowd 2011). There is additional evidence that the material was found in a tabular form in the Red River (Dowd 2011), making it ideal for the reduction of thin bifaces. Some additional macroscopic characteristics of this kind of Jasper are the presence of iron oxide impurities and a banded or mottled interior structure (Dowd 2011:91). Red and yellow varieties have likely experienced more weathering than their counterparts of other colors (Dowd 2011).

Chipped Stone Raw Material Types: Other Nonlocal

Chalcedony

Typically semi-transparent with shades of white, gray, or blue (Pretola 2001), this material type occurs very rarely in the School Land I collection. It tends to have a low gloss and a medium grain pattern which can make it a desirable knapping stone if found in a large enough nodule (Ray 2007). However, Chalcedony is a somewhat rare material in this region (Pretola 2001; Ray 2007), which makes extra-regional sourcing a distinct possibility.

Quartzite

A coarse-grained and very low-luster chipped stone resource (Tarver 2018), this material occurs very rarely in this collection and is only present in non-typable tool types. It is also very challenging to source this material without the aid of geochemical analysis methods (Tarver

2018). It could be local or non-local. The abrasive texture of this coarse-grained stone is perhaps its most diagnostic feature, making it easily distinguishable from chert materials (Tarver 2018). This texture also makes this stone a desirable type as a platform abrader in the reduction process (Andrefsky 2005; Ray 2007).

Biface Breakages

Developed by, Jay Johnson (1979, 1981), this method of lithic analysis is a typology dependent upon macroscopic observations that enable the analyst to make reasonable inferences about the use-life, or lack thereof, of a bifacial tool. It was perhaps the perfect method of analysis for this collection. This is because most specimens are either bifaces or biface fragments. Other possible paths were usewear (see Semenov 1964), and microwear (see Macdonald 2014) analyses. While usewear and microwear would have been methods of great benefit and utility for this research, I chose biface breakage analysis because of factors like time constraints and logistical challenges in obtaining the appropriate microscopes. It is also quite possible that the way the collection was housed would have made these wear analyses unreliable. The tools were frequently rubbing on each other which would obscure existing wear patterns and produce new ones. A further strength of Johnson's method is that it does not require special equipment, like the specific microscopes needed for use and microwear. In Johnson's texts, he describes eleven fracture types. They are discussed below.

1) *Hinge Fracture (Figure 4.1):* One of the key aspects of understanding this fracture type is the component of step fractures (Johnson 1979). The word 'step' refers to a stacking of striking platforms that takes the appearance of a series of steps on a ladder (Andrefsky 2005). Step fractures are usually interpreted as undesirable and can be an indication of a less experienced knapper or an expediently produced tool (Johnson 1979, 1981). One

consequence of using some stone tools is that they develop hinge fractures. For this analysis, hinge fractures are identified as primarily a production-related failure as opposed to one resulting from use. It should be noted that just because a tool has been labeled as a 'failure' resulting from hinge fractures does not mean it is unusable. This does not inherently affect their viability, but it may limit their use purposes and it does have an impact on aesthetics. Although aesthetics is a tentative subject because of the danger of imposing too much of a modernist lens.

Figure 4.1: Example of a Hinge Fracture. From Johnson (1981:44)

2) *Reverse Fracture (Figure 4.2):* Johnson likens this fracture to another commonly known as 'overshot' and 'outrepassé' and labels it as a production failure (Johnson 1981:44). This fracture could happen in several ways, but its effects are so pronounced that it has a traumatic effect on the potential tool. While hinge fractures rarely signify a complete end to the potential use life of a stone tool, reverse fractures frequently have that effect. The only alternative a prospective knapper has going forward would be to rework the objective piece substantially, completely changing their previous intent.

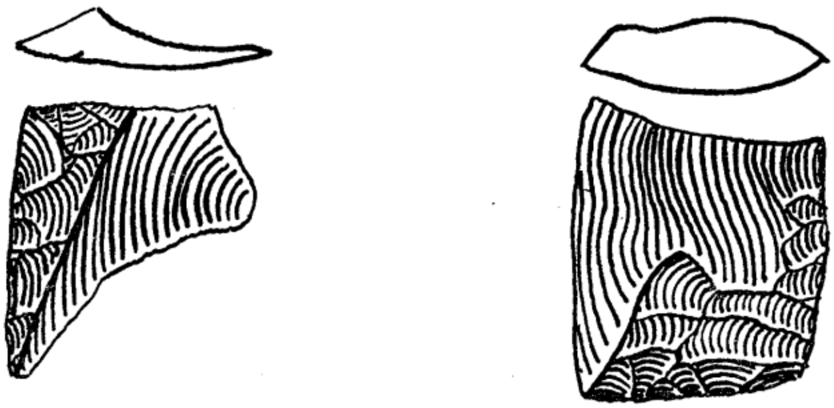


Figure 4.2: Example of a Reverse Fracture. From Johnson (1981:44)

3) *Longitudinal Reverse Fracture (LRF) (Figure 4.3):* Like the reverse fracture, the presence of an LRF typically indicates an end in the tool's use life. What makes the LRF different from a typical reverse fracture is that a portion of the central blade remains, either on the ventral or the dorsal side, while the material around it has been reduced. Johnson ascribes this abnormal fracture type to the removal of specific lateral flakes in the Yellow Creek assemblage he used this analysis on (Johnson 1981). Further, the LRF is designated as an early-stage production failure (Johnson 1981).

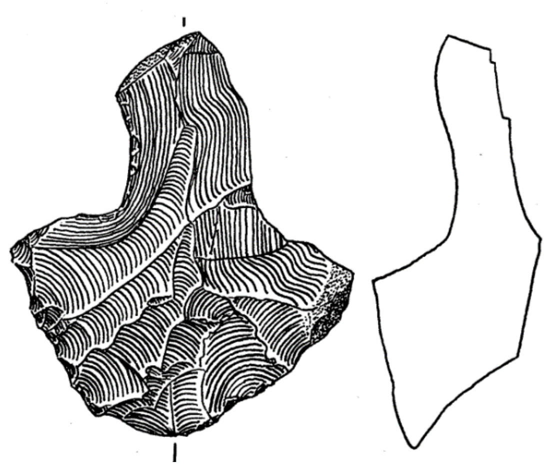


Figure 4.3: Example of an LRF. From Johnson (1981:45)

4) *Perverse Fracture (Figure 4.4):* More typical of a use failure than a production failure, the perverse fracture is signified by a twisting fracture plane across the biface that truncates it (Johnson 1981). This source of this visible twisting is an undulating residuum that originates from the point of impact, truncating the biface (Johnson 1981). Johnson also remarks that a bulb of force is commonly evident in this type of failure (Johnson 1981).

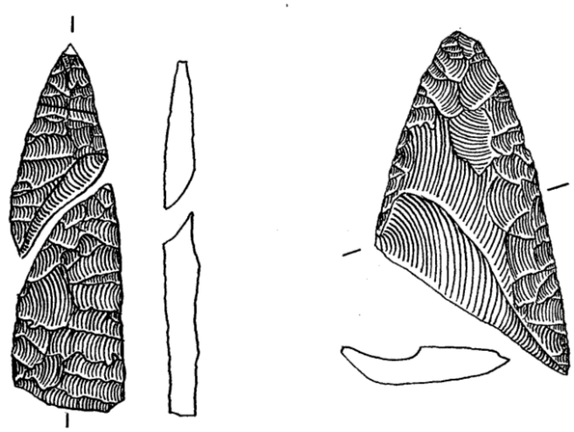


Figure 4.4: Example of a Perverse Fracture. From Johnson (1981:46)

5) *Impact Fracture (Figure 4.5):* This fracture type is also more emblematic of some sort of traumatic event in the tool's use life rather than a production failure. Perhaps the most straightforward of the nine types of biface failures, an impact fracture is signified by a series of undulations and removed flakes from the distal end of the biface. Impacts causing failure are of course possible in other areas of the biface but are much more likely to manifest as a different kind of fracture because of the lateral load applied on the biface than the impact fracture that is ascribed by Johnson (1981).

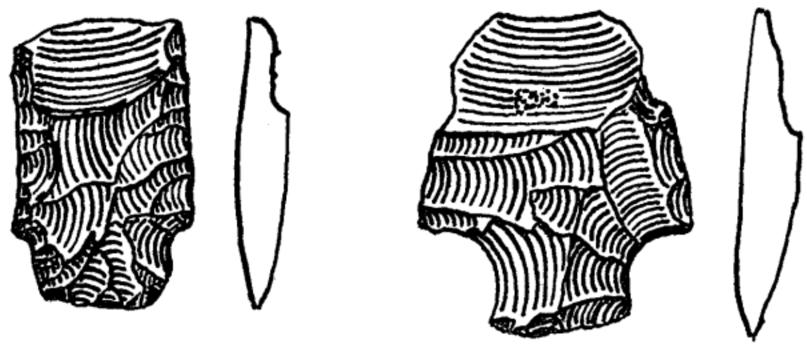


Figure 4.5: Examples of Impact Fractures From Johnson (1981:46)

6) *Lateral Snap Fracture (Figure 4.6):* While it seems to have been a matter of some debate whether or not this fracture signifies more of a use or production failure, Johnson does state that lateral snap fractures occur on primarily unfinished bifaces, indicating it as a production failure in the Yellow River context (Johnson 1981:47). It does seem entirely possible that this can vary depending on the assemblage. Therefore, it is important to use other lines of evidence like biface production stage and spatial relationships to make inferences into whether a tool experienced a use or production failure.

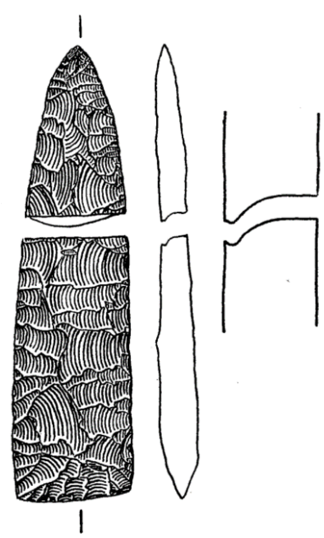


Figure 4.6: Example of a Lateral Snap Fracture. From Johnson (1981:47)

7) *Incipient Fracture Plane (IFP) (Figure 4.7):* Stated as being the most challenging fracture to identify (Johnson 1981: 48), the IFP is almost entirely determined by the material of the biface. Since identification can be challenging, it aids analysis greatly in gaining familiarity with the material types under one's purview. For example, Keokuk is one of the more likely material types in the School Land I assemblage to develop IFPs (Ray 2007). Apart from that, an IFP is characterized by a series of visible lines or cracks occurring geometrically due to the chemical composition of the material (Johnson 1979, 1981). The presence of IFPs can have an interesting interplay with heat-based fractures. Heat can cause the disintegration of fossil inclusions at structurally significant areas inside a nodule. This starts a domino effect that can result in an IFP fracture.

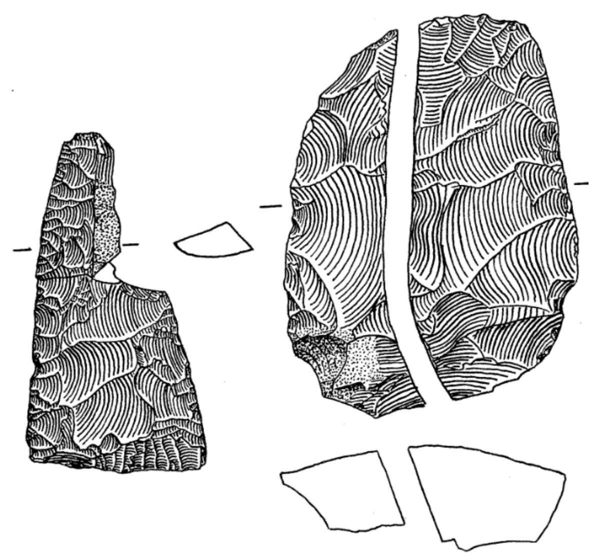


Figure 4.7: Example of IFPs. From Johnson (1981:48)

8) *Crenated Fracture (Figure 4.8):* The first of the fractures relating to thermal alteration, this fracture type can be differentiated from the other heat-oriented fractures in that it has a pot lid that occurs in a very unfortunate place structurally for the biface, truncating it (Johnson 1981). Crenated fractures are inferred as occurring in production or post-

depositional settings because it is categorically impossible for them to be a use fracture, (Johnson 1981). Once one becomes proficient enough to recognize crenated fractures they can be a valuable way of firmly identifying artifacts that have or have not been thermally altered. This is especially important when looking at materials coming from places like the Ozarks, where the sheer geological variety over such a contained geographic area means that tools from adjacent rock outcrops can have dramatically different chemical reactions to heating. An example of this would be the difference between Keokuk/Burlington and many of the types of Undifferentiated Osagean in terms of heat. The whiter varieties of Keokuk commonly turn glossy whereas Undifferentiated Osagean cherts can adopt a porous or pock-marked appearance due to the combustion of pyrite present within the stone. Another helpful tool in distinguishing crenated fractures is the presence of elliptical ‘S’-shaped fracture planes, Johnson further stresses that this is typically a later-stage production failure due to improper heat treatment (Johnson 1981:49)

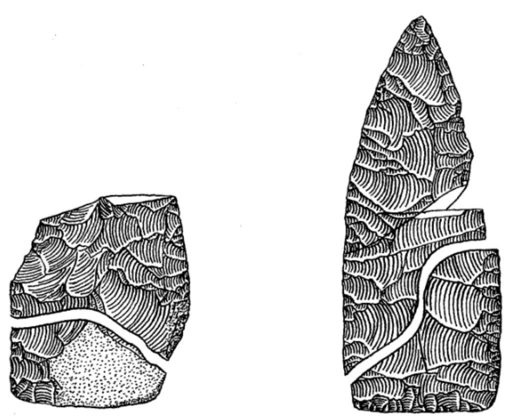


Figure 4.8: Examples of Crenated Fractures. From Johnson (1981:49)

9) *Pot Lid Fracture (Figure 4.9):* The placement of the pot lid is what differentiates a pot lid fracture from a crenated fracture. If the pot lid occurs in the interior of the stone and

causes it to fail, it is a crenated fracture (Johnson 1981). If pot lids occur in a way that does not cause the catastrophic structural failure of the tool, it is categorized as a pot lid fracture (Johnson 1981). Because of this, pot lids seem to be associated with post-depositional settings. This cannot be confirmed in this vein of evidence alone. It should also be noted that while pot lid fractures are categorized as failures, there are some cases where a tool still could be used despite this categorization.

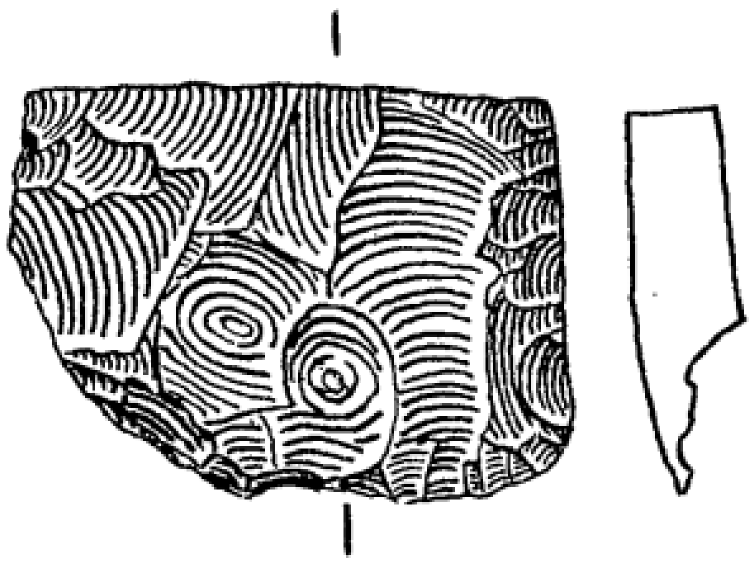


Figure 4.9: Example of Bifacial Pot Lids. From Johnson (1981:49)

10) *Expansion Fracture (Figure 4.10):* The third and final iteration of the thermal alteration fractures, the expansion fracture can be differentiated from the crenated fracture and the pot lid fracture in that it is essentially, “a large pot lid fracture turned sideways to truncate the biface” (Johnson 1981:50)

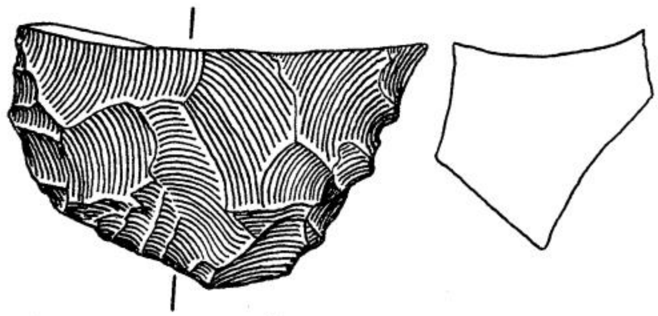


Figure 4.10: Example of an Expansion Fracture. From Johnson (1981:50)

11) *Haft Snap (Figure 4.11):* The final fracture, the haft snap, is inferred to be typically a use-related fracture as opposed to one that occurred at some point in the production process (Johnson 1981:52). Perhaps one of the more straightforward of the nine fracture types, next to the impact fracture, a haft snap is characterized by only the haft element of the biface remaining, and a linear breakage being present at a directly perpendicular angle.

Figure 4.11 Examples of a Haft Snap. From Johnson (1981:52)

Formal Tool Types in Time and Space

Unfortunately, typologies of form and style can be so convoluted and unnecessarily split apart that it is necessary to determine if they are a help or a hindrance. In this case, my conclusion is that they can help. This is because Jack Ray (2016) published a typology manuscript of what is now Missouri and surrounding states that goes through most of the preexisting literature. Not only does this lump preexisting types that were the same but created by different analysts, but it also creates an opportunity for scientific replicability. The manuscript has typical measurements for each biface type, their relationship with heat treatment, their relationship with other biface types, and discussions of where and why some biface types were lumped or split. Another strength of this manuscript is that it offers radiocarbon years before present dates for each biface type.

Despite this, it is important to respond to some of the more relevant criticisms of typology. One such piece was written by Edward Henry and colleagues (2017) titled *'Against Typology: A Critical Approach to Archaeological Order.'* However, as the authors specify, this critique is focused on the rigidity of typology (Henry et al. 2017). In their view, typologies have the potential to obscure understanding and be harmful when used restrictively. When done in this way, typologies are not helpful. Henry and his colleagues even go so far as to say that these typologies are a kind of 'epistemic violence' perpetrated by archaeologists (2017:28).

I believe that Ray's typology is congruent with these concerns. While it does lump preexisting types, I see this as enhancing flexibility rather than reducing it. This is because it allows for the unavoidable variance in tools produced by one knapper, let alone whole archaeological cultures. In this manner, lumping is more flexible than splitting. This is further exhibited in the excavation of the Big Eddy site in southwest Missouri (see Lopinot et al. 2005). This site provided an opportunity for a robust gathering of data relating to the Williams, Smith-Etley, Kings, and Afton formal tool types which are also present in the School Land I assemblage. Further analysis of these types allowed the researchers involved to identify relationships among these different types, especially when it came to resharpening episodes (Lopinot et al. 2005). A specific example of this is how Ray stresses that Smith and Etley are separate formal tool types but were likely parts of the same toolkit of a single cultural group (Ray 2016:90). In this fashion, using typologies as analytical devices to aid researchers in comprehending the complex variation present among past societies is an illuminating practice, not an obscuring one.

