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Lithic Analysis of an Early Archaic Assemblage on the Great Plains: The Spring Creek Site (25FT31)

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Lithic Analysis of an Early Archaic Assemblage on the Great Plains: The Spring Creek
Site (25FT31)

By

Andrea Elizabeth Kruse

A THESIS

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Lithic Analysis of an Early Archaic Assemblage on The Great Plains: The Spring Creek Site (25FT31)

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Early Archaic sites on the Great Plains are few in number and often little studied and poorly reported, as they are almost always found via salvage or compliance archaeology. Of those Early Archaic sites that have been studied, rarely has the recovered debitage been analyzed in detail nor have tools been fully evaluated for use-wear. This thesis describes the lithic assemblage from the Spring Creek (25FT31) site located in southwestern Nebraska. As one of two important early sites in the state, detailed lithic analysis will complement the thorough analysis of faunal remains conducted in the 2000s. This thesis presents the methods used to complete debitage and tool analyses including use-wear analysis. By using lithic analysis along with fauna analysis, archaeologists can gain better understanding of the relationship of the resources procured by Early Archaic hunter-gatherers on the Great Plains landscape.

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CHAPTER 1: INTRODUCTION

The Early Archaic on the Great Plains is defined by archaeologists as that cultural period extending from 7500 to 4500 BP. It is defined on the basis of notched dart points replacing lanceolate forms and the appearance or the apparent increase in the number of grinding tools (compared with the earlier Paleoindian period), and the greater use of local lithic material (Kornfeld 2003; Kornfeld et al. 2010; Wedel 1961). These changes in material traits are thought to herald a different adaptive strategy, one with greater resource diversity and reduced residential mobility. Although diet appears to have been diverse, bison continued to be hunted as an important food item (Frison 1979; Kornfeld et al 2010; Reeves 1973; Widga 2004). The interpretations about Archaic subsistence diversification and reduced residential mobility might well be true, but as of yet they have not been based on substantial amounts of data. Because of sedimentation and the deep burial of Early Archaic sites on the Great Plains, our knowledge of this time period remains sparse.

Prior to numerous large-scale salvage excavations in the mid-twentieth century that uncovered Early Archaic deposits, some archaeologists speculated foragers had abandoned the Great Plains during the Middle Holocene (Antevs 1955; Mulloy 1954, 1958). The Spring Creek site (25FT31), located in southwestern Nebraska, is one such site that demonstrated a continued forager presence during the Early Archaic on the Great Plains. The site was excavated in 1961 as part of salvage work prior to construction of the Red Willow Dam north of McCook. Grange's 1980 report provides basic information about the site such as the background and logistics of the excavation, site features, and

the artifacts collected, with some analysis of tools and bone. According to Grange, the site served as a base camp because a wide range of activities were represented by the stone tool assemblage, including hunting and collecting (Grange 1980:47). More recently, Widga (2003:73) conducted a complete faunal analysis, reporting 15 species in the Spring Creek assemblage. He interpreted the site as a short-term bison processing camp near a kill, that was occupied for days not weeks and concludes that bison exploitation was the focus of hunting activities. His analysis of the Logan Creek and Spring Creek faunal remains provided support for interpreting the Archaic as associated with an economy that was local and specialized in nature, that is, at odds with the notion of the Archaic on the central Plains as a generalist broad-spectrum adaptation.

Widga's (2006) analysis of the strontium isotopes in Spring Creek bison teeth enamel suggests that overall movements of bison were fairly localized. Research shows from body mass and home range estimates that bison foraged in an area of around 50-120 km in small to medium groups. Bands of foragers would have been able to follow small local herds of bison during the changing of seasons for a more certain food source. For most potential camp areas, one or another small herd likely would have been around during most of the year (Widga 2006: 169-171). Identification of the lithic raw material sources and other indicators can confirm the extent of the geographic range people were using for exploiting resources on the landscape. Nycz's (2013) research on lithic raw material sources in western Iowa Early Archaic sites confirmed the people used smaller resource catchments similar to those modeled for bison ranges by Widga.

The present analysis seeks to situate Early Archaic foragers who visited Spring Creek on the foraging spectrum by comparing the site's lithic assemblage with that of

other sites in the Great Plains and previous interpreted faunal remains. Previous analyses of lithic artifact assemblages from the Cherokee Sewer, Simonsen and Hill sites in western Iowa, the Hawken site in South Dakota, the Logan Creek Site in Nebraska, and the Growen Site in Saskatoon, Saskatchewan along with other recently analyzed Great Plains assemblages, will be compared to the Spring Creek lithic material.

This thesis aims to contribute to our expanding understanding of the Early Archaic period on the Eastern Great Plains of North America through the study of lithic assemblage from one Early Archaic site known as Spring Creek. Ultimately, through a comparison between the Spring Creek site and other Great Plains sites, this project will help answer questions about the Early Archaic within the Great Plains. Analysis of lithic materials from the Spring Creek site will aim to reveal the groups' foraging spectrum along with the geographic range of raw material procurement during the Early Archaic in the Great Plains. This comparative lithic analysis is important for understanding the activities of human groups during the Early Archaic within the changing and varied landscape of the Great Plains. This topic is under-researched and not well understood compared to other areas in North America. Another important aspect is that Middle Holocene (7500-4000 BP), coincident with the Early Archaic cultural period, is a transition period that can give insights into how the people handled climate change during this drier period (Meltzer 1999).