There is a potential clash between Ray's 2016 typology and the one presented in the 2021 *'The Calf Creek Horizon: A Mid-Holocene Hunter-Gatherer Adaptation in the Central and Southern Plains of North America.'* This Calf Creek-focused text splits this formal type into three: Bell, Andice, and Calf Creek. Ray (2016) states that the Bell and Andice types may be Calf Creeks at different stages of resharpening. I have followed Ray's route to maintain congruence with Henry and colleagues (2017). Nevertheless, Ray is a coauthor of a chapter in this Calf Creek text in which he elects to use just the Calf Creek type but neither Bell nor Andice (Ray and Lopinot 2021). While this can be a seemingly trivial divergence, I am displaying it to be transparent.

Formal Tool Types Relevant for the School Land I Assemblage

Calf Creek

These bifaces typically exhibit deep basal notches and heat treatment (Ray 2016). Their surface area to thickness ratio is representative of advanced knapping techniques (Ayala 2021a; Ray 2016; Ray and Lopinot 2021). It is also thought that Calf Creek bifaces went through multiple stages of heat treatment in the reduction process (Benefield and Duncan 2021). This focus on heat treatment is possibly related to material type selection (Ayala 2021a; Benefield and Duncan 2021). While some recorded Calf Creek specimens are obsidian (Oliver 2023), which does not require heat treatment, material types of heat-treated Florence A, Frisco, Reeds Spring, Keokuk/Burlington, and Alibates are much more common (Bartlett 1994a; Benefield and Duncan 2021; Ray 2007, 2016).

Geographically, Calf Creek bifaces are spread throughout the southern plains region with some specimens being recorded in what is now North Dakota and Utah (Lohse et al. 2021: 4). Important boundaries appear to be the Mississippi River and the Rocky Mountains (Lohse et al. 2021). The Calf Creek type is described as existing from 5400 B.P. and 4600 B.P. (Ray 2016). In this framework, the Calf Creek type fits into the Middle Archaic.

As discussed earlier, the Bell and Andice types are becoming more commonly associated with the Calf Creek type (Prewitt 2021a, 2021b). However, in this thesis, I am adopting Ray's (2016:14) hypothesis that the Andice and Bell types represent stages on a resharpening continuum. Consequently, the length of Calf Creek bifaces can differ substantially depending on how much resharpening has occurred. These tools are currently thought to be primarily for hunting bison (Lohse, Duncan, et al. 2021). Regional variation can also account for some differences as this formal tool type appears to have been utilized by several archaeological cultures over its 800-year range across an expansive geographic area (Ray 2016; Wyckoff 1994). The concept of the practice piece is also understood as a significant component of Calf Creek knapping practices (Ayala 2021b; Ray 2016). Specimens like this exhibit deep basal notches that are a characteristic feature of this formal tool type.

Smith

The Smith type is the other basally notched chipped stone tool that is present in this collection, and it differs from the Calf Creek type in a few important ways. One of the most observable ways is that Smith bifaces are rarely heat-treated with intent[2] (Ray 2016). The Smith

[2] Heat treatment is typically a practice to improve the knapping quality of stone. However, it is also important to consider secondary or post-depositional thermal alteration. Distinguishing between heat treatment and thermal alteration can be ambiguous. This is why I am using only thermal alteration in analysis.

type is also different from the Calf Creek type in terms of thickness-to-surface area ratio and the angle of the basal notch itself (Ray 2016). Smith tools are typically thicker, implying a less restrictive reduction process, and have a shallower and more gradual 'U' shaped basal notch (Ray 2016:15).

Geographically, the Smith type is common throughout the Ozarks with significant numbers of them recorded where the borders of what is now Missouri, Oklahoma, and Arkansas meet (Ray 2016). They occur less frequently in northern Missouri and southern Illinois (Ray 2016). Chronologically, the Smith type is thought to come after Calf Creek ranging from 4300-3700 B.P. (Ray 2016). The Big Eddy and Bear-Sac sites have provided some of the more substantial data relating to the Smith type which is associated with the Etley and Kings types (Lopinot et al. 2005). Big Eddy contained stratified evidence of the sequential relationship between these three biface types (Lopinot et al. 2005).

Here it should also be noted that Ray lumps the previously existing Stone Square Stemmed (SSS) type (Perino 1968) with the Smith and Etley types. He argues that the SSS type has the same flaking technology, lack of heat treatment, biconvex cross-section, shape, and thickness as Smith and Etley bifaces so SSS bifaces are therefore just at a different stage on the resharpening continuum (Ray 2016:90).

Afton

One of the most visually striking features of the Afton biface type is that it can have a dramatically triangular distal end. Bifaces of other types like Williams can also have this appearance when resharpened (Ray 2016:20). A valuable method to distinguish between them is the thickness ratio of the biface. Afton bifaces are corner notched and have a mean length of

73mm and a mean thickness of 8mm (Ray 2016:20). Practice pieces can also be an element of Afton production (Ray 2016) suggesting institutions of learning-oriented around manufacturing these bifaces. This implies a high focus on bifacial thinning that differentiates the Afton type from others in terms of the knapping process and intended use. This is possibly corroborated by the context in which this formal tool type was originally recorded. They were found inside a natural spring near Afton, OK, and thought to be a symbolic offering as opposed to serving a utilitarian purpose (Gregory and Towns 1966; Holmes 1903). One of these possible symbolic purposes relates to mortuary practices, but Afton bifaces have also been found at residential sites (Ray 2016). The School Land I site is currently interpreted as being entirely residential without any mortuary elements (Duffield 1969; Hueffed 2023). One hypothesis explaining this is that the nearby Reed site, which has the only known burial mound in the area, would have performed the mortuary functions for the people living at the School Land I site during the times relevant for the Afton type (Hueffed 2023; Regnier et al. 2019). This is similar to the Crenshaw site in the southern Caddo area where the current interpretation is that Caddo people from surrounding residential communities interred the dead at this ceremonial center (Samuelsen 2020). More work will have to be done to improve archaeological understanding of this type when it comes to this distinction between mortuary and residential settings.

The Afton type has been recorded over a limited range, seemingly occurring only in the immediate Ozark area with little presence on its periphery (Ray 2016: 22). A date range of 3300-2600 B.P. is suggested for Afton bifaces (Ray 2016). Heat treatment in Afton bifaces appears to be associated with material type selection meaning that it is common in Keokuk/Burlington and UO specimens but rare in Reeds Spring specimens (Ray 2016).

Scallorn

This type is a small arrow point with a mean length of 28mm (Ray 2016). Scallorns are corner notched and their length can vary depending on the placement of each specimen along their resharpening continuum (Ray 2016). These points are frequently recorded at Caddo sites from the Woodland to the Spiro phase with a suggested date range of 1300-600 B.P. (Ray 2016). Their geographic range consistently follows what is thought of as the Caddo area, with some occurrence in the surrounding areas (Ray 2016).

Waubesa

This formal tool type has a contracting stem and typically has an excurvate to straight blade (Ray 2016:130). Heat treatment is not believed to be an important part of this tool's manufacturing process and has a wide distribution across the Ozarks and surrounding areas (Ray 2016). This tool type is also referred to as Gary (Bell 1958) but I am adopting Ray's (2016) nomenclature to be consistent. Ray (2016:131) suggests a date range of 2500-2000 B.P. for Waubesa.

Standlee

This is another tool with a contracting stem (Figure 4.12) that has historically been called Langtry (Baerreis 1951; Ray 2016:119). The heat treatment of Standlees depends on material type, and its distribution is much more centered in the Ozarks (Ray 2016:119). While Waubesas are primarily associated with the Early Woodland, Standlee's are associated with the Middle Woodland (Ray 2016). One of the more reliable ways of distinguishing this type from Waubesa is that while Waubesas have a pointed or flat stem, Standlees have a slightly concave stem and can have barbs (Ray 2016:119).

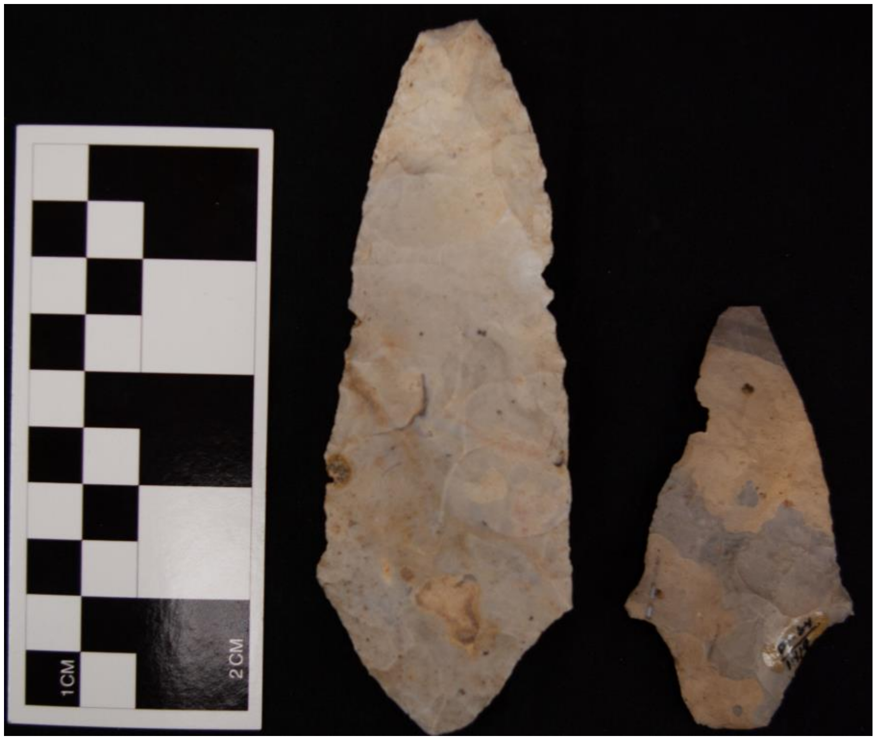


Figure 4.12: Waubesa (left) and Standlee (right)

Williams

A biface associated with the Smith, Etley, and Kings types, the Williams type is typically a corner-notched medium-sized biface with a mean length of 62.1mm (Ray 2016). Its base is either flat or excurvate and its corner notches typically have a gradual ‘U’ shape (Ray 2016). Heat treatment was an important component in the manufacture of this biface as it is present across specimens of all regional material types (Ray 2016). Geographically this type is concentrated in southern Missouri and northern Arkansas but can be found in what is now northeast Texas and southern Illinois (Ray 2016). Temporally, it is associated with the Late Archaic and Woodland periods with suggested dates of 4300-3500 B.P. (Ray 2016).

Harrell

A smaller arrow point, the Harrell type can either have two side notches and a flat base or a single basal notch along the centerline of the tool (Ray 2016). They can be heat treated but this has been observed as happening less frequently than in other arrow points in the region (Ray 2016). Harrell points can be found throughout the central plains of North America and have strong relationships in time and space with Washita and Huffaker points (Ray 2016). Suggested dates for this type are 1050-600 B.P. (Ray 2016: 62).

Morris

The Morris type is similar to other previously discussed arrow points but differs in that the notches on the side and the base of the stem are ovate (Ray 2016). Ray (2016) describes the heat treatment of these points as being not well documented, but this is something that this thesis hopes to do. They are quite similar to Reed points with convex bases but differ by having more lobed characteristics (Ray 2016). Spatially they are almost entirely limited to the Ozarks, with a focus in eastern Oklahoma, and the recommended date range is 900-600 B.P. (Ray 2016: 69). Morris types can also be serrated (Ray 2016).

Reed

This type is named for the Reed site in northeast Oklahoma, which is thought to be the civic-ceremonial center for this region from at least the Late Woodland to Spiro phase (Regnier et al. 2019). Reed is a small arrowpoint with side notches and either a flat or slightly convex base (Ray 2016). Reed points are focused in the Caddo area and have a suggested date range of 1050-600 B.P. (Ray 2016: 75). This type is specifically associated with the Harlan Phase (Ray 2016) in

Caddo history which corresponds with radiocarbon dates obtained from the house structures at the site (Regnier et al. 2019).

Etley

A medium to large size stemmed biface, the Etley type is associated with the Smith, Kings, and Williams types based on stratified evidence from the Big Eddy site (Lopinot et al. 2005; Ray 2016). Its mean length is 84.2 mm, it has a long blade, a low likelihood of being heat treated, it is relatively thick (mean 10mm), and has a typically flat but sometimes incurvate stem (Ray 2016). The Etley type is frequently found on the boundary of what is now Missouri and Illinois and is typically associated with the Late Archaic, with a suggested date range of 4300-3600 B.P. (Ray 2016: 90).

Additionally, the Etley type is one of the types that the SSS type has been lumped into along with the Smith type in Ray's typology (2016: 90). It can be challenging to differentiate Etley bifaces from Smith bifaces after they have been resharpened (Ray 2016). Further complicating matters is that data from the Big Eddy site possibly suggests that these two types existed at the same time in the toolkit for one archaeological culture or associated archaeological cultures (Lopinot et al. 2005: 174-192; Ray 2016). Lastly, the Etley type also shares similarities with the Mule Road and Ledbetter types from regions further east (Ray 2016).

Fresno

The Fresno point is a small bifacial triangular arrowpoint that can sometimes have a convex base and has sometimes been referred to as expediently made (Perino 1968). They can be found throughout the plains of North America and are commonly associated with the late-precontact phases in Oklahoma with suggested dates ranging from 700-600 B.P. (Ray 2016).

Nodena

A small unnotched formal tool type, Nodena points have an elliptical or ovate stem that can make a differentiation between the blade and the stem difficult (Ray 2016:149). They can also be bi-pointed (Ray 2016). Their heat treatment is not well documented. They are thought to be Middle-Late Mississippian, and they have a suggested date range of 550-250 B.P. (Ray 2016:49).

Alba

These small points are triangular with a square stem and are documented in direct association with the Harlan site (Bell 1958, 1972). They are commonly found at Caddo sites in both the northern and southern areas (Bell 1958). An age range of ~A.D. 1450-500 is suggested for this formal tool type (Bell 1958).

Inferred Morphology

I applied this category to every specimen but labeled some 'unknown' when they did not fit into known morphologies. What I intend to articulate with this is that some specimens are formal tools but they are either so broken that their type cannot be identified or they are atypical specimens manufactured by knappers with idiosyncratic tendencies (Ray 2016:163).

One of the primary goals for my morphological category is to deal with the dichotomy between appearance and actual use. The biface breakage method had a significant role to play in this because certain failures correspond with certain kinds of use practices. An example of this can come from comparing impact and lateral snap fractures. An impact fracture is evidence of distal lancing or puncturing where the lateral snap is more indicative of oblique load. Utilizing biface failures further helped me to gather evidence for inferred morphology when it came to the bifaces that I am calling chipped stone hoes. The hoes have a series of hinge fractures present on their striking ends and it was a frequent observation that their use life ended when a traumatic lateral snap fracture occurred. The combination of these two fractures means that these tools experienced regular use breakages along their distal ends but these breakages were not enough to end the use life of the tool. I explore this further in Chapter 6. However, it is important to recognize that many tools likely had more than one function or that their range of functions resulted in a range of breakages.

Ground Stone

I recorded the attributes of length, width, thickness, material type, and alteration for all ground stone specimens. Additionally, I categorized these specimens morphologically in the same fashion as I did the chipped stone specimens. There are comparatively fewer attributes to measure in ground stone specimens. Despite this, I still recorded a few different types of ground stone tools. These are generic modified ground stones, nutting stones, hammerstones, manos, abraders, a celt, and a stone pipe plus stone pipe fragments. Ground stone material types were sandstone and limestone. I was hopeful that the pipe fragments would be able to yield additional information with chemical residue testing, but it is unlikely that this testing would have been successful. This is largely due to insufficient collection and storage procedures resulting in contamination, as the specimens were collected long before archaeological chemical residue testing was even an option.

Ornamental Stone

I defined this category as lithic specimens that did not appear to have a functional value. They were neither chipped stone nor ground stone. Length, width, thickness, material type, and modification were recorded for this category. Some of these materials, like galena, may warrant additional sourcing methods like X-ray fluorescence at some point, but this was not feasible in this study. The other material types for this category are hematite, quartz, and mica. I previously had experience with quartz and was comfortable identifying it. Dr. Scott Hammerstedt instructed me on identifying hematite. Describing the number of hematite specimens is less straightforward than other material types because the hematite in this collection is very fragile. All hematite was still in its 1939-1940 paper field bags before I re-packaged them as part of this thesis. Sitting in a paper bag for 82-83 years was not kind to some of these specimens, and that is especially true for those that are hematite. Lastly, Dr. Debra Green, a geoarchaeologist at the Oklahoma Archaeological Survey, helped me by verifying the mica specimens.

Conclusion

In this chapter, I presented the methodology I used to analyze the lithic assemblage from School Land I. The lithic assemblage is deserving of this level of analysis because of morphological variation, the presence of poorly understood formal tool types, the variety in material types, the implication of deep time activities at the site, and the geographical location of the site itself with the associated role it played locally and regionally. The fact that School Land is a residential site near the Reed mound site makes it an important avenue of investigation because of the relationship between the two and the fact that residential sites are not as well understood as mound sites (Regnier et al. 2019). Hopefully, the methods presented here will be valuable contributions to the understanding of archaeology in the Arkansas River Basin.

These methods equipped me with the necessary data to be able to have answers for the research questions of this thesis: will analyzing the lithic assemblage confirm or deny current interpretations of the site? The use of these methods has also opened new questions as possible lines of inquiry for the future.

The sheer variety in the School Land I's lithic assemblage has made it challenging to properly account for methodologically. Despite my analysis here, there are still many paths open for future analysis of material types including different kinds of compositional analysis and sourcing methods. Unconsidered lithic analyses could be applied to this collection. This could prove extremely valuable in supplementing the findings of this research here. Apart from verifying or challenging what I have found, it could open up entirely new areas for questioning and analysis.

Chapter 5: Results

This chapter articulates the results of the analysis that I laid out in Chapter 4. Here I also discuss known limitations based on the condition of the collection as it was constructed from WPA field methods. These limitations in concert with the attributes of weight, material type, break type, modification, formal tool type, length, width, thickness, and morphology provide the parameters for my interpretation in Chapter 6.

Known Biases and Limitations

This process has taught me that collections-based research can be extremely rewarding but it also has its own unique set of complications. As mentioned previously, this could have specifically affected the lithic assemblage because of the lack of debitage collection and screen use. However, another important limit comes in the form of the unknown relationship between artifact provenience and features that affect spatial analysis. None of the structures line up perfectly with the arbitrary grid lines. Recorded artifacts were assigned row and alley numbers with no clear mention being made of their association with features. This means that there is no way to reliably differentiate between artifacts in the same 10' x 10' square when a feature only covers a portion of that square. My response to this is the same as Hueffed (2023:71) which means that artifacts recorded in the same square as a feature are assumed to be associated with that feature. Naturally, this imposes a large limit on spatial understanding as I am unable to determine where stone tools are situated within a house, or even if they were inside of a house. This is crucial for identifying activity areas and microeconomies which are essential for understanding the role of different houses and the demographics of their inhabitants. For more on this, the reader should see papers in Malouchos and Betzenhauser (2021).

Another limitation comes from poor recording procedures that have made some specimens unprovenanced. All specimens that were not in their original bags inscribed with provenience information had their field number directly inscribed with a permanent marker or pen. I would then look this field number up in Baerreis' notes to find the corresponding block that the specimen came from along with all the others that shared its field number. Unfortunately, this process depends entirely on the legibility of the embossed number. While I could decipher most of these embossed numbers, I could not do this for 11 specimens. Some specimens are entirely devoid of their field numbers included in this. One unfortunate example comes from an axeblade that only has 'Dl-64' embossed on it. This axe is one of only three axes in the School Land I collection. Another way in which this inscribing could become obscured was the use of highly adhesive glue on many of the specimens. Ironically, I believe this was done to enhance legibility, but it ended up having the opposite effect.

This practice of gluing specimens was also used on broken bifaces which has several implications for the methodology I am using here. Thankfully, this was primarily done on larger bifaces like chipped stone hoes. Other morphologically similar specimens with similar break types that allowed me to infer a break type on the glued specimens. I contemplated attempting to remove this glue to be sure about the tool break type, but this would have likely resulted in the further destruction of the biface. It should also be noted that some of the broken and glued bifaces had separate field numbers, implying that they were found in different locations, refitted, and then glued together.

Additionally, some very small bits of shatter were present in the bottom of the various receptacles the collection was housed in. These bits of shatter were too small to have field numbers embossed on them. I assume that they are a byproduct of abrasion among different specimens over time. If this happened in their original field bags, I was usually able to determine which specimen they came from, and I included them alongside this specimen when I assigned my new specimen identification number. This was impossible to do reasonably for those artifacts that were housed with hundreds of other specimens. Therefore, I have regarded them as unprovenanced specimens and removed them from spatial analysis.

Another limitation is oriented around the structures themselves. As stated in Chapter 2, many of the structures at School Land I have undergone rebuilding episodes. There is no way to reasonably determine which one of these rebuilt structures a specimen is associated with. So, I lumped the specimens from overlapping structures together, just as Hueffed (2023) did.

The final known limitation to keep in mind is the fact that School Land I was not completely excavated before its destruction upon the completion of the Pensacola dam which created Grand Lake O' the Cherokees (Regnier et al. 2019:278). The WPA knew that their time was limited, so they concentrated their efforts on the known structures. This need for haste likely did not mix well with the lack of consistent screening.

General Specimen Population Description

1769 total specimens were measured with 471 of them being formal tools. I classified 16 of these 471 tools as 'Unknown' because they are formal tools (Figure 5.1) that did not reasonably fit the attributes of Ray's (Ray 2016), Bell's (Bell 1958), or Perino's (1968) typologies. 1496 specimens were bifacial, and their breakage types were labeled when reasonable (Figure 5.4). When I could not reasonably determine the break type for a bifacial specimen, I labeled it as 'Unknown.' This only happened in what I believe are heat-related fractures when the stone was so transformed that I could not justify identifying how it broke.

Biface fragment was the most numerous of the morphologies with a count of 759 followed by Projectile Point with a count of 476. Most were able to be ascribed a morphology, but I labeled 24 as Indeterminant. These specimens did not possess signs of cultural alteration. The specimen count of other typological categories will be disseminated in their corresponding categories.

Figure 5.1: Examples of formal bifacial tools labeled as 'Unknown Formal Tools'[3]

Measurements like length, width, and thickness were largely used as evidence for morphological and formal tool type verification so that these results are as reproducible as possible. These measurements can also provide more specific insights relating to break patterns and aspects of reduction processes in further research.

[3] The central tools with convex bases could be fragments of Jakie points (Ray 2016:98, 2024: personal communication) which are associated with the Early and Middle Archaic. But I have termed them unknown because these are the only potential specimens that exhibit this U-shaped concave hafting element and they are not complete.

The most numerous formal tool type in the School Land I assemblage is Etley (Figure 5.2), and the most used chipped stone material type is Undifferentiated Osagean (Figure 5.3). Even without debitage, the total weight of this chipped stone assemblage is 37.14kg.

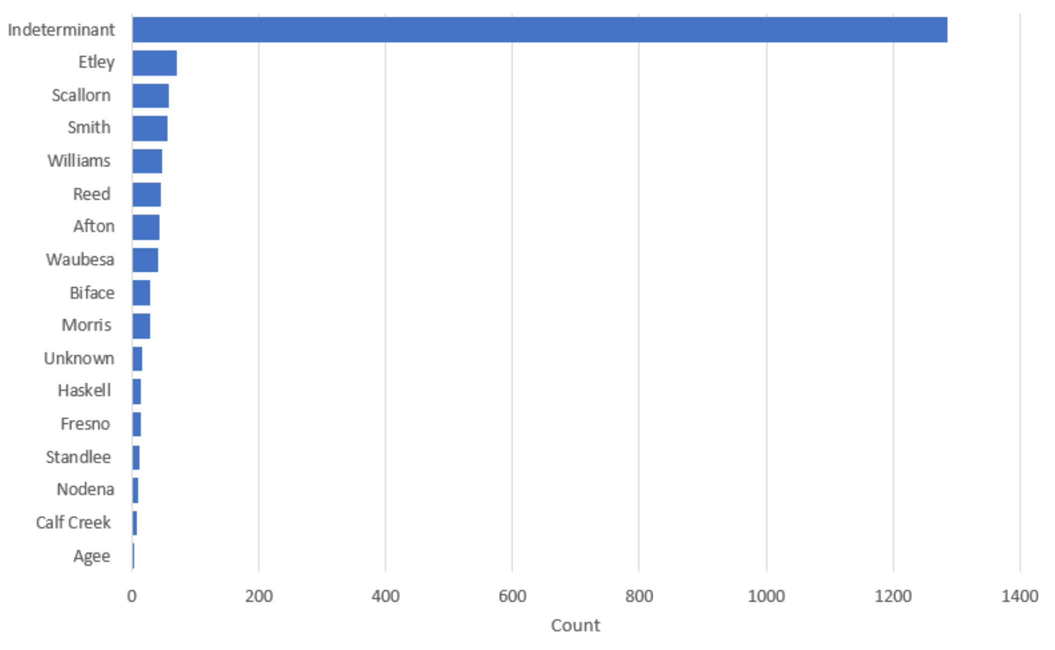


Figure 5.2: Total Count of Formal Tool Types

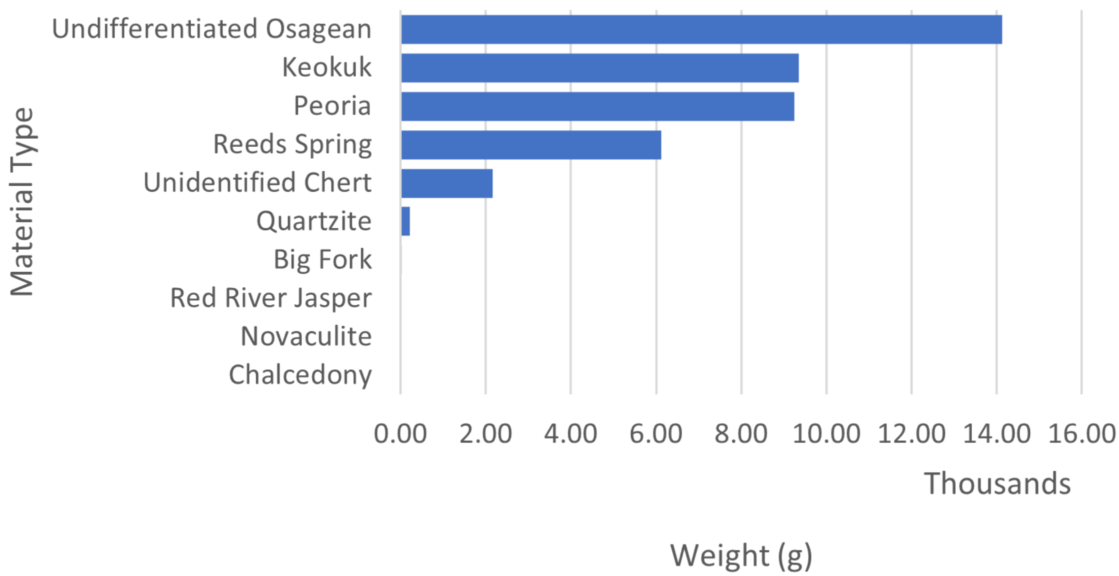


Figure 5.3: Total Chipped Stone Weight by Material Type

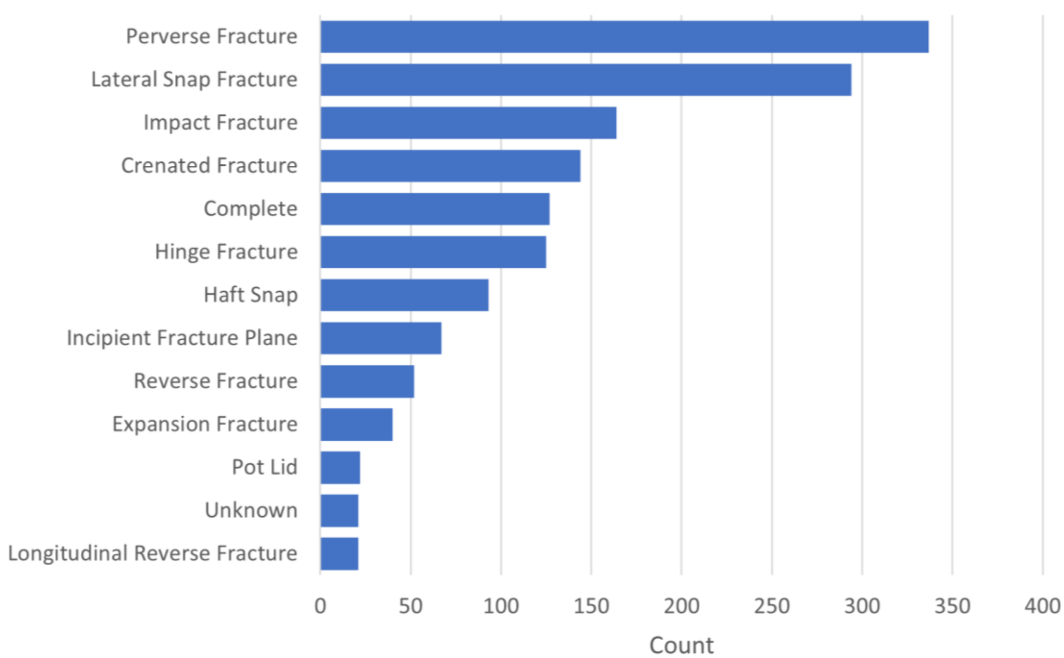


Figure 5.4: Total Count of Break Types

Chipped Stone

Tables 5.1-5.3 show a wide variety of break types, material types, and formal tool types present in the School Land I assemblage. There were 124 specimens I categorized as 'Complete' meaning that they did not possess a break type. The Perverse Fracture was the most common break type at 336 followed by the Lateral Snap Fracture at 284 (Figure 5.4). These two break categories are assumed production fractures and makeup 38% of the assemblage on their own. The least common break type was Unknown with 16. All Unknown break types occurred among biface fragments.

While I will dive deeper into interpretation in Chapter 6, it is worth pointing out some trends in these data based on categorical implications. First, biface fragments categorically cannot occur in the complete category. Second, the morphological category of Biface is the most common of specimens that have Hinge Fractures because this category has a bias towards tools that were otherwise complete.

Table 5.1: Heat Breakages by Formal Tool Type

	Calf Creek	Smith	Etley	Williams	Afton	Waubesa	Standlee	Scallorn	Fresno	Reed	Morris	Nodena	Haskell	Agee	Unknown	Indeterminant
Crenated Fracture	1	1	0	2	2	1	0	1	0	0	0	0	0	0	0	137
% of Total	12.50%	1.79%	0%	4.17%	4.65%	2.44%	0%	1.72%	0%	0%	0%	0%	0%	0%	0%	10.52%
Expansion Fracture	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	39
% of Total	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	3.00%
Pot Lid	0	0	0	0	0	2	1	1	1	1	0	0	0	1	0	15
% of Total	0%	0%	0%	0%	0%	4.88%	8.33%	2%	7.14%	2.22%	0%	0%	0%	20%	0%	1.15%

Table 5.2: Use Breakages by Formal Tool Type

	Calf Creek	Smith	Etley	Williams	Afton	Waubesa	Standlee	Scallorn	Fresno	Reed	Morris	Nodena	Haskell	Agee	Unknown	Indeterminant
Haft Snap	3	13	17	5	10	9	1	5	1	1	2	0	0	0	3	24
% of Total	33.33%	23.21%	24.29%	10.42%	23.26%	21.95%	8.33%	8.62%	7.14%	2.22%	6.90%	0%	0%	0%	18.75%	2.06%
Impact Fracture	3	8	17	20	12	11	8	17	0	11	7	0	7	1	6	34
% of Total	33.33%	14.29%	24.29%	41.67%	27.90%	26.83%	66.66%	29.31%	0%	24.44%	24.14%	0%	46.67%	20%	37.50%	2.92%
Perverse Fracture	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
% of Total	22.22%															

Table 5.3: Production Breakages by Formal Tool Type

	Calf Creek	Smith	Etley	Williams	Afton	Waubesa	Standlee	Scallorn	Fresno	Reed	Morris	Nodena	Haskell	Agee	Unknown	Indeterminant
Hinge Fracture	0	0	2	0	2	1	0	2	3	5	1	0	0	0	1	96
% of Total	0%	0%	2.86%	0%	4.65%	2.43%	0%	3.45%	21.43%	11.11%	3.45%	0%	0%	0%	6.25%	8.24%
Incipient Fracture Plane	0	7	5	1	3	5	0	2	0	0	0	0	1	0	0	54
% of Total	0%	12.50%	7.14%	2.08%	6.98%	12.20%	0%	3.45%	0%	0%	0%	0%	6.67%	0%	0%	4.64%
Lateral Snap Fracture	0	7	5	1	3	5	0	2	0	0	0	0	1	0	0	267
% of Total	0%	12.50%	7.14%	2.08%	6.98%	12.20%	0%	3.45%	0%	0%	0%	0%	6.67%	0%	0%	22.92%
Perverse Fracture	NA	17	15	13	7	4	1	15	0	11	10	0	2	0	1	239
% of Total	NA	30.36%	21.43%	27.08%	16.28%	9.76%	8.33%	25.86%	0%	24.44%	34.48%	0%	13.33%	0%	6.25%	20.52%
Longitudinal Reverse Fracture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
% of Total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1.80%
Reverse Fracture	0	0	0	0	1	1	0	1	1	2	0	0	0	1	0	42
% of Total	0%	0%	0%	0%	2.33%	2%	0%	1.72%	7.14%	4.44%	0%	0%	0%	20%	0%	3.60%
Complete	0	4	9	4	4	6	0	12	8	14	8	9	5	2	4	33
% of Total	0%	7.15%	12.86%	8.33%	9.30%	14.63%	0%	20.70%	57.14%	31.11%	27.50%	81.81%	33.33%	40%	25%	2.83%

There are also observable patterns when it comes to the relationship between break types and formal tool types (Tables 5.1-5.3). It is impossible to directly test the statistical significance of tool types and production failures (Table 5.3) because the counts are too low for chi-square to be reliable. But this can be made clearer when these data are filtered into major categories (Table 5.4). This shows there is a statistically significant pattern between production failures and tools based on diagnostic period (Table 5.4) ($\chi^2 = 35.2047$, $p<0.00001$, df=2) Specifically, production failures are found on the majority of Archaic and Woodland tools that were recorded, but for Spiro-era tools, the majority of specimens are complete.

	Archaic Tools	Woodland Tools	Spiroan Tools
Production Failures	58	70	28
Complete	13	26	46

Table 5.4: Condensed Table for Production Breakages by Formal Tool Type

There is a similar predicament for use failures (Table 5.2). But when these data (Table 5.4) are condensed in this way there is a statistically significant relationship between the type of use failure and time period ($\chi^2 = 18.3316$, $p=.000105$, df=2). This table shows that despite Spiroan tools having the highest number of complete specimens, they have the lowest amount of use breakages (Table 5.5). But I should state that this agglomeration does have some drawbacks. I lumped categories like Afton and Williams into the Woodland section to isolate the terminal Archaic tools.

	Archaic Tools	Woodland Tools	Spiroan Tools
Haft Snap	33	30	3
Impact Fracture	28	68	26

Table 5.5: Condensed Table for Use Breakages by Formal Tool Type

	Archaic Tools	Woodland Tools	Spiroan Tools
Crenated Fracture	2	6	0
Expansion Fracture	0	0	0
Pot Lid	0	4	3

Table 5.6: Condensed Table for Heat Breakages by Formal Tool Type

Table 5.6 compiles data on heat-related breakages across time. The counts are too low for the chi-square to be reliable. But this suggests some possible changes in heat-treating or material selection through time. Among Archaic tools, only crenated fractures were observed, both crenated fractures and pot lids were observed in Woodland tools, and only pot lids were observed on Spiro-era tools.

Other trends are that use-related fractures are most common in the Etley, Smith, Afton, Williams, and Scallorn types (Table 5.2). Overall, formal tools occur very infrequently in the categories more akin to production-related failures. The Perverse Fracture category does have many Smith, Scallorn, and Etley types. This type of fracture could be either a use or a production-related fracture depending on context, but there is currently no way to accurately determine this in all formal tool types. Reed and Scallorn had the most complete specimens. Formal tools, which are indicative of a later stage in the production process, are much less likely to exhibit heat-related fractures (6%). The label ‘Indeterminant’ is included here to articulate how most bifacial specimens in this assemblage do not have a formal type (73%). Many of the Calf Creek types possessed a Perverse Fracture on one of their barbs because a twisting force was macroscopically visible in that region. I have interpreted this as a use fracture because these specimens had already been reworked in other areas before this breakage which was also reworked thereafter. I also found it intriguing that many of these bifaces exhibited multiple fracture episodes with subsequent reworking which made them challenging to categorize. This is more difficult to do in other formal tool types that do not exhibit reworking and do not have barbs.

Table 5.7: Chipped Stone Material Type by Formal Tool Type

	Calf Creek	Smith	Etley	Williams	Afton	Waubesa	Standlee	Scallorn	Fresno	Reed	Morris	Nodena	Haskell	Agee	Indeterminant
Big Fork	0	0	0	0	0	3	0	0	0	1	0	0	0	0	0
% of Total	0%	0%	0%	0%	0%	7.32%	0%	0%	0%	2.22%	0%	0%	0%	0%	0%
Keokuk	4	16	14	12	14	8	0	16	1	12	11	2	7	2	287
% of Total	44.44%	28.57%	20%	25%	32.56%	19.51%	0%	27.59%	7.14%	26.67%	37.93%	18.18%	46.67%	40%	22.04%
Novaculite	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
% of Total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	20%	0.01%
Peoria	1	8	12	15	15	6	4	19	5	4	4	3	3	1	245
% of Total	11.11%	14.20%	17.14%	31.25%	34.89%	14.63%	33.33%	32.76%	35.71%	8.89%	13.80%	27.27%	20%	20%	18.88%
Red River Jasper	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1
% of Total	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.22%	0%	0%	6.67%	0%	0.01%
Reeds Spring	1	12	12	16	8	6	5	14	6	18	11	0	2	0	222
% of Total	11.11%	21.42%	17.14%	33.33%	18.60%	14.63%	41.67%	24.14%	24.86%	40%	39.29%	0%	13.33%	0%	17.05%
Undifferentiated Osagean	3	22	32	4	6	20	3	9	2	9	3	6	2	1	319
% of Total	33.33%	39.29%	45.71%	8.33%	14%	48.78%	33.33%	15.51%	14.29%	20%	10.71%	54.54%	13.33%	20%	24.50%
Chalcedony	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% of Total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.01%
Unidentified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
% of Total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.03%

Purple is intended to designate Ozarks materials and green is intended to designate non-local materials in Table 5.7. There are some trends among formal tool types towards certain material types. 32 out of 71 (45%) of the Etley specimens in this assemblage were Undifferentiated Osagean. It was similar for the Smith type with 22 out of 55 (40%) specimens being Undifferentiated Osagean. Another overall trend is that 90.2% of raw material is locally sourced with only 9.8% coming from non-local sources. When non-local material is present, it is in more recent formal tool types (100%). This is something that will be discussed in more depth in Chapter 6.