Outline of Thesis

This thesis proceeds by laying a foundation for considering a detailed lithic analysis of the Spring Creek site, referencing our current understanding of hunter-gatherer mobility and subsistence. For chapter two I review the Great Plains ecosystem

and its history. I also provide an overview of the Great Plains environmental conditions during the Middle Holocene. Chapter three presents a discussion on the Early Archaic on the Great Plains. Looking specifically at sites in Iowa, South Dakota, Nebraska, and Saskatchewan, this chapter describes the lithic and faunal assemblages found at each site, site functions, and any inferences into daily life activities. Chapter four looks at hunter-gathers and how they would have used the Middle Holocene landscape as understood from optimal foraging theory. I modify expectations derived from classical optional foraging theory while considering several factors. For example, the diet of the bison can also give insight into their range of movement. In addition, I will look into the Paleoindian to Early Archaic transition and also how dogs can factor into hunter-gatherer movement patterns. Chapter five summarizes previous research on Spring Creek and Logan Creek. It looks at faunal remains and the clues this gives as to diet and site formation. I also review what is known about lithic tools, projectile point types, and grinding tools found at these sites. Chapter six presents the methods employed to study the lithics assemblage at Spring Creek. Chapter seven presents the results of the Spring Creek lithic analysis, including insights into site formations and group mobility at the Spring Creek site. Reclassification of the tools can also give new ideas of processing of the bison on site. Chapter eight concludes this effort and offers suggestions for future research with lithics analysis and the Early Archaic.

CHAPTER 2: LANDSCAPE OF EARLY ARCHAIC GREAT PLAINS AREA

This chapter sets the stage for an analysis of Spring Creek and the Early Archaic by introducing the ecology and climate of the Middle Holocene Great Plains. The Great Plains encompasses natural grasslands, river basins, and oases in places like the Black Hills. The local fauna adapted to the new warmer and drier Middle Holocene climate.

Physiography

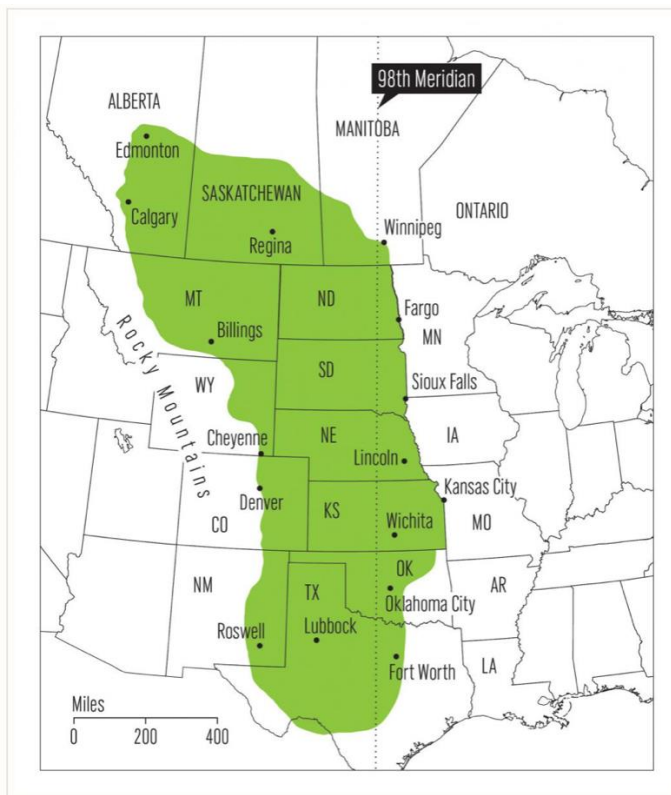


Figure 2.1 Map of the Great Plains of North America (Figure by UNL Center of Great Plains Studies online)

The Great Plains is an area that is variable in terms of climate with the east-to-west precipitation gradients and north-to-south temperature gradients (Ratallack 2005, Salley et al 2016). The rivers on the Great Plains generally flow from west to east. Most

of the rivers begin in the Rocky Mountains or other higher areas flowing through tributaries towards the Missouri or Mississippi rivers. Sediment is carried downstream and deposited along the way.

Focusing on southwestern Nebraska, the Republican River starts in the tablelands of northeastern Colorado before flowing through southern Nebraska and northern Kansas. The headwater tributaries of the Arikaree and South Fork Republican start the drainage basin and then many streams flow into the Republican, including Red Willow Creek, Medicine Creek, Frenchman River, Beaver Creek, Sappa River, and Prairie Dog Creek (Wedel 1986:7-9). Since the Republican River receives its flow from the Ogallala aquifer beds, the flow should not have been cut off during the Holocene due to it being replenished by regional and local precipitation. Since of the soils above the aquifer are sands and gravels any precipitation is collected (Wedel 1986:79). Ogallala aquifer ground water flows generally from west to east at an average of about 1 foot a day into streams, springs, along with directly into the atmosphere (Gutentag et al. 1984:1)

The uplands of the Black Hills of Wyoming and South Dakota was a special environment that received more rainfall and was home to unique flora, hybrid species of oak and ponderosa pine, open parks with excellent grass, and numerous streams making it a true oasis-like environment (Konfeld et al. 2010:32).

Grassland Ecology, Vegetation, and Fauna

In terms of vegetation, the Great Plains is populated by grasses and is bounded by the Rocky Mountains to the west with their coniferous forests with aspen alpine meadows, the broad leaf woodlands to the east, the tiaga environment to the north, and the scrubland and deserts in Texas to the south. As Moran states,

[n]atural grasslands occur where rainfall levels are generally too low to support forests but higher than the levels commonly associated with desert ecosystems. The grassland is a transitional biome characterized by gradient by which temperature, rainfall, and humidity determine many of the characteristics of vegetation and other dependent life forms. [Moran 2008: 229]

Bates (2005) and Moran (2008) both explain that fire impacts the grasslands and plays an important role in maintaining and extending the grassland ecosystem.