Table 5.8: Modification by Formal Tool Type

	Calf Creek	Smith	Etley	Williams	Afton	Waubesa	Standlee	Scallorn	Fresno	Reed	Morris	Nodena	Haskell	Agee	Indeterminant
Reworked	8	14	8	11	8	3	1	7	2	4	2	1	1	0	28
% of Total	88.89%	25%	11.42%	22.92%	18.60%	7.31%	8.33%	12.01%	14.29%	8.89%	6.90%	9.01%	6.67%	0%	2.15%
Thermally Altered	9	15	5	0	26	17	3	25	8	18	14	4	3	1	572
% of Total	100%	26.79%	7.14%	0%	60.47%	41.46%	25%	43.10%	57.14%	40%	48.28%	36.36%	20%	20%	43.93%
Serrated	1	0	0	0	0	0	0	2	2	7	9	0	4	1	11
% of Total	12.50%	0%	0%	0%	0%	0%	0%	3.45%	14.29%	15.56%	31.03%	0%	26.67%	20%	0.80%

Table 5.9 shows the trends for tool modification across formal and informal tools. These counts are statistically significant ($\chi^2 = 151.285$, $p<0.00001$, df=2). Strikingly, 59% of formal tools show thermal alteration while 94% of non-formal tools do.

	Formal Tool	**Informal Tool**
Reworked	70	28
Thermally Altered	138	572
Serrated	26	11

Table 5.9: Modification in terms of Formal vs Non-Formal Tools

One of the things that first stood out to me about these results is that the Afton type was one of the most likely to be thermally altered (60.47%) (Table 5.1). Heat treatment for the Afton type is thought to be dependent on material quality (Ray 2016:20). This is observable at School Land I because Reeds Spring Afton specimens are rarely thermally altered (7%) but Undifferentiated Osagean Afton specimens were always thermally altered (100%). However, it is unknown how much secondary thermal alteration plays a role in this. Overall, thermal alteration was present on 669 out of the 1478 (45%) chipped stone specimens. Additionally, I only attributed 127 out of the 1478 (9%) as showing signs of reworking.

Other observations include the Reed and Morris types (31% and 48%) being the most likely to be serrated. But there are interesting contradictions with a Calf Creek specimen being the only one in which I detected rework, thermal alteration, and serration. While the former two modifications are common for Calf Creek bifaces, serration is uncommon (Ray 2016:15).

There are many trends along break types and specimen morphology (Tables 5.6-5.8). One is that biface fragments are the most likely to have heat-related fractures. Another is that formal tools are the most likely to show signs of use-related fractures. This is evidenced by the fact that Projectile Points dominate the Impact Fracture category, and Bifaces and Projectile Points dominate the Haft Snap category. I should also mention that many of the Haft Snap specimens that I labeled as Bifaces may have had a formal type in their original form, but the fracture did so much damage that this became obscured. Additionally, Biface Fragments are the most likely to have a fracture associated with production. This is exhibited by the fact that Biface Fragments are the most numerous in the Incipient Fracture Plane, Lateral Snap Fracture, Longitudinal Reverse Fracture, and the Perverse Fracture categories (Tables 5.6-5.8). They are also second most common in the Reverse Fracture category.

It is possible that WPA collection methods limited the number of cores that ended up being in the collection. I described most of the drills (72.2%) as having Perverse Fractures because of the relatively homogenous twisting nature of the fractures they possessed. These could be use fractures because of how drills can be used in a twisting motion. I look at this more closely in Chapter 6. Likewise, all broken Hoes possessed Lateral Snap Fractures. But these may not be as closely associated with production as Lateral Snap Fractures are with other morphologies. This would be better supplemented with experimental data.

Table 5.10: Heat Breakages by Morphology

	Projectile Point	Biface	Scraper	Hoe	Drill	Axe	Core	Indeterminant	Practice Piece	Biface Fragment
Crenated Fracture	8	2	1	0	1	0	2	0	0	128
% of Total	1.69%	1.33%	2.78%	0%	5.56%	0%	9.52%	0%	0%	12.72%
Expansion Fracture	0	0	0	0	0	0	0	1	1	35
% of Total	0%	0%	0%	0%	0%	0%	0%		12.50%	3.48%
Pot Lid	7	2	2	0	0	0	0	1	2	8
% of Total	0.21%	2.67%	5.56%	0%	0%	0%	0%		25%	0.80%

Table 5.11: Use Breakages by Morphology

	Projectile Point	Biface	Scraper	Hoe	Drill	Axe	Core	Indeterminant	Practice Piece	Biface Fragment
Impact Fracture	128	6	0	0	0	0	0	0	0	28
% of Total	27%	4%	0%	0%	0%	0%	0%	0%	0%	2.78%
Haft Snap	68	0	0	0	0	0	0	0	0	25
% of Total	14.35%	0%	0%	0%	0%	0%	0%	0%	0%	2.49%

Table 5.12: Production Breakages by Morphology

	Projectile Point	Biface	Scraper	Hoe	Drill	Axe	Core	Indeterminant	Practice Piece	Biface Fragment
Hinge Fracture	17	66	15	0	0	1	6	0	0	17
% of Total	3.59%	44%	41.67%	0%	0%	33.33%	28.57%	0%	0%	1.70%
Lateral Snap Fracture	26	9	8	3	1	0	4	5	3	231
% of Total	5.49%	6%	22.22%	43%	5.56%	0%	19.05%		37.50%	22.96%
Perverse Fracture	104	14	0	1	13	0	0	0	0	203
% of Total	21.94%	9.33%	0%	14%	72.22%	0%	0%		0%	20.18%
Incipient Fracture Plane	9	6	1	0	0	0	1	2	0	47
% of Total	1.90%	4%	2.77%	0%	0%	0%	4.76%		0%	4.67%
Reverse Fracture	8	17	2	0	0	0	8	0	0	15
% of Total	1.69%	11.33%	5.55%	0%	0%	0%	38.10%		0%	1.49%
Longitudinal Reverse Fracture	0	1	0	0	1	0	0	0	0	19
% of Total	0%	0.60%	0%	0%	5.56%	0%	0%		0%	1.89%
Complete	85	25	8	3	2	2	NA	NA	NA	NA
% of Total	17.93%	16.67%	22.22%	43.00%	11.11%	66.67%				

Stone Pipes and Celt

These are two of the rarest morphologies in this assemblage since there are only five pipe specimens and one celt. One of the pipe fragments was so well made that the original documenters thought it was made of clay. Despite it being included in the ceramic assemblage, John Hueffed identified this and notified me. This specimen is fine-grained and would seem to be a bowl fragment. It also has several marks running its circumference. There is also burned carbon residue on the interior of the bowl.

The other specimens are coarse-grained, and one of them is fully intact. It is a straight pipe designed for the vertical loading of smoked material with the orifice gradually changing in size. While the remaining stone pipe specimens appear to fit into this more coarse-grained morphology, they are fragments from different pieces.

The celt is likely non-utilitarian because it is made of a very fragile limestone. This was noticed by Dr. Hammerstedt who has experimental experience related to the production and use of celts (see Hammerstedt 2005). This specimen has peck marks, red hematite stains, and carved elliptical lines transecting it that are macroscopically visible.

Other Patterns

There are some other occurrences in the assemblage worth mentioning. One of these is a grouping of eight highly fossiliferous large and expedient Keokuk bifaces that share the same provenience (Figure 5.5). These may be preforms, but they also could have been used as tools in their current form. They are associated with Structure 8. A second occurrence also recorded within Structure 8 is a grouping of three large Etley bifaces of different material types. Each exhibits a curved blade and the same flake taken out of their distal region. They share the same provenience, and one is oversized. I also have found it intriguing that several biface fragments were originally part of the same objective piece but have wildly different proveniences. Fragments from the same objective piece were found as far as 20m away from each other and at different levels. This was determined by happenstance refitting. I have not attempted to determine how widespread this phenomenon is.

Figure 5.5: Keokuk Bifaces with Same Provenience (Structure 8)

Spatial Results

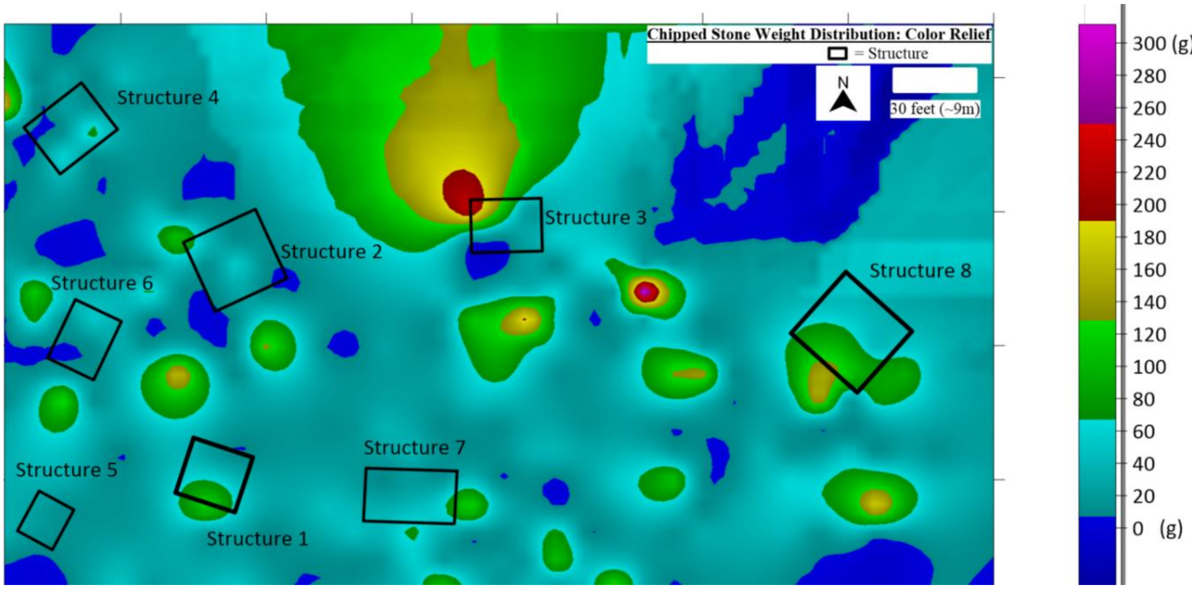


Figure 5.6: Chipped Stone Weight Distribution

Overall lithic weight is concentrated in the areas in and between Structure 3 and Structure 8 (Figure 5.6). Structures 5, 1, 6, 7, 2, and 4 all have proportionally low concentrations of chipped stone weight by comparison. When looking at just the plaza, which was not fully excavated, over 80% of the weight in this area was in the eastern half. The presence of chipped stone immediately south and southwest of Structure 8 has led me to believe that the plaza also extends into these areas.

Distribution of Breakages

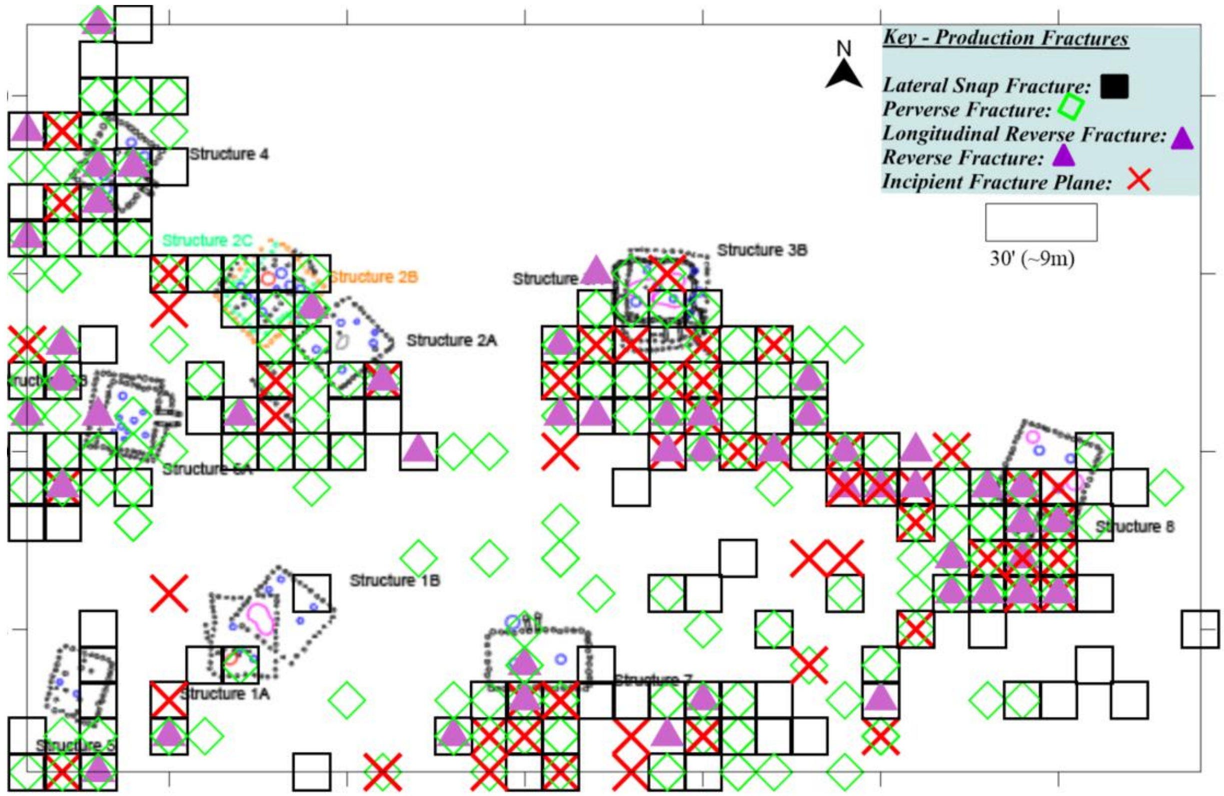


Figure 5.7: Distribution of Assumed Production Failures

The 10' x 10' grids provide a very low resolution for establishing spatial differences (Figure 5.7). However, these materials are concentrated in and around all of the structures save for Structure 9[4] which I have no data for. In these data's present form, there does not appear to be a preferential area at the site where tools broken from production were discarded. But Structure 1 has the fewest number of production failures associated with it (1%). The central plaza area has less than 5% of bifacial specimens, but it is unclear if this is because the plaza was largely unexcavated. The eastern plaza, between Structures 3 and 8, has more than 50% of all bifacial

[4] Structure 9 is an enigma. Baerreis drew a single representation of it in his notes that was unassociated with any of the other structures. The WPA did not collect or record any artifacts from Structure 9.

specimens which is corroborated by the concentration of chipped stone weight in this area demonstrated by Figure 5.6.

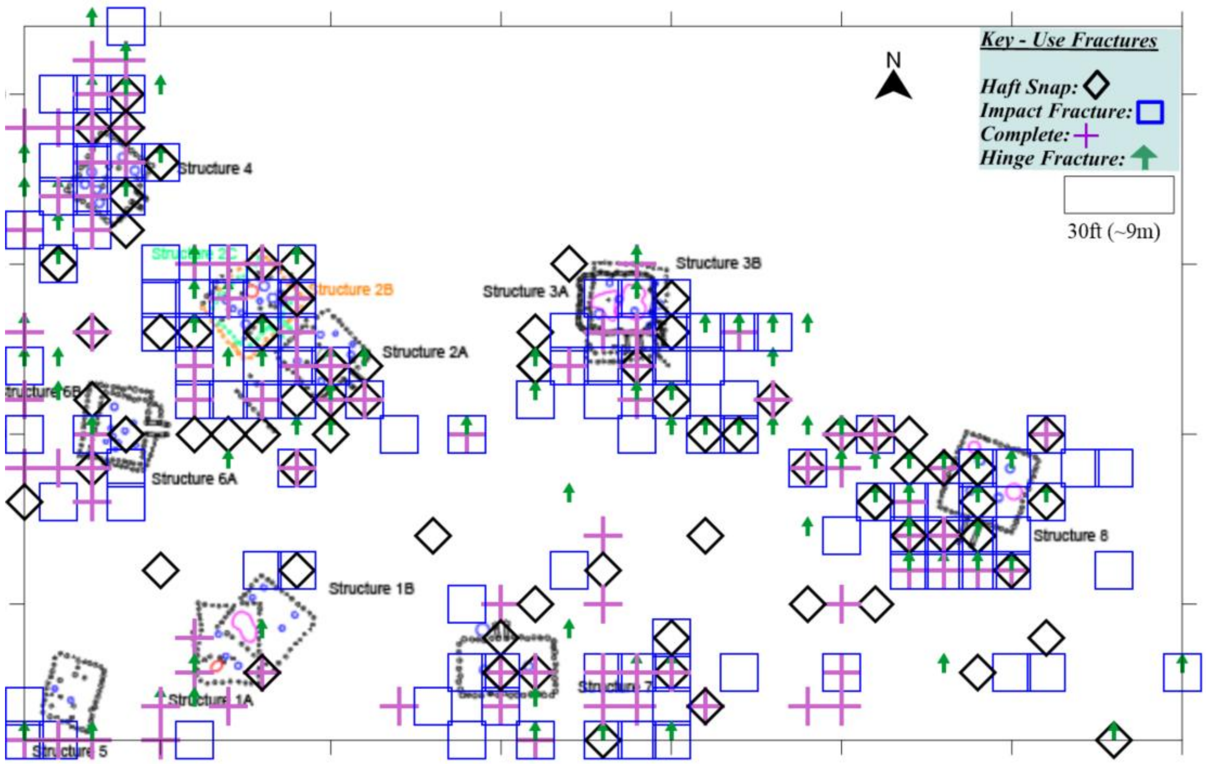


Figure 5.8: Distribution of Assumed Use Failures

Similar to the production breakages, the use breakages also appear to follow no obvious pattern aside from being associated with the structures (Figure 5.8). There was no preferential area for use failures to be discarded in the present state of these data. Less than 1% of all specimens with use failures were recorded in the vicinity of Structure 1. But this is slightly different for complete specimens with 5% of them being associated with Structure 1.

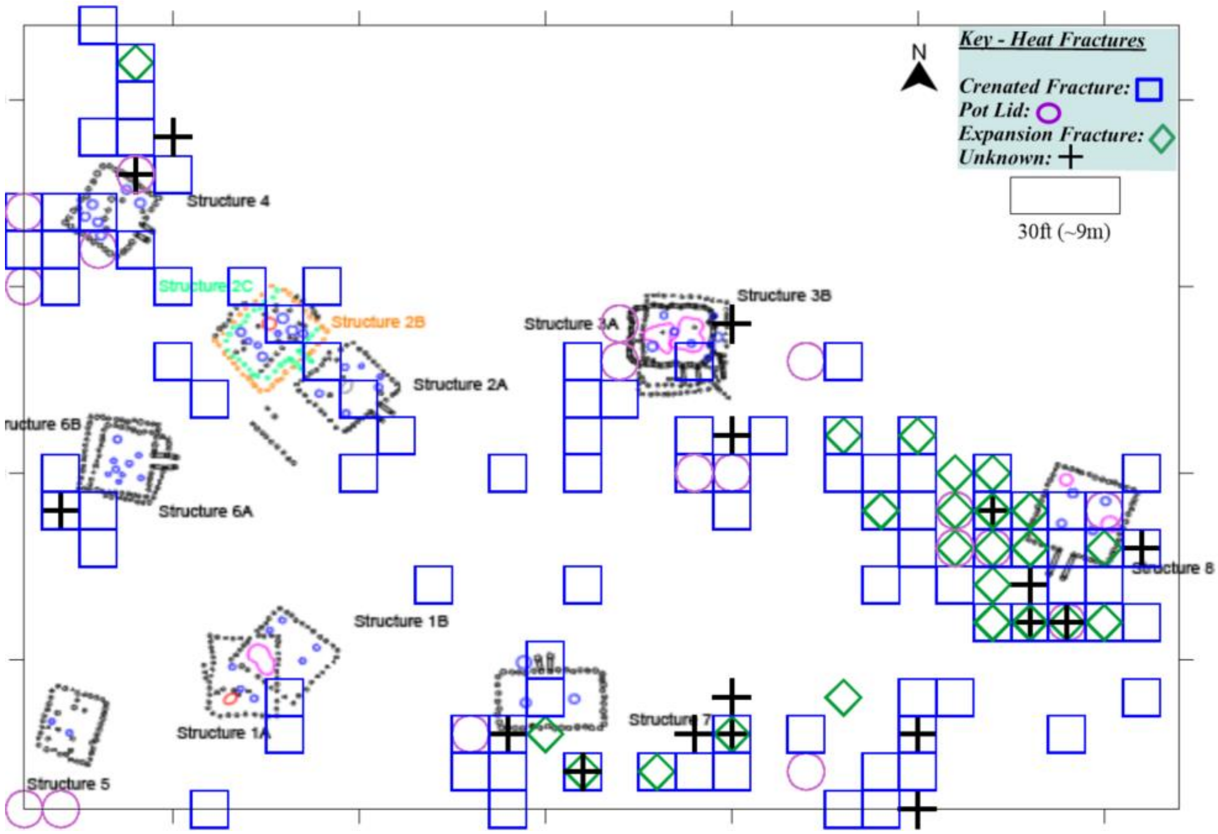


Figure 5.9: Distribution of Heat Failures

While crenated fractures are evenly distributed throughout the site (Figure 5.9), expansion fractures are mostly concentrated around Structure 8 (56%). 12 out of the 17 (71%) unknown fractures appear in and between Structure 8 and Structure 7. There is a large number of all three fracture types across the site with production failures constituting the majority (57.33%). Structure 1 and Structure 5 only have 4% of use failures in their vicinity.

Distribution of Formal Tool Types

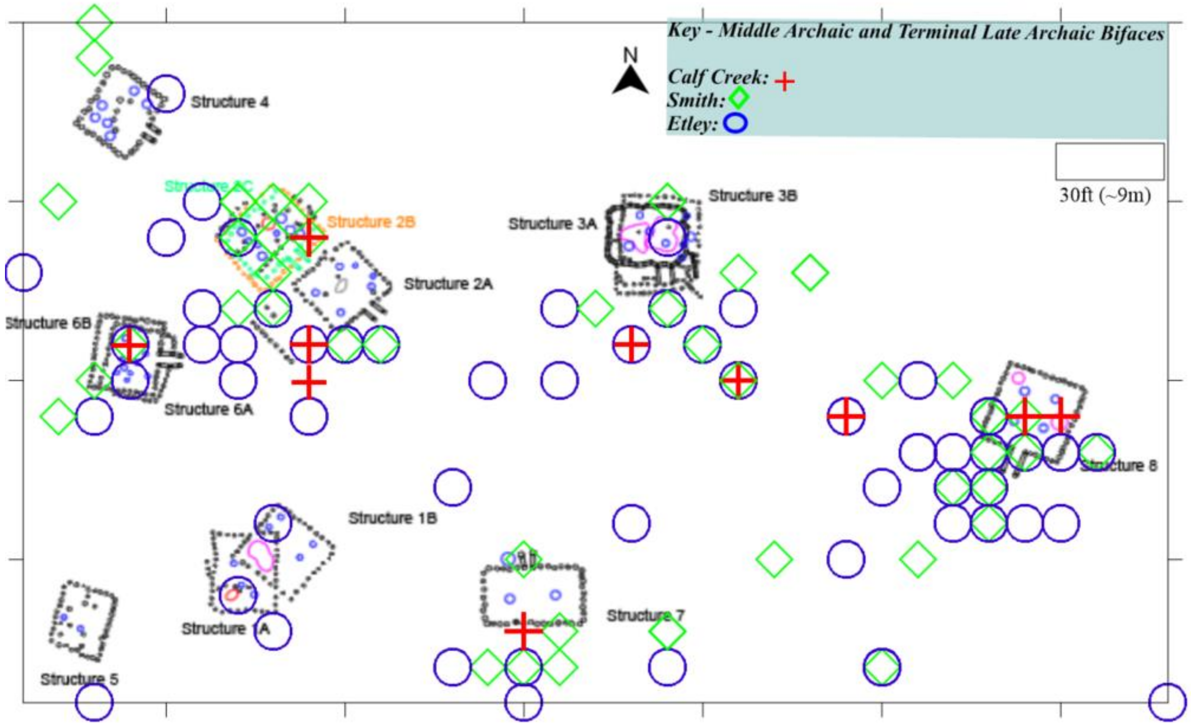


Figure 5.10: Terminal Middle-Early Archaic Formal Tool Type Distribution

Formal tool types from the Middle to Late Archaic are interspersed relatively evenly throughout the site save for the southwestern portion which only has four Smiths. Only two Smith tools and one Etley are adjacent to Structure 4. This contrasts with Figures 5.7-5.9 where this area has the consistent presence of all major categories of biface breakages. The concentrations of chipped stone weight in Figure 5.6 do not appear to overlap with concentrations of these biface types.

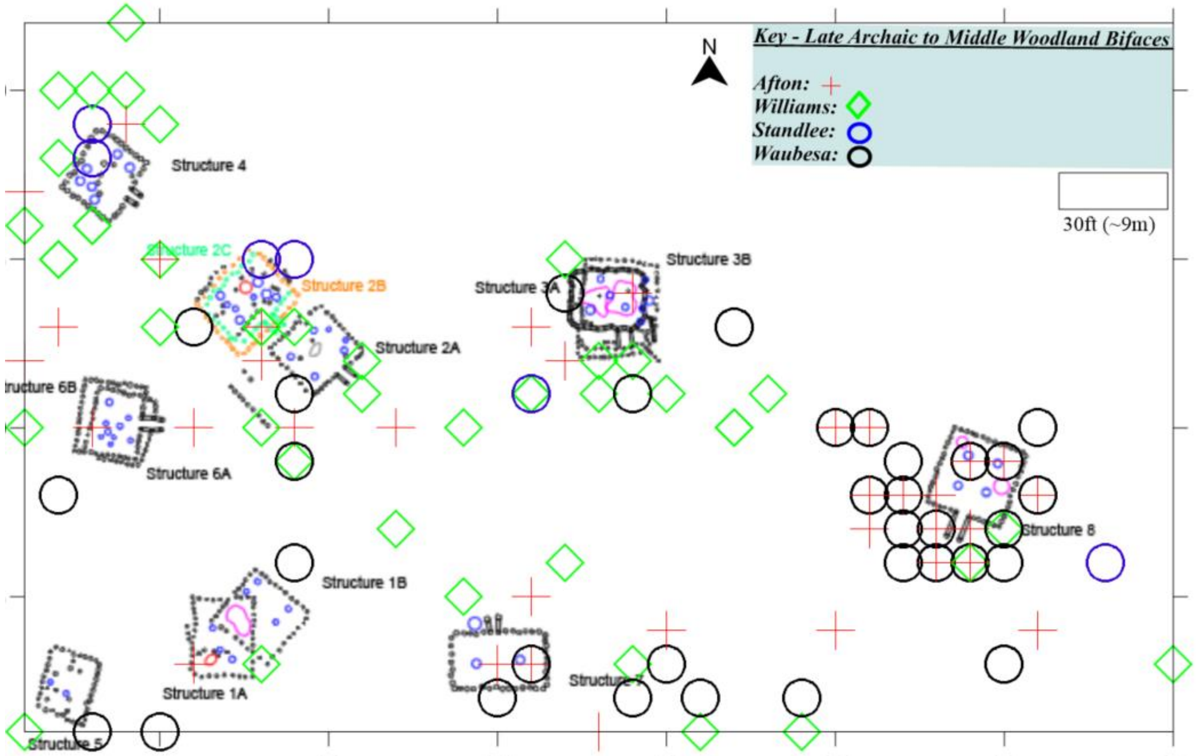


Figure 5.11: Late Archaic to Middle Woodland Formal Tool Type Distribution

The area in and around Structure 8 has 35% of all Afton and Waubesa formal tools but only 5% of Williams and Standlee bifaces (Figure 5.11). 51% of all Afton and Waubesa bifaces were recorded in and between Structure 8 and Structure 7. Conversely, the area around Structure 4 has 21% of all Williams and Standlee bifaces but only 4.7% of all Afton bifaces. Structures 1 and 5 still have small chipped stone representations at 4%.

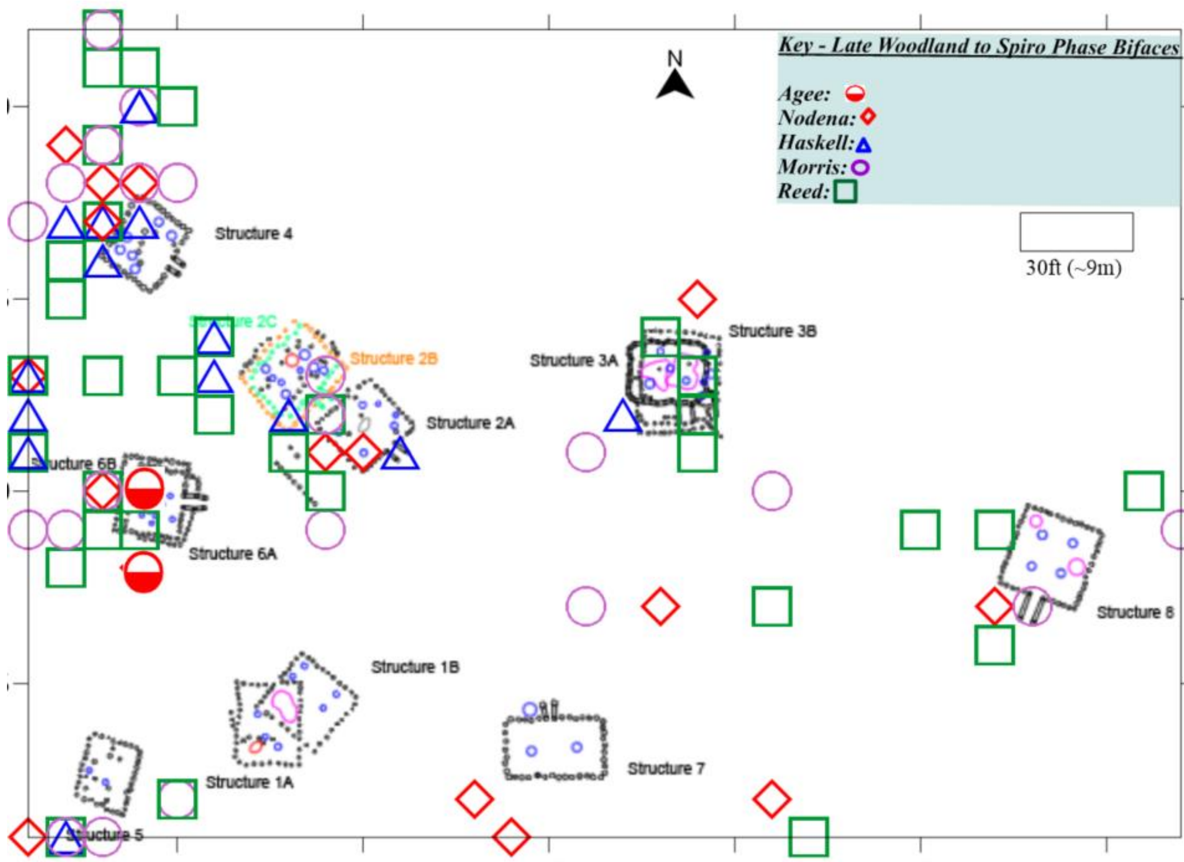


Figure 5.12: Late Woodland to Spiro Phase Formal Tool Type Distribution

These formal tool types continue the trend of the Williams type with a concentration in the northwest corner of the site. This is expressed by 51% of these tools being recorded in the area around Structures 6, 2, and 4. In contrast, only 10% of these bifaces were recorded in the areas in and between Structures 7 and 8 while 51% of Afton and Waubesa bifaces were recorded in this area (Figure 5.12).

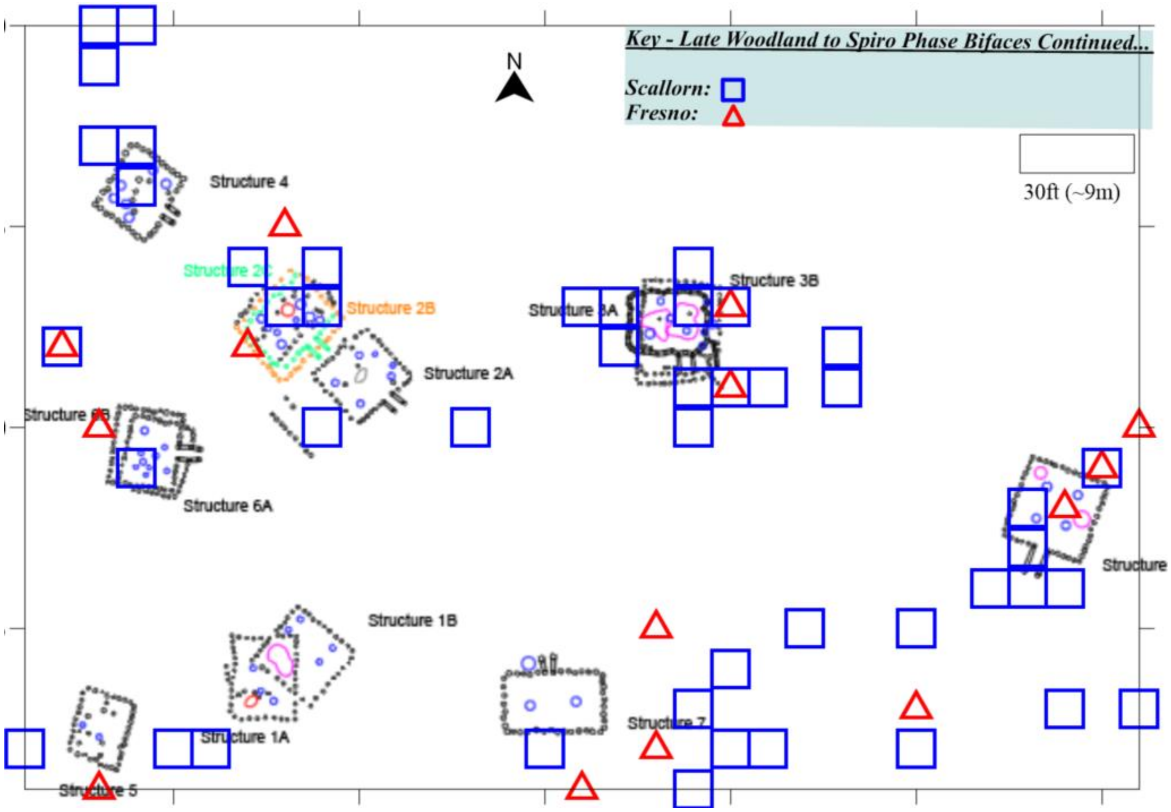


Figure 5.13: Middle Woodland to Spiro Phase Biface Type Distribution …

These last two formal tool types which are representative of the Middle Woodland – Spiro periods appear to be evenly distributed throughout the site (Figure 5.13). This patterning has more in common with the Archaic distributions than the Spiroan distributions.

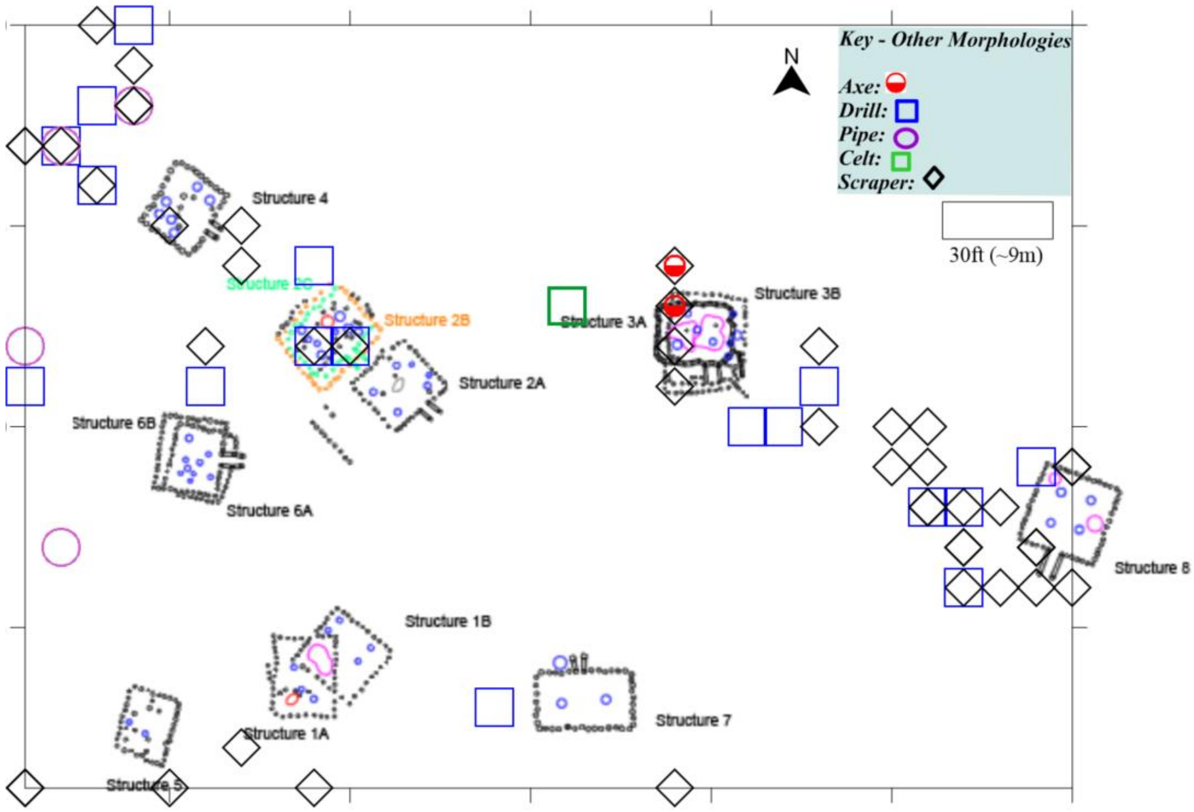


Figure 5.14: Miscellaneous Morphology Distribution

There are many scrapers nearby with Structure 8 along with four drills (Figure 5.14). Another grouping of these two morphologies is in the far northwest corner of the site. All pipe fragments fall along a relatively narrow north-south axis in the far-western region. All axes that had spatial data are inside or to the north of Structure 3. Lastly, while chipped stone hoes are not included on this map, four out of the five specimens were recorded in the area between Structures 6 and 2 with the fifth being recorded between Structures 3 and 8.