Ethnohistorical accounts indicate that Native Americans used fire to maintain grasslands, but lightning strikes would also have caused natural fires over the landscape prior to human colonization (Bates 2005). Citing other researchers, Samson and colleagues (2004: 8) note that fire frequency on the Great Plains likely depended on the grasses themselves: “In the past (<1840), fire may have been a yearly event in the tallgrass prairie (Edwin et al. 1966), occurred every 3-5 years in the mixed prairie (Umbanhowar 1996) and was an ecological driver on the shortgrass prairie (Brockway et al. 2002).”

Along with fire, large and roaming grazers contributed greatly to the character of the grassland ecosystem. As stated by Samson et al. (2004:8), “Herbivores and grasslands on the Great Plains have a long relationship extending over several million years.” Because of these large seasonally predictive herds, it can be hypothesized that the lifestyle of hunter-gatherer groups would not have changed much during the 3000 years of Early Archaic or during the late Paleoindian on the Great Plains.

Baker et al (2000) used pollen, macrobotanical remains, and phytoliths from southeastern Nebraska and found that from (~8200 to 7580 cal BP) the climate became more arid and alluvial fans aggraded rapidly with upland forests declining and the prairie dominating during the early Holocene. Then from 8500 to 5800 cal BP, upland forests disappeared and alluvial fans continued to aggrade.

The faunal evidence shows patterns of grassland species adapting to the prairie environments from woodland and forest as a result of climate change. With fewer lakes and streams, the Plains saw reduced population of birds. Bison also underwent an accelerated species evolution from *Bison antiquus* to *Bison bison* especially in more southern areas of the Plains between 8000 to 6500 BP (Frison 1991; Hill et al. 2008; Lewis et al. 2007).

Climate

The Northern Hemisphere had much higher summer temperatures than currently because of the Earth's orbit during the Middle Holocene (NOAA 2018:1). On the plains, this would have caused higher temperatures and a decrease in precipitation leading to a drier landscape with extended droughts. The sites that have been found indicate that people remained on the Great Plains despite the warming and drying climatic trend. The traditional interpretive scenario is that foragers broadened their diet by learning to use different resources such as small mammals, fish, and maybe even plants, and resided near reliable water sources.

During the Middle Holocene (7500-4000 BP), the Great Plains were becoming considerably drier. Even though the sites are in different locations and time periods within this region, it is not believed that the area was depopulated as was once thought. Research out of Moon Lake in North Dakota provided data on the Holocene moisture. From 9500 to 7100 BP, a decrease in moisture first occurred and then the most arid period started around 7100 BP (Valero-Garces et al. 1997). Cores from Moon Lake also show changes in pollen from the change in lower lake levels and high-salinity water around 7000 BP using *Ruppia* (ditch-grass). Then in 6600-6200 BP, cores showed peaks

of *Iva annua*, *Rippia*, and *Picea* (spruce) with significant changes in water temperatures and re-deposition of older sediments with lower lake levels (Valero-Garces et al. 1997:363). Alithermal and Hypsithermal are terms that were used in the literature to refer to Middle Holocene (Antev 1948, Metlzer 1999). It was thought that during this drier period the Great Plains were abandoned by people and bison (Mulloy 1958; Sheehan 1995; Wheeler 1958). Rather than complete abandonment of the Plains area, Frison (1998) and others (Frison et al. 1976; Hurt 1966; Sheehan 1994) suggested that they took refuge in areas like the Black Hills or the Rocky Mountains. Sheehan (1994) looks at the use during the Middle Holocene and the Ogallala Aquifer and how it supported life on the Great Plains during this dry period.

Isotope studies have documented a rise in warm season (C4) grasses on the Great Plains during the Middle Holocene (Meltzer 1999). In addition, Sheehan and Rovner (1997) looked at the phytolith washes from bison teeth from the Logan Creek and Spring Creek sites to understand bison paleo diets during the Middle Holocene. Spring Creek samples showed higher percentages of chloridiod (C4) grasses and lesser amounts of festucoid (C3) and panicoid (C4) grasses at Spring Creek. The Logan Creek samples had higher festucoid grasses and lower chloridiod (Widga 2003:12). The C4 grasses are a marker of change in the environment as they are favored by a drier climate like the southern plains, indicating that a prevailing drier climate now extended further north.

Surface water would have declined during the Middle Holocene but the rivers that started in the Rocky Mountains, such as the Platte, would have carried water even during the Middle Holocene. Some springs and streams though could have been very intermittently dry (Meltzer 1999: 405). There is evidence that rainfall did increase in

some areas east of the Continental Divide such as the Hawken site in the Black Hills (Kornfeld et al. 2010). This could have caused flooding down river and buried some Middle Holocene sites (Meltzer 1999).

The Spring Creek site and other Early Archaic sites show that even during the driest period of the Middle Holocene, the Great Plains were not abandoned. The faunal evidence indicates that a rather broad spectrum of subsistence resources were taken, but bison were still a large percentage. This change might have had a change in other resource gathering across the landscape with site locations and lithic material because of the need for water and the climate.

The presence of other faunal remains besides that of bison at the Logan Creek and Spring Creek sites show the possible human adaptations to climate change during this drier period. All of these sites have different species besides the large percent of bison remains. The introduction of smaller mammals such as rodents, gophers and even some birds into the diet during the Early Archaic may be the result of influences from eastern North America. Sheehan (2002:130) compared faunal remains from Paleoindian, Early, and Middle Archaic sites and found that there are potential changes in the Early Archaic diet, including “the overall use of terrestrial mammals, relative emphasis on small game and large game, emphasis on bison as opposed to other terrestrial mammals and the relative emphasis on other fauna such as fish, amphibians, reptiles, and birds.” As Kornfield and Larson (2008:21) suggest, the “Archaic broad-based subsistence is a much more realistic perception of hunter-gatherer existence than the Paleoindian scenario.”

The Growen site in Canada has a limited diversity in species represented in the faunal remains, although this is expected since it is the most northern. Most of the

remains at this site had been broken into fragments in order presumably to obtain the bison marrow to make pemmican. Pemmican was a mix of pulverized dried meat, fat, and berries that would last through the winter. The production of bone grease is a new development during the Archaic and is associated with hearths and small bone fragments (Bamforth 2011).

The humans adapted to Great Plains climate through using the resources around them and understanding the new climate and waterways during the Middle Holocene. As we will see in the next chapters there was little change from the late Paleoindian time period in terms of overall subsistence but more use of the meat and bone grease along with more non-bison species showing up in the archaeological record.

CHAPTER 3: EARLY ARCHAIC- BACKGROUND AND RESEARCH INSIGHTS

This chapter introduces the Early Archaic sites from the central Great Plains that have received some analytic attention. These sites can give some comparative details from site locations, lithic raw materials and functions, along with faunal remains that all together can provide a base line for the Early Archaic on the Great Plains. I discuss the Logan Creek Site, the Schudel Site Complex, the Cherokee Sewer Site, the Simonsen Site, the Hill Site, the Growen Site, and the Hawken Site all located on the Great Plains.

Before the Early Archaic

Human occupation of the Great Plains started prior to the end of the Pleistocene, which terminated some 11,500 years ago. Archaeologists label this earliest interval of human presence the Paleoindian period (11,500-9500 BP). Human groups during this time period are thought to have been highly mobile in the pursuit of megafauna or other large game. Later they hunted bison with specialized tools including Folsom projectile points (Bamforth 2007). Lithic technology that is diagnostic of the Paleoindian time period includes well-crafted projectile points often made of lithic material from sources at a great distance from the find spot. The tools were designed to be recycled and are found often in caches (Bamforth 2007).

The Allen Site located in the Medicine Creek area of Nebraska is a Paleoindian site that was intermittently occupied from 11,000 cal B.C. until 7500 cal BC (Bamforth 2007; Holliday 2000). Bamforth and Becker (2007) completed an analysis of the site's lithic assemblage and found that 99% of the assemblage was comprised of Smokey Hill/Republican River Jasper. This material is found abundantly in the lower part of the

Medicine Creek along with other areas of the Republican River drainage. They found 281 pieces of worked stone with intentional retouch. Projectile points include one Agate Basin point and a Hell Gap base from Occupation Level 1 along with three lanceolate points and two non-typologically diagnostic. There was an increase in the number of burned debitage over time including both heat modified and heat damaged flakes (Bamforth and Becker 2007:180). They also found that tool production became more important and carried out on site especially during early stages of reduction. The volume of debitage increased due to the number of projectile points, bifaces, and other retouch pieces. These artifacts suggest that the production of other tools not found on the site made this site activity very important (Bamforth and Becker 2007:182). The Allen site also had hammerstones and ground stone that included four handstones/manos, three milling slabs, and two grinding tools. The grinding materials are made of sandstone that was possibly obtained from a source 300-400 km from the site. They also show retouch through pecking and two items have grooves that might be bola stones (Bamforth 2007: 184-187). There is not much transitional change at the Allen site into the Early Archaic as some archaeologists argue. The main difference is in point morphology and a little more focus on bison during the late Paleoindian (Bamforth 2007).

The succeeding Early Archaic is conventionally dated from 8500 to 4500 BP (Frison 1991, Kornfeld et al. 2010). Frison's (1978) Plains Archaic excludes Canada and focuses instead on the Wyoming area. This is an example of naming of eras or breaking up time into "periods" due to changes in material culture, specifically dart point hafting in this case. Since we can only look at the materials collections that last over the thousands of years and lithics are the most available, tool changes indicate points of

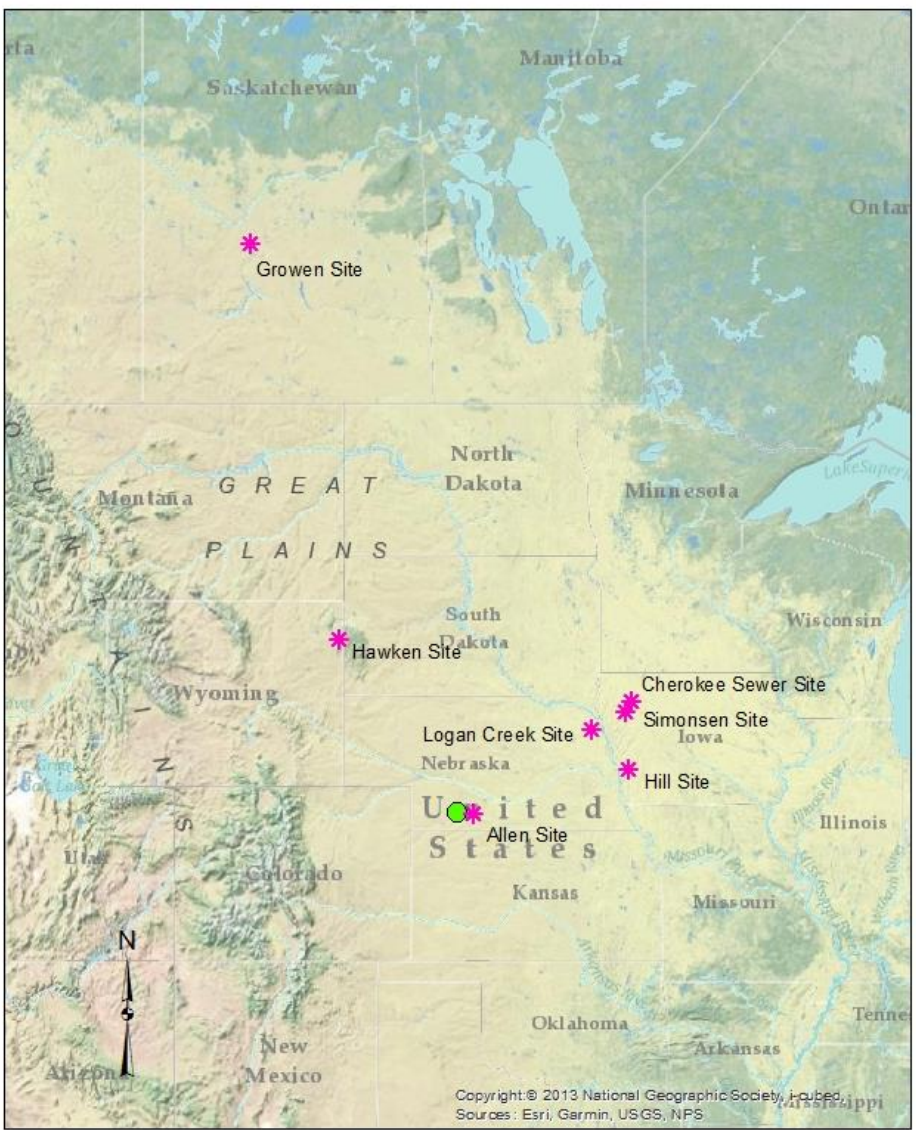
culture changes within the archaeological record. However, what we archaeologists see as technological change, may not in fact represent a real change in the overall adaptive stance of human population. As Bamforth (2011:35) states, "... well-defined Archaic periods effectively forces us to search for, and think in terms of, differences rather than continuities."