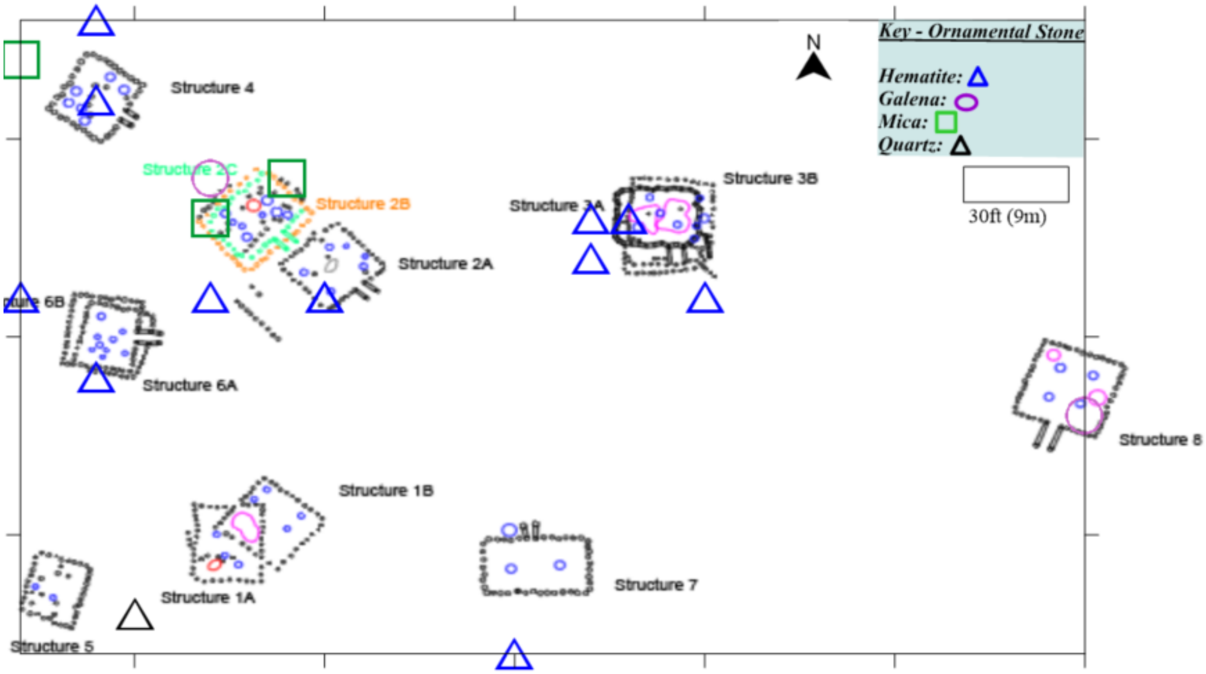


Figure 5.15: Ornamental Stone Distribution

While Structure 8 has a high concentration of other lithic materials such as all kinds of breakages and most formal tool types, the opposite is true when it comes to ornamental stone. There is only galena associated with Structure 8 (Figure 5.15). Hematite appears to be concentrated in the area ranging from Structure 3 to Structure 4 (91%). All mica specimens were documented as coming from the northwest corner. The only quartz crystal in this assemblage was recorded between Structures 5 and 1.

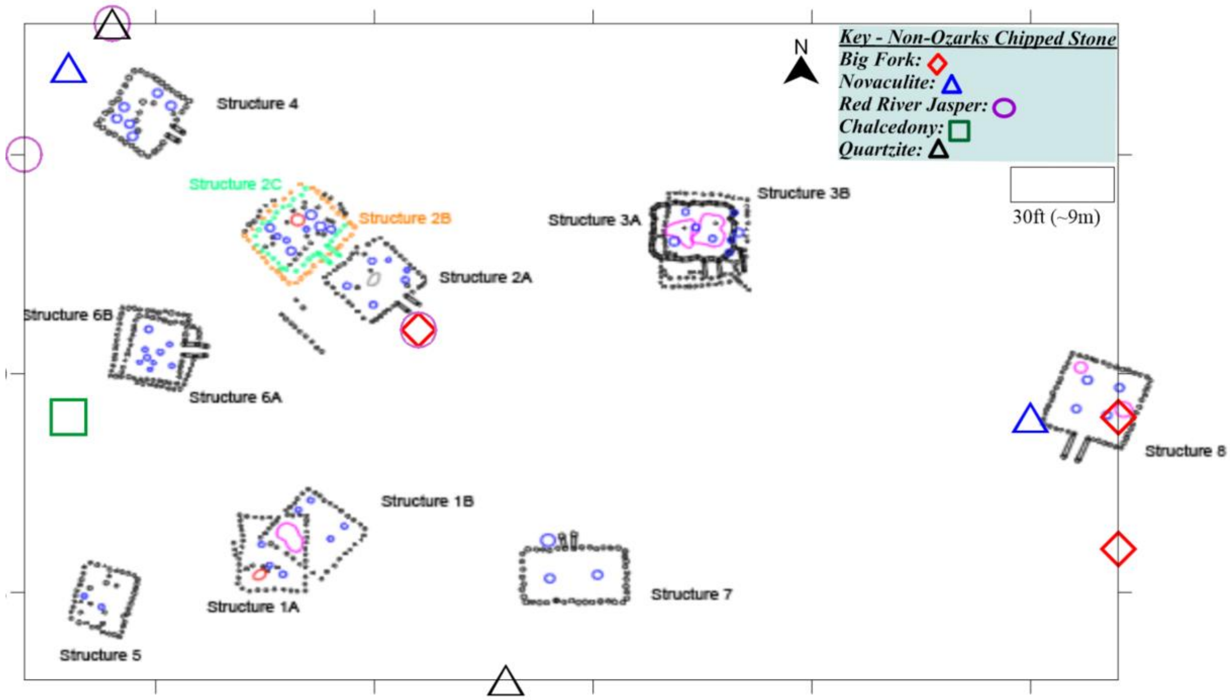


Figure 5.16: Non-Ozarks Chipped-Stone Distribution

Ozark chipped stone materials are found throughout the site. There appears to be no preference for certain Ozarks materials depending upon the area of the site and their presence is so substantial over such a low spatial resolution that map representations are not helpful. However, this is not the case when it comes to non-local materials. There are visibly very few non-Ozarks chipped stone resources (9.2%) at School Land I. 64% of all non-local specimens are present in the northwest areas near Structures 6, 2, and 4 (Figure 5.16). The area in and around Structure 8 has 27% of these specimens.

Table 5.13: Formal Tool Type by Level

	Calf Creek (Middle Archaic)	**Smith** (Late Archaic)	**Etley** (Late Archaic)	**Williams** (LA-EW)	**Afton** (LA-MW)	**Waubesa** (EW-LW)	**Standlee** (EW-LW	**Scallorn** (MW-Spiro)	**Fresno** (LW-Neosho)	**Reed** (Evans to Spiro)	**Morris** (Harlan to Spiro)	**Nodena** (Evans to Spiro)	**Haskell** (Harlan to Spiro)	**Agee** Evans to Spiro)	**Indeterminant**	**% of Total**
Surface	1	0	0	3	4	1	0	0	2	2	1	0	1	0	58	4.73%
1	0	5	5	3	3	0	2	6	3	14	8	0	2	0	140	8.60%
1.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1.23%
2	0	12	9	5	7	5	4	16	5	22	13	3	9	3	242	22.22%
2.5	4	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1.23%
3	0	17	17	11	17	10	3	14	1	2	5	1	2	0	266	23.33%
3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1.23%
4	0	16	27	14	9	12	1	11	2	4	0	4	1	2	278	24.25%
4.5	3	1	0	0	0x	0	0	0	0	0	0	0	0	0	2	1.23%
5	0	3	10	9	3	3	1	9	1	1	1	2	0	0	122	2.47%
5.5	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1.23%
6	0	0	2	2	0	0	0	1	0	0	1	0	0	0	14	1.41%
6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%

There are some stratigraphic differences dependent on formal tool types in this collection (Table 5.13). Fresno, Reed, and Morris types were recorded primarily in levels 1 (66% of total formal tools in level) and 2 (63% of total formal tools in level) (Table 5.10). Formal tool types that are representative of earlier eras are more dominant in levels 3 (75% of total formal tools in level), 4 (77% of total formal tools in level), and 5 (72% of total formal tools in level). Over 70% of all chipped stone specimens were recorded in levels 2, 3, and 4. But these levels do not appear to be discrete with a Morris and a Scallorn specimen both being recorded in level 6.

Conclusion

A total of 1769 lithic specimens were analyzed for this study. Production-related biface failures were the most common (57%). However, there were significant amounts of use (24%) and heat-related fractures (15%) as well. 4% were unknown fracture types that I have associated with heat. Thermal alteration appears to be a significant component at the site with over half of the total specimens showing signs of this. These breakages do not have a reasonably discernable spatial pattern, affected by the low resolution of 10’ x 10’ grids, but this has a variety of implications which will be explored in the next chapter. The vast majority of materials were from the Ozarks (92%) with materials from the Ouachita’s (8%) being represented as a distant second. Keokuk and Undifferentiated Osagean were the most common chipped stone material types overall. Structures 1 and 7 were the lowest in terms of lithic representation.

The areas just north of Structure 3 and between Structures 8 and 3 were the densest in terms of weight. But there seems to be some chronological variance in this with the eastern half of the site being dominant among earlier formal types but comparatively underrepresented among later formal types. More recent formal tool types, chipped stone hoes, and non-local cherts to a lesser degree appear to be targeted in the western and northwestern portions of the site.

Chapter 6: Discussion

Given the results from the faunal and ceramic analyses, does this lithic analysis confirm or deny current interpretations of the site? In this chapter, I aim to present possible answers to this question when appropriate and within reason using different analytical frameworks and archaeological models of human behavior. The primary theoretical framework I have chosen to interpret the findings of my biface breakage analysis is a life history approach. This approach is appealing because of its discursive focus on use and disuse which overlaps quite well with breakage analysis.

Spatial Patterns and Comparisons with Other Data Sets

The WPA was not fully able to excavate School Land I and these excavations happened long before more expedient non-intrusive methods would even be an option. This means that data collected from the areas around the structures is much more reliable for comparing the structures themselves while the opposite is true when comparing the structures to areas like the plaza which were partially unexcavated. The lack of specificity provided by the 10’ x 10’ grids also limits the capacity of approaches like household assemblage theory (e.g. Malouchos 2021). Despite this, there are several spatial patterns worth discussing in the lithic assemblage of the site. This becomes even more apparent when comparing these lithic data with those of the faunal and ceramic analyses and other nearby sites.

Spatial Faunal Patterns

Duffield (1969:48,52) determined that faunal materials are heavily concentrated in the northwest corner of the site (Figure 6.1). He also noted that structures in the southern corridor, namely Structures 5, 1, 7, and 8 are almost devoid of faunal materials. About 54% of the remains were white-tailed deer, 15% were reptiles, 7% were fish, 4% were birds, and 4% were bison (Duffield 1969:53). The only elements that Duffield (1969) identifies as non-food are the remains of a domestic pig and a great horned owl. There are domesticated dog elements, but Duffield (1969) is unsure if they are food related. While the domestic pig is certainly intrusive, owls are powerful symbols in Southeastern cultures (Dye 2021). This would warrant further analysis if there was more than one owl.

Duffield (1969:60) states that there may even be an opportunity to explore the material evidence for clans at School Land I. House 1 had one left half of a deer, House 2 had six rights and four lefts, House 3 had 17 rights and 8 lefts, House 4 had nine rights and 17 lefts, House 5 had one right and five lefts, House 6 had 10 rights and four lefts, House 7 had none, and House 8 had the right side of one deer (Duffield 1969:60). Duffield (1969) combined this with a 17th-century ethnohistoric account from Swanton (1942:136) to interpret this as the dividing of food along family-based clan lines. Swanton's (1942) text is centered around translation from a Spanish missionary named Espinosa who interacted with the southern Caddo in 1690. This same account (Swanton 1942:136) describes Caddo hunters as, "tak[ing] great pains to see that the one who killed it does not eat of it unless the others invite him and that he does not take anything else to satisfy his hunger." This phenomenon has been observed in other societies with focuses on assertive reciprocity (Woodburn 1982:431) and is thought to discourage competition or unequal concentrations of wealth.

Duffield (1969:64) also argued an environmental change caused an adaptive change in hunting practices away from deer and towards bison. Rogers (2006:20) corroborates this and also states that this ecological change is associated with the collapse of the 'Spiro chiefdom.' Modern interpretations deemphasize the usefulness of the chiefdom concept for understanding Spiro and they describe this prolonged event as less of a collapse and more of a dispersal (Burnette et al. 2020). But this later change appears to be less intensive when comparing the total amount of deer versus bison. Regardless, the faunal materials collected decisively came from the northwestern portion of the site, and there may have been a focal change from deer to bison.

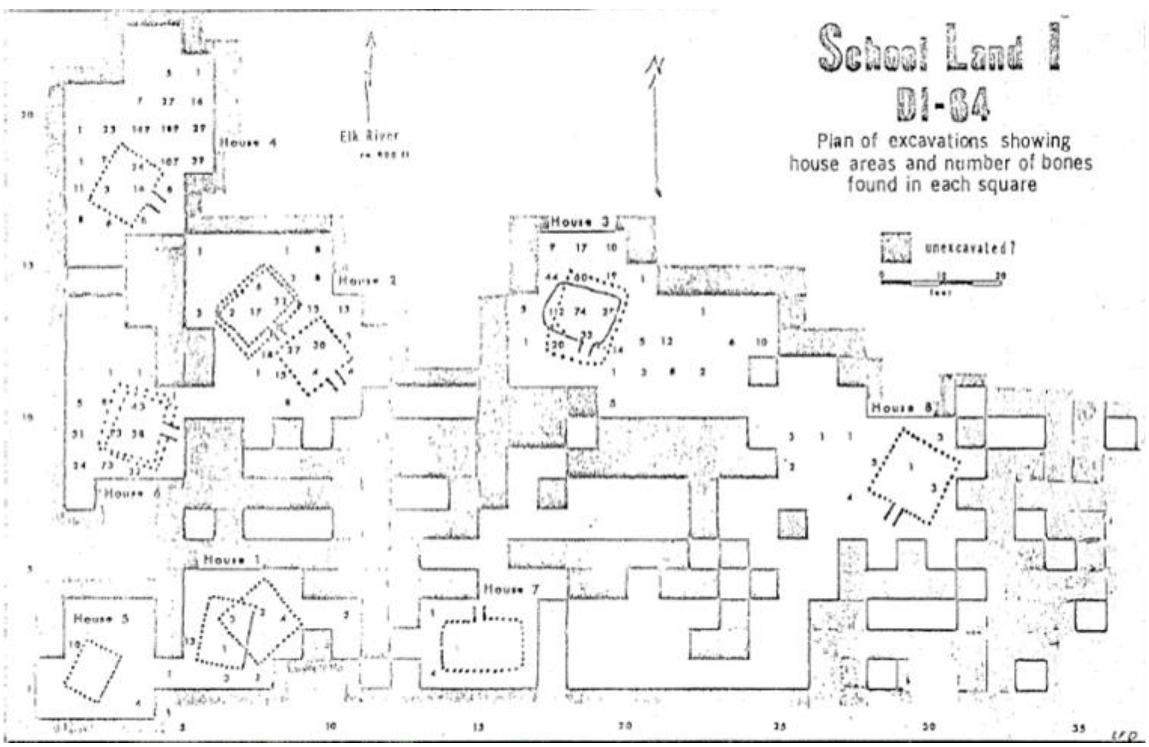


Figure 6.1: Faunal Distribution (Duffield 1969:48)

Spatial Ceramic Patterns

Hueffed (2023:144) identified that shell-temper (93.5%) and Woodward Plain (90.9%) dominated the ceramic assemblage in his analysis. This is extremely similar to the ceramic assemblages of the nearby sites Reed and Lillie Creek (Regnier et al. 2019:262,288-289), suggesting intensive contemporaneous Harlan to Spiro Phase occupations. Another important observation is that about 80% of the sherds came from the northern portion of the site (Figure 6.2) (Hueffed 2023:145). Hueffed's data has a great deal of overlap with Duffield's in both spatial and temporal concentrations. Hueffed (2023) only identified 2% of sherds as coming from Structure 8 and 17.2% from Structure 3. Hueffed's (2023) findings also have some overlap with Duffield's (1969) in terms of possible ritual expression. Two Iwi Engraved sherds consistent with Birdman iconography, two re-filmed sherds with handle peaks, and two sherds from small pinch pot bowls were collected from the site (Hueffed 2023:111-112). This is important because Iwi Engraved vessels are sourced from the southern Caddo area and are rare in northern domestic contexts, handle peaks are diagnostic of the transition between Harlan and Norman phases and are associated with ritual and communal practices, and the pinch pot bowls may have been used to hold pigment (Hueffed 2023:111-112).

Structure	**N=**	**% from Structures**
Structure 1	72	10.0%
Structure 2 Door	6	0.8%
Structure 2A	77	10.7%
Structure 2B/C	53	7.4%
Structure 3	123	17.2%
Structure 4	106	14.8%
Structure 5	34	4.7%
Structure 6	212	29.6%
Structure 7	20	2.8%
Structure 8	14	2.0%
Grand Total	**717**	**100.0%**

Figure 6.2: Ceramic Distribution (Hueffed 2023:86)

Spatial Lithic Patterns

While my findings here have a great deal of overlap with previous research, there are also some significant discrepancies. Formal tool types like Reed, Morris, and Haskell are concentrated in the northwest corner of the site (Figure 5.12). Ornamental specimens are also approximately concentrated in this region (Figure 5.16). Ornamental specimens are neither ground stone nor chipped stone and I have interpreted them as entirely non-functional. Non-local materials are quite rare, but they were recorded at a higher rate in the northwest portion of the site (Figure 5.15). These findings are associated spatiotemporally with Hueffed's ceramic findings and are diagnostic of Spiroan culture, with specific Harlan phase elements (Hueffed 2023; Ray 2016). The ornamental stone distribution likely supports this as well since it is believed that hematite is used to produce the color red, galena is used to make black, and quartz crystals are used to make white in artistic works in Spiroan society (Hammerstedt and Bobalik 2018). This relationship is unknown in earlier periods. 80% of chipped stone hoes are recorded in this area which is congruent with Spiroan people being farmers.

There do not appear to be reasonably defined spatial differences in terms of any of the biface breakage types. However, this lack of spatial difference is meaningful for analysis. It demonstrates that both production and use activities were taking place at the site in significant quantities but with production being the greater of the two. This is somewhat surprising as bifaces broken from use are often thought to be discarded close to where the use activity occurred as opposed to being brought back to the residential area (Binford 1979). Tools with traumatic breaks are usually thought to be discarded in the field while tools gradually reduced from wear are thought to be discarded at camp (Binford 1979:263). Both phenomena are present at the site. This could either indicate different hunting practices where broken bifaces that were not reworked are brought back to the habitation area to be discarded or that this area was used for more than one purpose.

It is highly unlikely hunting activities took place in the middle of School Land I when it was a sedentary agricultural village. Since heat treating most Ozark materials takes a long time and requires near-constant supervision (Benefield and Duncan 2021; Ray 2007), heat treating likely took place near residential-type sites for logistical convenience. This evidence indicates that School Land I was used for both hunting and habitation but at different times. The non-discrete stratification of the site (Table 5.13) is evidence of this. Formal tools associated with Spiroan culture are primarily in level 2 while those from earlier periods are primarily in levels 3 and 4. These spatial and stratigraphic differences between assemblages indicate that there are temporal differences within the lithic assemblage.

Late Archaic to Middle Woodland formal tool types like Afton and Waubesa were 51% concentrated in the area in and around Structure 8 (Figure 5.11). The Williams type (Ray 2016:45) appears to have a concentration (21%) in the northwest corner, similar to the later biface types associated with Spiroan culture (Figure 5.12). Middle Archaic to terminal Late Archaic (Ray 2016:12,15,88) formal tool types like Calf Creek, Smith, and Etley are dispersed relatively evenly throughout the site (Figure 5.10).