The traditional argument holds that the Archaic Period on the Great Plains saw ever increasing use of a wide variety of fauna along with the broadening of the diet to include plant resources. The latter is evidenced by the appearance of grinding tools (manos and metates). On the Great Plains Early Archaic peoples started to use a wide variety of fauna, occasional ground stone and side-notched projectile points. During the latter part of the Early Archaic and in Rocky Mountain locations, pit houses are a widespread feature that help explain human survival in this area during winters (Francis and Larson 1994; Gregg et al. 1996). One example of this change is that only one bison bone midden (Hawken) exists in the area for the time between 7500 and 5000 radiocarbon years ago but deer and pronghorn bonebeds around 6500 BP support this new broader subsistence strategy (Kornfeld and Larson 2008).

Sites in the Great Plains

Early Archaic Great Plains sites are few in number. Many of these sites are buried by meters of sediment and usually found only in salvage archaeology with few detailed studies after excavation. Not only are these buried early sites hard to find, they are very costly to excavate such that the areas excavated tend to be small. Moreover, because of the salvage nature in some cases the recovered material has received little if any analysis. Widga has greatly helped the situation by conducting a thorough study of

the faunal collections from several of these sites such as Spring Creek and Logan Creek. The following are some of the sites in the Great Plains that date to the Early Archaic time period.



- Legend**
- * Other Sites
 - Spring Creek

Figure 3.1 Maps of Early Archaic sites on the Great Plains discussed in this chapter

Cherokee Sewer Site

The Cherokee Sewer site (13CK305) is located on an alluvial fan overlooking the west floodplain of the Little Sioux River Valley in northwestern Iowa. Environmental reconstructions for this site indicated that between 9000 and 6000 BP, this region was slowly becoming drier and was characterized by increasing grasslands and thinning of the riverine gallery forest of willows, hackberries and other deciduous trees (Tatum 1980:164). Northwest Iowa had tall prairie with gallery forests on the floodplains and forest galley walls (Hoyer 1980: 23).

This site has three different occupations including one Late Paleoindian and two Archaic. Of the latter, Horizon Ib dates to 7430-7020 cal BP and Horizon IIb dates to 8170-7930 cal BP (Widga 2006:70). Although the site was used different times throughout its history, it is a good example of material cultural change because Anderson (1980) states that the lithic assemblages recovered at different levels of the Cherokee Sewer Site demonstrate a high degree of cultural stability during the Middle Holocene.

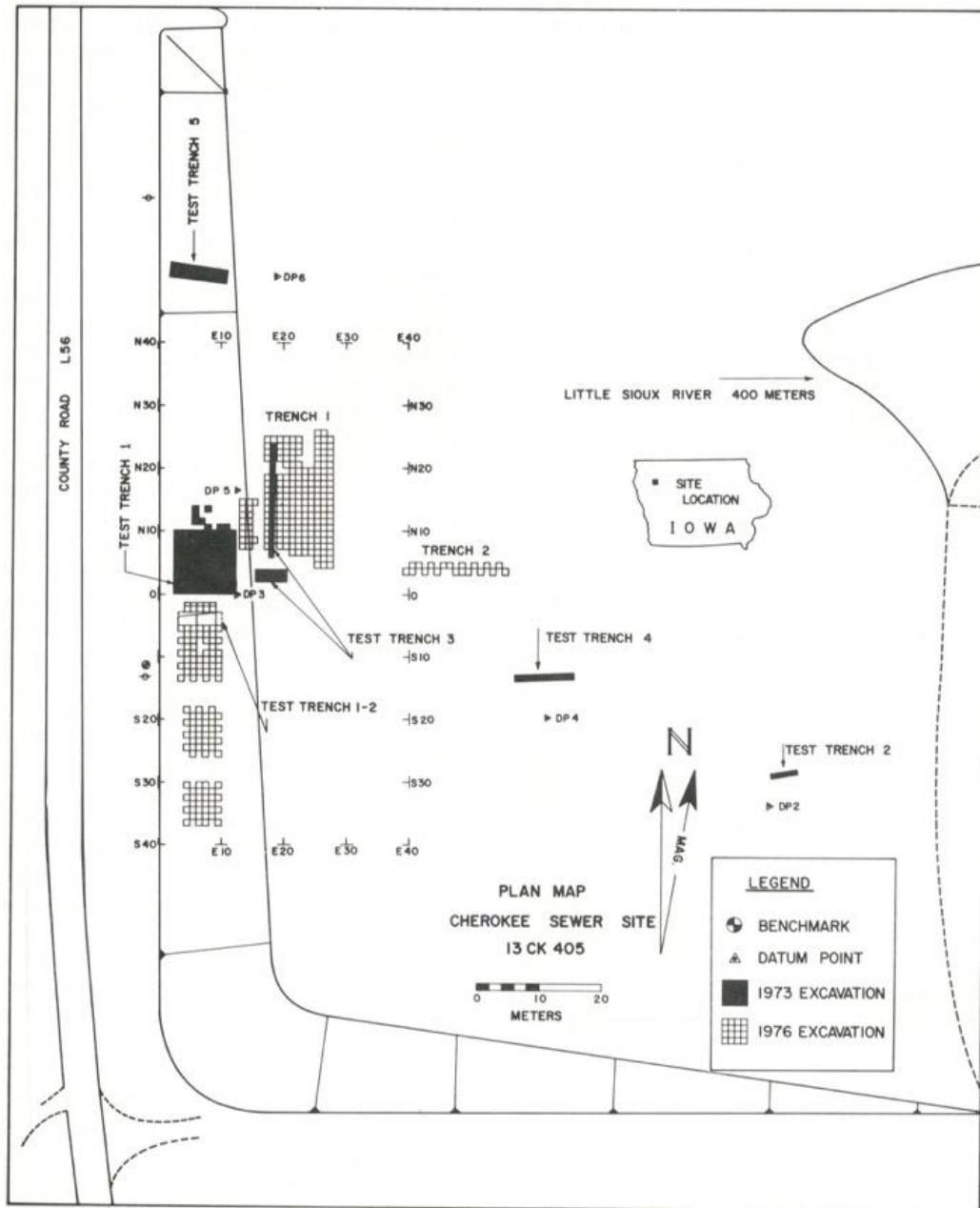


Figure 3.2 Site Map of Cherokee Sewer site. (Shutler at el. 1980:3)

Within Horizon IIb the debitage by count was largely (89.7%) Tongue River Silicified Sediment, which is found in nearby glacial gravel (Anderson 1980:201). In contrast in the Horizon Ib, 42.8% of the debitage was Fusulinid chert, which is found in southwestern Iowa (Anderson 1980:201).

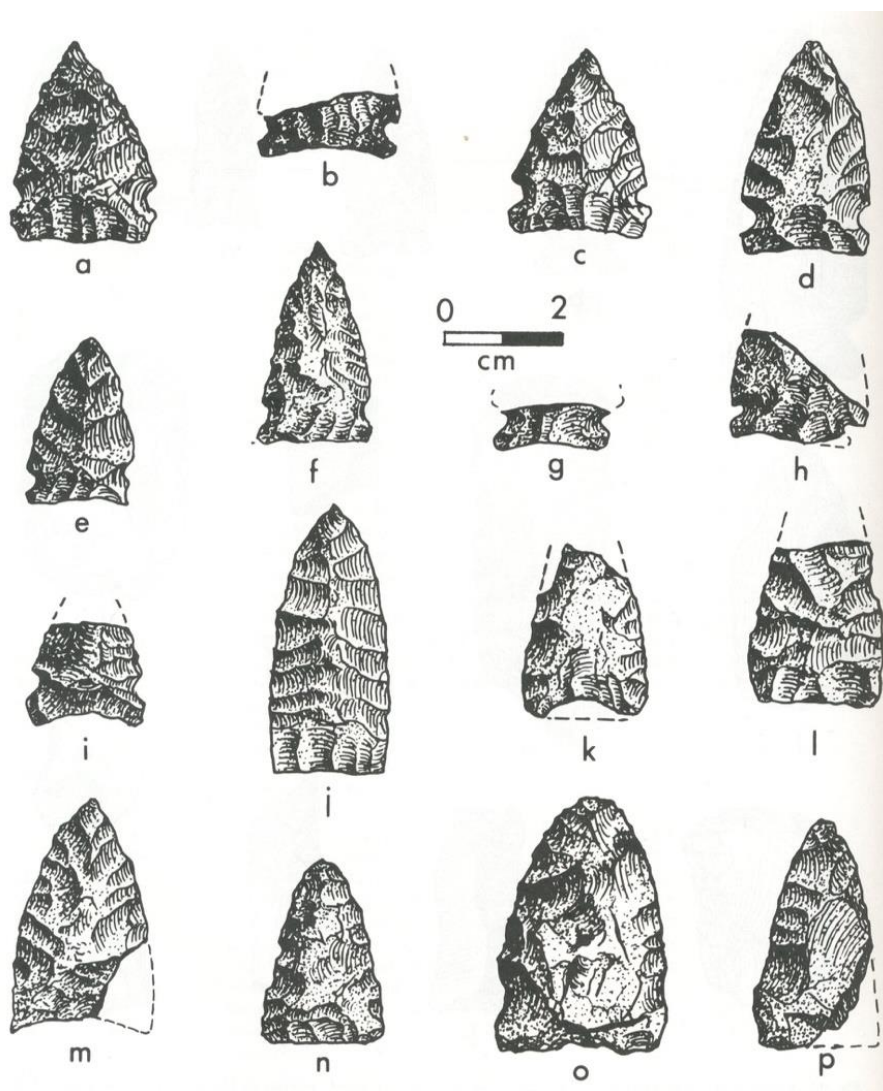


Figure 3.3 The projectile points from Cherokee Sewer site Horizon IIb, Trench 1.
(Anderson 1980:210)

Overall, 22 projectile points portions were found within the Horizon II assemblage. Ten were notched, and nine unnotched. In addition, two projectile point tips and one mid-section were found. Of these, 15 were made of Tongue River Silica. Also found in the Horizon IIb was a flat milling stone made of Sioux Quartzite that was shaped by pecking. The polished working surface shows evidence of renewal through pecking (Anderson 1980:225). Presumably the grinding stone was used for grinding hackberry

seeds, which were found in this cultural level. It might also have served to make pemmican from dried meat fat and berries, although for this purpose, there would be no need to roughen the use surface by pecking it (Tatum and Shutler 1980).