There are some trends among formal tool types depending on level (Table 5.13), but these observations are not discrete. Big Eddy, which shares alluvial and general regional characteristics with School Land I, had Paleoindian deposits from about 290cm-320cm (Stackelbeck 2010:53). The Calf Creek horizon in alluvial settings has typically been documented as beginning between 150cm-190cm (Bartlett 1994b; Chowdhury et al. 2021; Duncan 2021; Ray and Lopinot 2021). Excavations at School Land I only reached about 106 cm. Even the more recent Smith and Etley types were found in a range from 140 cm-250 cm and 50 cm-100 cm depending on local geology at Big Eddy (Lopinot et al. 2005:cover). School Land I sat in a very similar alluvial setting. On top of this, Archaic sites in the region may be affected at an increased rate by geomorphic processes like erosion and deposition (Mandel 1995:37) which could obscure the extent of Archaic activities at the site.

Based on conjunctive evidence from the faunal, ceramic, and lithic analyses, I believe that it is highly likely that there are significant changes in occupation patterns at School Land I through time. All three analyses showed high concentrations of Harlan Phase to Spiro Phase material culture in the northwestern corner of the site associated with Structures 4, 2, and 6. Structures 1 and 3 also played prominent roles in the faunal and ceramic analyses for similar reasons. Structure 8 has played a very minor role in the analysis of non-lithic materials. However, this is different in the lithic assemblage. While the structures are Spiroan constructions, changes in breakage patterns, formal tool types, and material type selection indicate that human activities at the site are more nuanced.

Preservation bias (Albert and Wyckoff 1984; Mandel 1995) has likely played a large role in this material difference. It is safe to assume that faunal materials played a prominent role in Archaic activities at School Land I. Nonetheless, faunal materials do not appear strongly associated with concentrations of Archaic tools. Site type could also play a role in this if Archaic peoples were transporting their game to camps in other places.

Since there were very few faunal materials recorded in the area around Structure 8, the two most likely options are either hygiene practices dictating the disposal of bones in the northwest, or that the faunal materials that were consumed near Structure 8 simply decomposed. Or both could be true. Soils in this area are known to be highly acidic (Albert and Wyckoff 1984) which has a much more pronounced impact on faunal remains and ceramics than lithics. My argument here is to be aware of how dramatically site formation processes (e.g. Schiffer 2002) could affect differential preservation at School Land I. The only other structure with an entranceway that is so barren faunally is Structure 7. All other entranceway structures have significantly stronger faunal representations. This suggests more intensive recent occupations in the areas with strong faunal concentrations. However, Structure 7 is intriguing because it does not have a strong concentration of faunal, ceramic, or lithic materials. This could very well support Hueffed's (2023) and Duffield's (1969) proposals that Structure 7 was an alternative use building, possibly relating to governance (Dorsey 1905).

While there is evidence of pottery being used in the Southeast as long ago as 3,800 years ago (Sassaman 1999:6), the chronology of this is much less clear in the Ozarks. There is potentially genetic evidence of domestication in the region as long as 4,000 years ago (Fritz 1984, 1990). But paleobotanical materials are not present in the School Land I collection so there is no way to evaluate this. Since there are no diagnostic ceramic materials from earlier times, their archaeological use is limited to furthering our understanding of the various Spiroan phases. Lithic specimens at School Land I are the only ones that have shown the capability to preserve from older times and are unfortunately the only current material representation of human activity from these older times.

Considering all of this, I believe that School Land I is a palimpsest where subsequent generations used the same area as their ancestors for both socio-cultural and environmental reasons. Echoes of earlier occupations or uses remain but are archaeologically obscured because of site formation processes.

This pattern is not limited to School Land I. Reed has a Calf Creek biface recorded in its assemblage (Figure 6.3) (Regnier et al. 2019:260). Additionally, Archaic types like Smith and Williams are recorded in both the Reed and Lillie Creek assemblages (Regnier et al. 2019:260,284). Reed contains one of the only platform mounds in the region (Regnier et al. 2019:249). With the possibility of a significant Archaic presence throughout the region, a forward-thinking approach of monumental construction and settlement intensification (e.g. Kassabaum 2021) in conjunction with a landscape approach (e.g. Randall 2015) may be of great benefit to future research. There is great potential for understanding this regional cultural change in a forward-thinking fashion such as each new generation imbuing new but connected meaning into the landscape (e.g. Joyce 2004). These spatiotemporal relationships and approaches that operate on a wider scale are essential for moving beyond restrictive analyses, like the one I have conducted here, and toward broader themes related to economic and ideological interaction, connection, influence, identity, and exchange between communities throughout the Caddo homeland and into adjacent areas (McKinnon 2021:62).

But considering the similarities between these different assemblages at School Land I can speak generally to these exchange networks and offer insight into the function of the site in the Spiroan phases. The presence of an owl's remains, the possible presence of clans, Iwi Engraved Birdman iconographic pottery, red-filmed handle wear pottery, possible pigment pinch pots, and extended entranceways caught both Duffield's (1969) and Hueffed's (2023) attention. Combining this with more than two kilograms of ornamental stone, a pigmented celt, and serrated arrow points with arguably aesthetic qualities seems to indicate that there were significant ritual components built into everyday domestic life at the site. This is further accentuated by the pattern of Structures 5 and 7 having very small quantities of artifacts associated with them which is consistent with Duffield's (1969) hypothesis that they are special-purpose buildings. This stream of evidence could indicate that School Land I was chosen as a settlement location for specific historical reasons that were perhaps connected to a legendary past. If this hypothesis is true, then the ritual elements at the site are representative of Spiroan descendants drawing connection and meaning from their ancestors. The implications of this are broad, but not uncommon, and are tied to the fact that Spiroan peoples were very intentional with their settlement decisions. This intentionality was not limited to advantageous ecozones and trade networks but also encompassed connections to ancestors, implying even more nuanced embedded meaning in the local landscape.

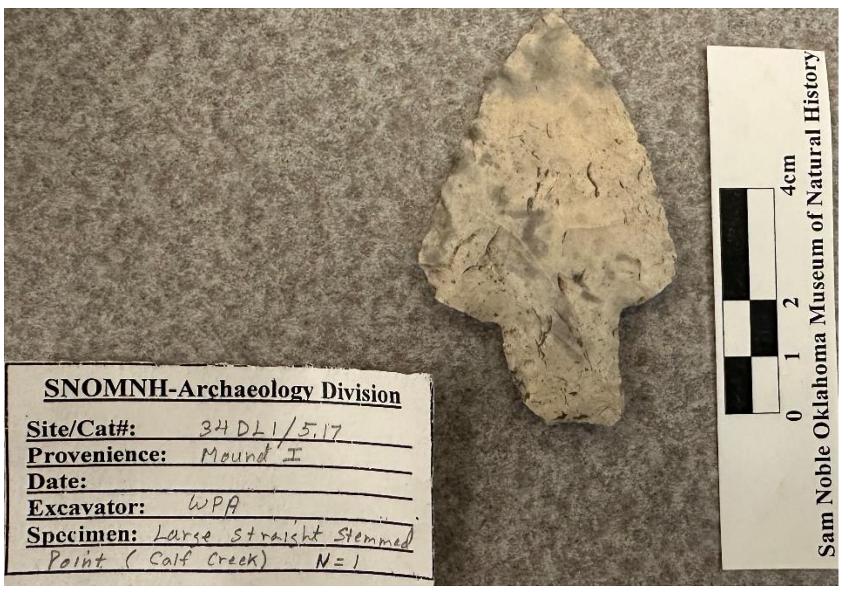


Figure 6.3: Calf Creek Biface from the Reed Site

Technological Changes Through Time at School Land I

This section is aimed at approaching the enormous morphological and technological variety in the School Land I assemblage. I believe that one of the more profound examples of this is associated with the emergence of the bow and arrow. This change was not linear

(Nassaney and Pyle 1999), but the eventual result was the widespread adoption of the bow over alternative hunting tools. A study based on the central Arkansas Plum Bayou culture stated that A.D. 600 is a reasonable date for the widespread adoption of the bow in the region (Nassaney and Pyle 1999). I have chosen this example as an analogical benchmark because it has homologous and homoplastic strengths for considering this technological change at School Land I. This is important because the trajectory of the bow in the region is historically particular (Nassaney and Pyle 1999). The Plum Bayou culture seems to have interacted frequently and directly with Spiroan people (Nassaney and Pyle 1999) which allows for more analogical viability than broad regional generalizations. While a direct Spiroan analogy would be ideal, enough time had passed from A.D. 600 to the Harlan Phase several centuries later that the bow could have been even more established. These reasons for technological change may be even more pronounced at School Land I because of how plentiful the Osage Orange is throughout the Caddo area (Schambach 2009). The incredible hardiness and elasticity of this material are much more fully utilized by a bow than by other compositions like spears or atlats (Pettigrew et al. 2023; Schambach 2009). If there were holdouts in the area, they were likely due to socio-cultural reasons (Nassaney and Pyle 1999) or niche hunting practices (Kinsella 2019).

I believe that the change towards the bow explains the technological change at School Land I from larger hafted bifaces to smaller arrow points. I also believe that this adds credibility to actual Archaic and Woodland activities being conducted at the site as opposed to later Spiroan descendants regularly practicing the reuse of these bifaces that would have been impractical by their standards. These later Spiroan descendants had little to no utilitarian reason for using these tools and it would severely defy the adjacent Plum Bayou pattern (Nassaney and Pyle 1999). While there may have been instances of descendants collecting these bifaces as a form of ancestor veneration, this does not explain how bifaces that are too large to be hafted on an arrow make up the majority of formal tool specimens. There is also the added element that these larger bifaces took much more investment to make in terms of production processes and skill acquisition (Benefield and Duncan 2021; Ray 2007). Alternative hunting methods require more training and are less likely to produce consistent positive results (Pettigrew et al. 2023). This model of human behavior indicates that larger hafted bifaces like Calf Creek, Smith, and Etley are representative of pre-Spiroan activities at the site.

The Change from Calf Creek to Smith and Etley at School Land I

Technological changes can also be seen within terminal Archaic formal tool types when contrasting Calf Creek with Smith and Etley. While robust experiments studying how much time it takes to knap a Calf Creek biface have not been conducted yet, experiments targeted around heat treatment times of Calf Creek materials have been conducted (Benefield and Duncan 2021; Ray 2007:196,216). Approximately summarized, these experiments found that great attention has to be paid when heat treating Keokuk and different tasks have to be performed at specific times to make an acceptable outcome more likely. One consideration is that Keokuk must be dry to avoid crenated fractures and pot lids and this is best facilitated by having a ladder-like staged heat-treating process where larger cores are heated at lower temperatures (506°F) and thinned preforms are heated at higher temperatures (700 °-750° F) (Benefield and Duncan 2021:199). This process takes more time in winter when the soil is colder because heat treatment is thought to have taken place in specialized pits (Benefield and Duncan 2021:187).

Meanwhile, Smith and Etley bifaces do not require heat treatment and categorically require much less commitment (Ray 2016:15,88). While Smith and Etley may be a part of the same toolkit (Lopinot et al. 2005; Ray 2016), Calf Creek does not share any primary chronological overlap with these two types (Lohse, Culleton, et al. 2021; Ray 2016). It is also possible that the various cultures that used Calf Creek tools had completely different socio-economic organizations as opposed to the cultures that used Smith and Etley tools. Calf Creek technology spread rapidly over a massive area (Lohse, Wyckoff, et al. 2021:4). The caching of finished tools and preforms was also a regular practice among many of the people who used Calf Creek bifaces (Ayala 2021a; Bartlett 1994b; Ray and Lopinot 2021). These two behavioral aspects coupled with the rapid expansion of Calf Creek technology could be indicative of a more forager-type hunter-gatherer settlement strategy (Binford 1980; Carlson and Bement 2021). The Smith and Etley types had a much smaller geographic range (Ray 2016:15,88) which may be more emblematic of a collector-type hunter-gatherer settlement strategy (Binford 1980) or a much less mobile horticultural settlement strategy. While answering these larger questions is beyond the scope of this research, there may be enough evidence to hypothesize as to why there was a change from Calf Creek to Smith and Etley.

This hypothesis comes in the form of a homoplastic analogy comparing the findings of Bebber (2021) with my findings here. Bebber's (2021) study was centered around Archaic Great Lakes copper tools. Similar to Calf Creek bifaces, utilitarian copper tools take a long time to make (Bebber 2021). The units I desire to use for direct comparison are the Archaic periods and the large time investment required to make these tools. The period is important because Bebber (2021) hypothesizes that copper hunting tools were widely used in the Middle Archaic in the Great Lakes region but were used dramatically less in the Late Archaic because of environmental changes across the continent. These changes in the latter portion of the Middle Archaic are largely referred to as the Hypsithermal (Anderson and Sassaman 2012:73; Bebber 2021). Bebber (2021) argues that the Middle Archaic had a more humid climate and a lower population concentration while the Early Archaic had a much drier climate and a higher population concentration. This necessitated that more time be spent on obtaining food in the Early Archaic than in the Middle Archaic, requiring more expedient tools (Anderson and Sassaman 2012; Bebber 2021). While copper arrowheads and spear points are on average more durable than their stone and bone counterparts, this advantage in durability is overshadowed by drawbacks relating to procurement and production (Bebber 2021). Bebber (2021:1246) also hypothesizes that the reason for utilitarian copper tools not being a component in sedentary cultures is because economic focuses were on the production of crops and people had less free time on average than their mobile predecessors (e.g. Sahlins 1998) which resulted in copper tools being non-utilitarian and associated with dependent artisan social roles. The mobility of Calf Creek foragers may also be an observable trait of people 'voting with their feet' (Sanger 2017) where easy access to food meant that these people had high degrees of independence.

This analogy argues that Calf Creek bifaces serve a similar function to copper hunting implements because they are both high-risk high-reward kinds of tools. I view this as similar to Bleed's (1986:739) concept of a reliable tool which is a tool that is overdesigned, has redundant systems, a generalized repair kit, and a specialist to repair it. The favorable ecological conditions of the Middle Archaic contributed to the emergence and dissemination of the Calf Creek biface. Ecological changes also played a critical role in why people stopped making the Calf Creek biface and started making the Smith and Etley types in the Early Archaic of the western Ozarks. These conditions were not favorable for the long production time and costs associated with the Calf Creek biface, causing people to shift to using bifaces that still fit their needs but took less time to make. By the time environmental conditions changed, human socio-economic organization was much more focused on horticulture/agriculture, and technology had changed towards the bow which Calf Creek, Smith, and Etley types are all ill-suited for. Socio-historical matters certainly had a role to play in this but more research will have to be done to understand their chronology. But specimens of all three of these formal tool types in the School Land I collection can contribute to the understanding of what they were used for and the meaning invested into them.

A Life History Approach on Biface Breakages and Ground Stone Specimens

This approach is aimed at identifying and deconstructing manufacture, use, recycling, and disuse processes in stone tools (Hadley 2023). These stages are not necessarily linear nor mutually exclusive. I found it highly appealing because it offers a theoretical framework to elaborate on observations relating to biface breakage patterns. Hadley (2023) uses this approach in her analysis of ground stone pipes but it also works well for bifaces because it is informed by Adam's (2013) insights on identifying specimens at these different stages and Schiffer's (1972) work defining archaeological and systematic contexts. Breakage analysis can be a formalized system for identifying different life history stages which can in turn facilitate the understanding of dynamic context formation which is essential for a palimpsest like School Land I.

Life History of Broken Bifaces

Some of the most fruitful morphologies for applying this approach are Calf Creek, Smith, Afton, and Spiroan formal tools along with chipped stone hoes, drills, and axes. In this collection, there are several identifiable stages of Calf Creek biface production that each have individual representative specimens. They are much more elaborate than the four stages identified by Adams (Adams 2013) because they have a much more intricate manufacturing process. Ayala (2021a, 2021b) identifies performing and practice pieces as important aspects of

Calf Creek biface production. Calf Creek heat treatment also has a role to play here because of how it can be broken down into stages. Benefield and Duncan (2021) argue there were likely at least three different heat treatment stages that correspond with the reduction of Calf Creeks. Generally, temperatures would increase as the biface was reduced (Benefield and Duncan 2021). Because of how intensive this process was and how challenging it was to perform all these steps correctly, failure would have been a relatively common occurrence (Ayala 2021b, 2021a). While there are currently no experimental studies that can offer insight into how Calf Creek bifaces functioned when used, this is an area where breakage analysis can thrive.

The Calf Creek specimens from the School Land I collection show evidence of barbs snapping as perverse fractures, traumatic impact fractures, a heat-related fracture, and consistent reworking. These breakages and modifications demonstrate that these bifaces were used frequently and intensely, often to the point of being a quarter of the size that they once were (Kuhn 1994; Ray 2016). One specimen, in particular, demonstrates this with a fracture occurring in the lateral portion of the blade that resulted in a barb snapping, but then it was expertly reworked to still maintain a sharp edge despite its lack of symmetry with the remaining barb. Following this, the biface (Figure 6.4) continued to be used until it experienced a traumatic impact fracture, thereby signifying its movement into the disuse stage of life history analysis as defined by Hadley (2023).

Figure 6.4: Multi-Breakage and Reworked Calf Creek

I believe that one of the most profound insights to be gained from this is unpacking the value that people embedded into Calf Creeks. Whether this was because their livelihoods depended on these tools, they were integral to social status or identity (e.g. Weissner 1983), or both, it is clear that the people that used Calf Creeks invested a substantial amount of time into their production and maintenance. It may be worth considering certain specimens as inter-generational tools. Calf Creeks only entered their disuse phase in the School Land I assemblage when they could no longer be reasonably reworked (e.g. Kuhn 1994:430) or their utility was expended (e.g. Shott and Ballenger 2007:157). This is an aspect that is not shared in the other tool categories in this assemblage. The only other tool that I noticed with similar patterns is the possible Jakie (Ray 2024:personal communication) haft (Figure 5.7) because it was pressure flaked into a scraper after experiencing a break that I inferred to be a haft snap. Based on the theory of expanded utility (Shott and Ballenger 2007), it is possible many of the Calf Creek specimens that are currently small were likely once much larger and their contemporary size is an indication of how much they have been used and reworked. I am viewing this in a very similar way to how Shott and Ballenger (2007) interpreted curation among sampled Dalton bifaces. I am also arguing that they would have been abandoned at this stage because they were too small to be reworked and still perform within the range of intended functions (Kuhn 1994).

Lastly, a different intriguing Calf Creek specimen is serrated (Figure 6.5) which is extremely uncommon (Ayala 2021b; Ray 2016:12). If Spiroan descendants were reworking the Calf Creek tools of their ancestors, this would be the most likely candidate because serration is common only among Morris, Reed, and Scallorn types in subsequent periods (Ray 2016:30,61,75). But this is unclear because Dalton types of the Late Paleoindian and Early Archaic periods are also frequently serrated (Ray 2016:136). The addition of serration in the final stages of this tool's use-life could also be indicative of a change in function. Regardless, this specimen had a long life history where it was gradually used and reworked until it was much smaller at which point it was serrated.