The bifaces appeared to have been used during the butchering process: “Given the fact that over 50% of these artifacts were broken, one cannot dismiss the possibility that these items may also have served in the cutting or splitting of hard materials such as bone” (Anderson 1980:223). Raw material use indicates a patterned selection according to suitability for type of activity: “igneous and metamorphic rocks were collected for use as hammerstones, anvil stones, cooking stones and grinding implements, while projectile points, knives, and scraping tools were manufactured from either cherts, chalcedonies, or fine-grained quartzites” (Anderson 1980: 198).

Fourteen bone tools were recovered from Horizon IIb, including seven choppers, five hide working tools, two awls, and one possible pendant. The bone tools and the lithic materials both reflect the same activities on this site with animal butchering and hide-working activities. Horizon II remains support an inference that the occupants inhabited the site during the winter, and for a rather long time period, with extensive hide working serving as a primary activity (Tatum and Shutler 1980: 251-2).

The Horizon II level contained 13 bison individuals represented by 205 bone fragments and 52 small and micro-mammals (Pyle 1980; Semken 1980). The Horizon IIb faunal remains represent bison kills that occurred in the winter, possibly February or March, based on tooth eruption and wear (Pyle 1980:182). The isotope analysis showed that the animals from this herd fed on C3 grasses along with C4 during the winter time, possible options of letting the humans track the location of the herd (Widga 2006). The

bison bones had “[f]ine cut marks on long bone fragments, particularly ribs, [and] demonstrated extensive meat removal before the bones were broken up for marrow or boiling” (Tatum and Shutler 1980:244). One feature from Horizon II had 18 cobble-sized rocks believed to be used for stone boiling (Anderson 1980:200).

Based on the six hearths in this location within Horizon IIb and from other data, it is estimated that 5-10 family members used a hearth and a group of 30-60 people lived at this site. The evidence points to the location’s primary function as a bison kill site, but because of the presence of various plants and animals it was also used as a camp (Anderson and Shutler 1978). On the other hand, Widga’s (2006:72) more recent analysis suggests that Horizon IIb served as a secondary processing locality.