Figure 6.5: Serrated Calf Creek

Breakage analysis of the Smith and Etley (Figure 6.6) types has shown here that they do not require anywhere near the same amount of investment as Calf Creeks. While it is possible that practice pieces can also be a part of learning Smith reduction (Ray 2016:15), this is not documented at anywhere near the same rate as in Calf Creeks (Ray and Lopinot 2021). Smith and Etley bifaces also are much less likely to be reworked with less than half of them showing signs of this while eight out of nine Calf Creek bifaces do show signs of reworking. This correlates with the fact that Smith and Etley bifaces were much more likely to enter a disuse phase after a reworkable break as opposed to Calf Creek specimens. This leads me to believe that the production processes behind the Smith and Etley bifaces at School Land I were much shorter and less intense, and their use lives were much shorter because they were less likely to go through multiple use stages. But this phenomenon is still present within these formal tool types because they can be reworked into a smaller barbless form with a proportionately large stem which used to be referred to as the Stone Square Stemmed type (Figure 6.7: top left) (Ray 2016). Overall, these types had a shorter life history than their earlier Archaic counterpart.

Figure 6.6: Sampled Etley Bifaces[5]

[5] All three of these specimens share the same provenience and exhibit extraordinarily similar knapping patterns. It is possible that they were made by the same person or someone in the same knapping lineage.

Figure 6.7: Sampled Smith Bifaces[6]

For Afton bifaces, a life history approach reveals that they share some similarities with these earlier Archaic bifaces but are also dramatically different in other areas. Preforming and practice pieces are also thought to be a part of Afton's production processes (Ray 2016:20). Still, they are diagnostically different from Calf Creek and Smith practice pieces because Afton is corner notched with a very different angle than basally notched bifaces (Ray 2016:20). Afton technology having a practice piece component is somewhat surprising because this sets it apart from all other corner notched bifaces present at School Land I. This makes more sense when considering that pronounced thinness is one of the Afton types' diagnostic characteristics (Ray 2016:20). There is also the possibility that many of these bifaces were first documented

[6] The specimen in the far left of the top row is a resharpened Smith biface that would sometimes be called a Stone Square Stemmed formal tool.

archaeologically in what is thought to be a symbolic context (Holmes 1903) which makes it unclear how much they were used day to day. But School Land I is positioned well to offer more insight into this because it is a residential site.

Figure 6.8: Sampled Afton Bifaces

Heat treatment of Afton bifaces at School Land I appears to be higher than usual (Ray 2016:20), but this correlates with Undifferentiated Osagean (UO) being a dominant material type at the site. Reeds Spring Afton bifaces (Figure 6.8 left) were not heat treated at the site. Breakage analysis reveals that these tools are well represented in terms of production failures but much less so in terms of determinable use failures. What I interpret from this using a life history approach is that Afton bifaces also saw substantial investment into their production and these production processes were practiced frequently at School Land I with a high degree of late-stage production failures. But their use-life was relatively short before transitioning into a disuse phase. They appear to be a high investment tool with a very short use-life, supplemented by a low rate of being reworked. It is also possible that they were simply used in a different place, building off Binford's (1979) concept of personal gear. While there are several possibilities, this would appear to be congruent with the notion that Afton bifaces were largely produced for non-utilitarian reasons at residential sites and then transported elsewhere.

A similar observation can be made in some of the smaller Spiroan bifaces. Reed, Morris, Huffaker, and Scallorn also have non-utilitarian qualities and are not well represented in terms of use fractures. The most striking of these non-utilitarian qualities relates to reduction processes as some of these specimens have vibrant red portions of the heat-treated stone that are homogenously present only on the distal portion of the tool. This implies a more nuanced production process in some ways because only certain portions of flakes or nodules would facilitate this knapping style in Ozark material types (Ray 2007:196,216,227). Hematite staining is another possibility. If this is true, it would fall into a similar narrative with Hueffed's (2023) possible pigment bowls.

Whenever I identified this phenomenon in the School Land I collection, the distal region was red which may be bound up in Spiroan cosmology since red is believed to represent masculinity, and is associated with the sun, life, daytime (especially dawn), father, Morning Star (Great Star), Red Star, and east-southeast (Dorsey 1905; Hammerstedt and Bobalik 2018:1). Studying the cosmological significance of stone tools has proven to be successful and very valuable for archaeological analysis (e.g. Brumm 2010). Many of these specimens were also serrated which has both aesthetic and practical benefits. Still, it will have to be the task of future research as it is beyond my scope here.

Figure 6.9: Sampled Arrowpoints with Thermally Altered Distal Ends

This indicates that the use-life of these smaller bifaces was relatively short but their production required a large investment in terms of time and material, perhaps more so than the Smith and Etley types. This is not to say that use was not a significant portion of their life history, but it is likely their use occurred in areas away from the village at School Land I (Binford 1979). The only path to understanding this via the School Land I assemblage is through reworking, of which Scallorn specimens show some signs but the other specimens do not. These smaller tools were also the most well-represented in terms of complete specimens (Figure 6.9).

Chipped stone hoes (Figure 6.10) offer somewhat less information from a breakage analysis standpoint than previously discussed morphologies, but there are still some valuable conclusions to be drawn. First, many of these specimens have morphologically visible hinge fractures built up on their distal ends indicating that their use-lives primarily consisted of direct impacts. Second, many of these specimens have maintained platforms without striking marks in their proximal region. I am interpreting this as a hafting element. Third, many of these specimens display signs of these use fractures yet possess lateral snap fractures. This is surprising because these fractures are thought to be primarily associated with production (Johnson 1979, 1981), which suggests this is differentially experienced depending on morphology. Some of these specimens may also exhibit signs of polish, depending on life-history stage.

Figure 6.10: Sampled Chipped Stone Hoes

I view the implications of this primarily in two ways. One is that these tools were used in ways that involved consistent impacts but also a large amount of lateral force that would eventually cause the tool to snap. I believe this is congruent with what one should expect in the life history of a chipped stone hoe. Further, this is corroborated by Cobb (2000:15-17) who argues that Mill Creek chert was intentionally selected over other chert types for hoe production because of its hardiness despite it being selected at a much lower rate for other chipped stone tools. In the School Land I assemblage, all hoes were made of UO. It is harder to draw a linear correlation between UO and hoes than with Mill Creek and hoes. This is because UO is a category of great diversity where some sub varieties produce sharper edges and are more fragile, therefore more suitable for other tool categories that require more finesse. At the same time, other varieties are more impact-resistant but less sharp, making them more suitable as hoes. Cobb's (2000) logic of Mill Creek hoes does stand true here because the variety of UO in use does not occur in any projectile points but all of the hoes are made from it. There may even be a cultural connection between these two hoe production practices because there is evidence of a Mill Creek hoe being imported to Reed (Perino 1967:64). No identified hoes showed signs of reworking which suggests that they entered the disuse phase of their life history once they were initially broken. This appears to be congruent with the fact that School Land I is positioned in direct proximity to UO resources and the assumption that hoes can be produced with relative speed.

Cobb (2000) also provides an opportunity for discussion on the potential for gendered differences in terms of stone tool use at School Land I. This comes in the form of the Birger Figurine in which a woman is depicted using a stone hoe in a Mississippian setting (Cobb 2000:47; Emerson and Jackson 1984:255-257). Cobb (2000) also uses ethnohistoric accounts to supplement his interpretation of the relationship between women and stone hoes. The ground underneath this woman also takes the form of a snake (Emerson and Jackson 1984:255), suggesting further cosmological implications. While the Caddo should not be considered Mississippian (Regnier 2017), it could be possible that there is a similar relationship in Caddo societies because of their cultural similarity with many other southeastern groups in this period. This is especially intriguing when considering the potential relationship between the color red and masculinity in some Caddoan-speaking societies (Hammerstedt and Bobalik 2018) and findings where some tools show signs of being knapped in such a way that their distal ends are red.

This lithic assemblage cannot offer insight into whether or not there was also a gendered divide in terms of production other than my assumption that the people who made these tools would also be the ones who used them. The life history analysis of the chipped stone hoes at School Land I indicates that they were a relatively expedient and hardy tool that would typically fall into disuse upon experiencing a lateral snap fracture.

Two of the remaining chipped stone morphologies in which a life history approach can be applied are drills and axes. They are grouped here because their chronological association is much more ambiguous. Drills are associated with sites at least as old as the Early Archaic in Oklahoma. One example is the Pumpkin Creek site (34LV49) which had drills of the same morphology (Figure 6.11) as those in the School Land I assemblage and were associated with Scottsbluff, Meserve, and Dalton-Greenbriar formal tools (Wyckoff 1984:128). School Land I does include drill specimens that I believe to be perforators. It is also possible that smaller narrow bifaces like Scallorn and Morris could be used as perforators.

While they are useful in producing a variety of goods, it is possible these tools had other purposes that were not necessarily functional. Tattooing is one of these possible purposes and it has been abundantly documented ethnohistorically among cultures in the Caddoan language family (Wallace 2013) but evaluating this archaeologically is challenging. Chipped stone, bone, and wood could all have been used as tattoo implements (Deter-Wolf 2013:56-57). Duffield

(1969:59) also recorded one bone awl made from the cannon bone of a white-tailed deer. Other bone awls were supposed to be a part of the collection but were missing when Duffield (1969) performed his analysis. Garcilaso de la Vega, who chronicled the De Soto expedition 20 years after its completion (Deter-Wolf 2013:57; Vega 1993[1605]), specifically mentioned “points of flint” as being tattoo implements in Caddo society at this time. It is also possible for chipped stone tools to be associated with hygienic sterility (Walton 2021), but this would need to be explored in much more depth considering local ontologies.

Axes (Figure 6.11) are even less chronologically diagnostic, but are often thought to be associated with landscape modification and are considered a common component in Fourche Maline sites (Bell 1953, 1980). Axe specimens at School Land I show signs of use and have complete examples that have entered their disuse phases.

Figure 6.11: All Axes Present in School Land I Assemblage

These axes are likely more associated with habitation as opposed to other practices. This is because they entered their disuse phase by either gradual use or by being complete. This fits into Binford's (1979) idea of personal gear where tools discarded in this way are indicative of a residence. Drills are especially telling because they are primarily a processing tool that requires more site furniture (Binford 1979). Breakages on the School Land I drills are indicative of both use and production processes.

While drills at the site appear (Figure 6.12) to have entered their disuse phases after just one break, this is different for axes. One axe specimen was continuously worked down to such a size that it could no longer be used, thereby entering its disuse phase. Another was heat treated, with red hues on its distal end, but entered its disuse phase without showing macroscopic signs of use. This specimen exhibits hinge fractures associated with production because they did not occur in the distal region. These two specimens may be examples of different use life trajectories despite being similar morphologically. One's use life was primarily functional, while its counterpart could have had more symbolic applications (Figure 6.7) (e.g. Brumm 2010). There could be an overlap between these two, but the limited data I have can only offer insights in this dichotomous fashion.

Figure 6.12: Different Drill Morphologies

Ground Stone Life Histories

My observations of the ground stone specimens have less to offer in terms of life history analysis because my primary mode of analysis, biface breakages, can only be applied to bifaces. But I did record several attributes for the groundstone specimens that allowed me to make some inferences about their life histories. One example is the morphological category of nutting stone. While these specimens may have been used for more than nutting purposes, they did all possess a central bored-out divot in which various foodstuffs could be placed. This is an area where a floral collection for School Land I would have been very helpful. Plantstuffs such as amaranth, Chenopodium, and maize would likely have been consumed at the site (Fritz 1984, 1986b, 1990) but there is no way to know this because the site is submerged.

There are several specimens that I have identified as manos (Figure 6.13) because of the way they were shaped and the signs of grinding on their distal ends. They were either elongated and cylindrical or bulbous. I did not identify any manos that were broken, but I did notice several nutting stones that were broken. I believe they broke along lines of either cumulative pressure or heat. The heated nutting stones exhibited the characteristics of fire-cracked rock, and it is unclear whether this was deliberate, meaning they would have been used as a base to cook foodstuffs (Figure 6.14), or if it was secondary. Baerreis describes burning as an element of Structure 3, but it is unclear why this happened and what this occurrence meant for following generations.

Figure 6.13: Sampled Manos

Figure 6.14: Sampled Cooking Stones

There were six diagnostic ground stone specimens: four pipe fragments, one complete pipe, and one complete celt. Of the pipes, two are tabular or straight linear contracting cones (Hadley 2023:84). One of these is broken and the other is complete (Figure 6.15). The others are all fragments from at least one different morphology, but this is challenging to determine because of the size of the fragments. Complete stone T-shaped pipes have been recorded in northern Caddo contexts, but Moorehead (1931:49) and Thoburn (1931:54) both believed that they were associated with the more recent Fort Coffee Phase, although the way they articulated this was that the pipes were “Siouan intrusions.” Later research established that these pipes were present at Spiro in earlier phases (Brown 1996; Hoffman 1967).

Figure 6.15: Complete Stone Pipe Bowl

All of these specimens in the School Land I collection appear to be bowl fragments (Figure 6.16), which could be remnants of T-shaped pipes. One has regular curvilinear lines on its exterior and burned residue on its interior. These samples provide a limited view of pipe use and production at School Land I. They do provide examples of pipes entering their disuse phase both because they were broken and because they were whole. The coarse grain and perceived expedience of the straight pipes may mean they were made locally but this is unclear for the other variants which are smooth-grained and perhaps less expedient.

Figure 6.16: Stone Pipe Fragments

While only one ground stone celt was recorded (Figure 6.17), there is a surprising amount of information that can be gleaned from it. It has macroscopically visible peck marks, elliptical and linear cut marks, signs of use with impacts and abrasions in its distal region, hematite stains, a pitted indent near the distal end, and a clear hafting element in the proximal end. The cut marks may be associated with hafting this specimen via leather or sinew and the reason why this process left such deep cut marks could be because of the malleable material the specimen is made from. This implies a paradox that this specimen is not necessarily well-equipped to be consistently used but there is clear evidence of it being used. Combining this with the presence of hematite could mean that this specimen was primarily non-utilitarian, but it was still actively used. It is possible that these purposes, however brief, left profound traces on the surface of the specimen. It is also possible that these marks are secondary. Nonetheless, the presence of red coloration could indicate a gendered division of use similar to smaller formal chipped stone tools (Hammerstedt and Bobalik 2018).

Figure 6.17: Ground Stone Celt Side A

Chapter 7: Conclusion

Throughout this thesis, I sought to lay out all of the contextual information relevant to School Land I to demonstrate the paths that led to these conclusions. I summarized the background of the western Ozarks and the Arkansas River Valley from the Middle Archaic to the Neosho Phase. Massive changes in lithic technology and human behavior occurred over this wide expanse of time. This study used a biface breakage typology, a formal tool typology, inferred morphology, and material type identification which provided a wealth of information that has enabled me to provide some tentative answers to this study's research question.

This question is: given the faunal and ceramic analyses, will a lithic analysis confirm or deny current interpretations of the site?

Analysis has demonstrated that this lithic assemblage contains greater time depth and more nuanced activities at the site than previously thought. Biface breakage patterns indicate lithic tools were produced, used, and thermally altered at School Land I in significant quantities, with production being the most observable activity. these activities are indicative of the purpose of the site changing over a long period from food procurement to settlement. This is supported by terminal Middle and Late Archaic bifaces being used and discarded at the site, Spiroan bifaces being the most well-represented in terms of complete specimens, non-discrete stratification at the site displaying different cultural layers, and the differential spatial comparison with the faunal and ceramic assemblages.

But this analysis has also confirmed many of the pre-existing interpretations of the site. The interpretations that the Harlan phase occupations at the site were the most intensive and that ritual behavior played a role in this domestic space are supported by the quantity of ornamental stone and the possibility of symbolic activities being performed with stone tools. Evidence from the faunal and ceramic analyses is much more substantial on this front with the presence of owl remains, Iwi Engraved Birdman iconography, red-filmed handle wear pottery, and possible pigment pinch pots. Architectural factors like extended entranceways and the possible cleaning of Houses 5 and 7 also contribute to this narrative.

Yet it is important to acknowledge that this study has been limited by some factors. Identifying discrete activity areas has also not been feasible due to poor spatial resolution. Collection strategies employed by the Works Progress Association had strong selection biases that resulted in only 36 flakes being collected out of 1769 total stone specimens. Very few cores are also present in the collection which is surprising because they are commonly associated with household economies at Cahokia (Ray 2007). But it is also important to stress that this collection is the only material way to glean information about this site and others in the area like Lillie Creek because they have since been submerged.

A great deal of evidence is present in this collection despite its current state. Technological changes in the School Land I collection’s formal tools appear to be a diagnostic feature in detecting changes in hunting practices. These technologies at the site are not limited to hunting and butchering. There is evidence of plant cultivation and consumption with chipped stone hoes, axes, manos, and nutting stones. Certain items like ornamental stones, hoes, and thermally altered arrowpoints can offer insights into symbolic value. Non-local materials were only brought into the site at later points in time and there are trends in material type in terms of morphology. Sharper and more fragile materials were selected for projectile points formal bifaces while more hardy but dull material types were selected for informal bifaces and ground stone tools. School Land I shares a great deal of similarity with sites in its immediate vicinity like Reed and Lillie Creek and with regional centers like Spiro and Harlan.

This analysis was enhanced by integrating a life history approach to facilitate a more formalized and transparent interpretation of biface breakages in terms of formal tool types and morphology. This approach used biface breakages to explain some of the differences in and among these other categories in conjunction with modifiers like thermal alteration and reworking. Some tools had labor-intensive and time-consuming manufacturing processes and long use lives, after which they fell into disuse only when a breakage was so traumatic that the tool's utility was expended. Other tools required much less investment in production and entered their disuse stage after only a single breakage. This approach also provided space for discussion on possible gendered divisions of tool use and non-functional purposes for some stone tools.

While acknowledging that excavations at the site were limited, I have argued here that School Land I was once a place used for resource gathering by hunter-gatherer societies like the people that used Calf Creek, Smith, and Etley formal tools. This analysis indicates that their purpose was primarily active hunting, but poor site preservation and field methods may have obscured habitation episodes. It is also important to mention that their activities would have encompassed many activities that did not use stone tools, but stone tools are the only ones that ended up in the collection that could represent their presence. Subsequent habitations have much more evidence and are clearly defined archaeologically by the presence of the eight (or nine) structures. This place continued to be significant to following generations as they navigated the meaning previously embedded into the site and imparted upon it their own meaning.

Material evidence supports the idea that these structures are associated with a dramatic increase in production since there were more production breakages overall, there were proportionally more production breakages among Middle Woodland-Spiro Phase formal tools, and these tools have different spatial patterns than formal tools emblematic of earlier eras. The biface breakage framework has equipped me to analyze this lithic assemblage in a way that contributes to the holistic understanding of the site.

These findings are significant because School Land I is a Harlan Phase residential site in the northern Caddo area. Past research in the northern area has been centered around civic-ceremonial centers like Spiro and Reed, but these sites can only help solve part of the puzzle. The residential component is crucial in understanding the differences between the two site types and understanding what the day-to-day lives of people were like. While my research here cannot claim to be that particular, I have been able to hypothesize about broad trends in human behavior at the site. While School Land I appears to be a village oriented around the nearest civic-ceremonial center, Reed, material evidence indicates that ritual behavior was a component at this domestic site. Ritual behavior was not limited to Reed. School Land I may also have been chosen for settlement not just because of favorable biotic zones or spatial proximity but because of embedded social memory and meaning. Spiroan descendants may have sought connection with their Archaic and Woodland ancestors when choosing a place to build their houses at School Land I.

There are also still plenty of opportunities for future research. These could involve analyzing other sites and collections from the region, applying and conceptualizing different theoretical approaches, and utilizing new methodologies and sourcing methods. I believe that there is great untapped potential still in this area for all manner of research questions to be asked that enhance our understanding of what life was like for these people and why they did what they did. I also believe that conducting this work in the future can have ethical ramifications on the ongoing curation crisis and the ethical treatment of Indigenous material culture.

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