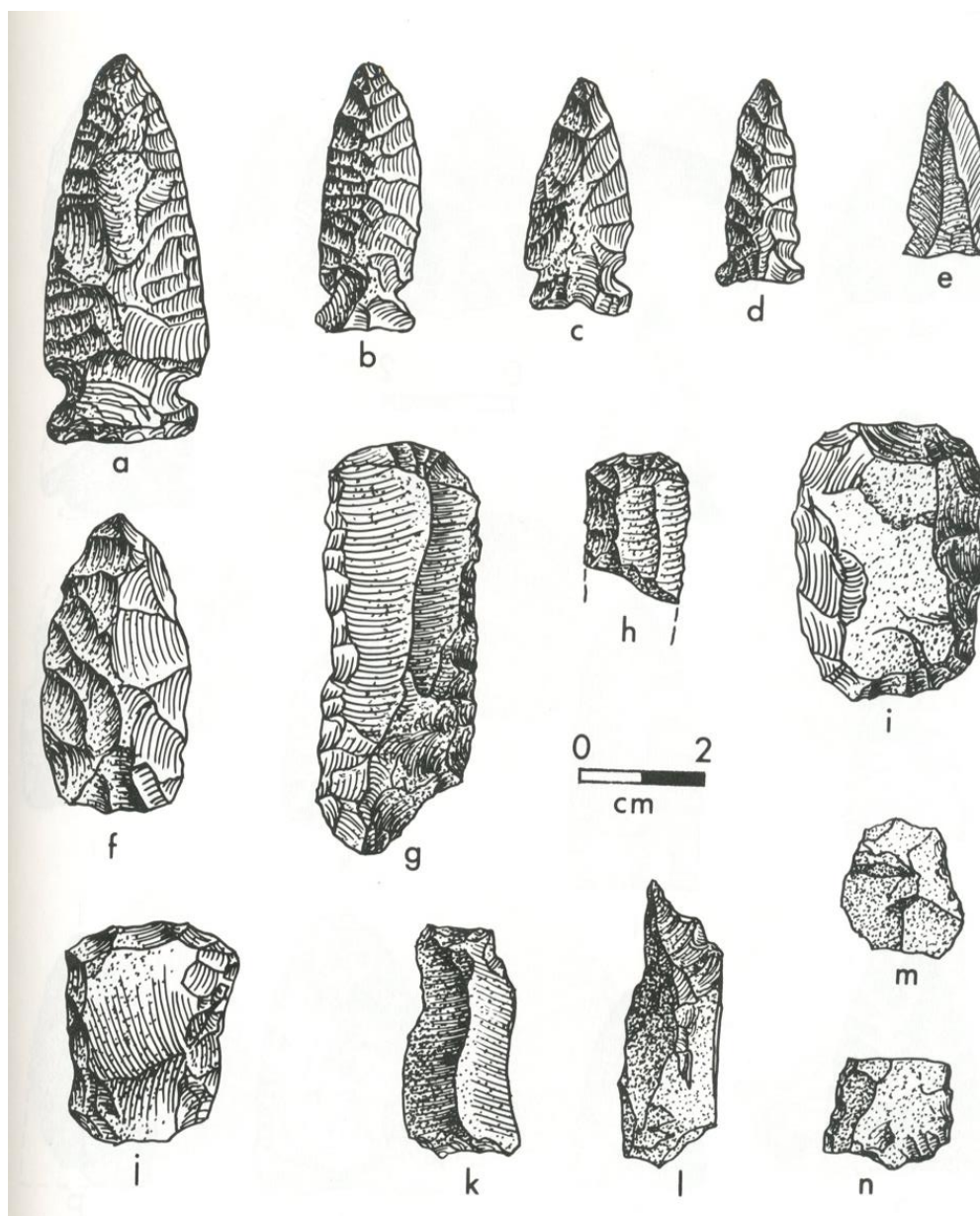


Figure 3.4 Lithic material from Cultural Horizon 1b: (a-e) projectile points; (f) biface; (g-j) endscrapers; (k-l) utilized flakes; (m-n) retouched flakes (Anderson 1980: 209)

The projectile points (Figure 3.4) from Horizon Ib included five side-notched projectile points. Four of these were well-made with asymmetrically biconvex transverse and longitudinal sections with bases that are straight or subconcave; all had some

grinding on the notches with only one (a) having more extensive basal grinding (Anderson 1980:207). One biface was of Fusulinid Chert of medium sizes and ovoid shaped. The mean working lengths of the end scrapers was 4.28 mm with five that were found in level 1b. The end scrapers were made from chert: Fusulinid (3), brown (1), and gray tan (1) (Anderson 1980:224). Anderson (1980:230) inferred nine uses of tasks the lithic materials: stone tool manufacture, stone tool maintenance, hide-working, bone engraving, killing, skinning/cutting, pounding, lithic collecting and cooking/heating.

The ten bone tools from Horizon I included two choppers, a punch, and a bird bone flute fragment. According to Tatum and Shutler (1980:242), "Fine cut marks on long bone fragments indicate extensive muscle stripping before breakage for marrow extraction." The bone assemblage for Horizon I had seven different bison individuals within 158, in addition to two wolf, two coyote, and seven rodent species for a total of 17 species. The Horizon I assemblage suggests a temporary site occupation, where people stayed short term and gathered near the water because of the bison (Tatum & Shutler 1980).

Simonsen Site

Like the site previously mentioned the Simonsen Site (13CK61) is along the Little Sioux River in northwestern Iowa and was found in the late 1950s. It was located when bison bones were found eroding out of the river bank and then was excavated by Frankforter and Agogino from 1956 to 1961. The cultural level Zone 3 had bison bones and a hearth with charcoal dating to 7430-7270 cal BP (Widga 2006:60).

This hearth also contained a large canid without signs of butchering, along with three pieces of debitage, a possible core, and a projectile point fragment (Frankforter and Agogino 1960; Widga 2006).

Underlying Zone 3, excavations found more cultural material in Zone 7 which is dated 7800-7610 cal BP (Widga 2006:61). Zone 7 contained five dart-sized projectile points (Figure 3.5): one whole side-notched with a straight base and two point fragments that are side-notched with slightly concave bases; all have grinding on the bases and in the notches (Nycz 2013:37).



Figure 3.5 Projectile Points from the Simonsen site (Nycz 2013: 39)

The assemblage also includes nine bifaces and fragments including one knife, and three scrapers. Predominant materials included Tongue River Silica (TRS), which was heat-altered to make four of the projectile points and the point fragment. Even with water screening of these deposits, only seven pieces of shatter and 90 flakes were found. Most of the flakes are sharpening ($n=20$) or thinning flakes ($n=35$) with cortex only on seven of them. Debitage was also dominated by TRS, accounting for 63.9%, with 26% from

unidentified glacial cobble chert (Nycz 2013:41). TRS is located in the Little Sioux River approximately 22.5 km (14mi) north of Simonsen (Nycz 2013: 33).



Figure 3.6 Bifaces, scrapers (two upper right) and knife (lower right) from the Simonsen Zone 7 (Nycz 2013:40).

The bison from the site are identified as *Bison occidentalis*, a species that became extinct approximately 5,000 years ago (Agogino 1959; Hall 1972). Frankforter and Agogino (1959) interpreted the site as a bison kill location based on the occurrence of bison bone with tools, hearth features, and side-notched projectile points.

Logan Creek

Logan Creek (25BT3) is located in eastern Nebraska along the drainage of the same name, which is a tributary to the Elkhorn River and ultimately the Platte. The site contains multiple components (10 in all), exhibiting eight levels of buried deposits in addition to surface materials (Kivett 1959, 1962; Thies and Witty 1992). The radiocarbon dates on charcoal from features range from 6020 ± 160 BP for Zone A (the uppermost

Archaic component) to 7350 ± 270 BP for Zone F (Stuiver et al 1998). Two additional underlying Archaic components remain undated. A complete analysis of the lithic materials has not been published, although the projectile points and hafted end scrapers have been featured in public talks and presentations about the Logan Creek Complex. The Logan Creek Points are small to medium sized, triangular, side-notched with concave bases, usually basally ground (Figure 3.7 & 3.8) (Thies and Witty 1992). From Kivett 1959 & 1962 site reports the other chipped stone are side-notched with straight bases, triangular unnotched points, side-notched scrapers, end scrapers, utilized flakes, blades, and one T-formed drill. Ground stone included: fragments of ground stones from hearths, hammerstones, grinding stones that fit in a hand, and scoria fragments from Missouri river have groves for bone or wood polishing (Kivett 1962:3).

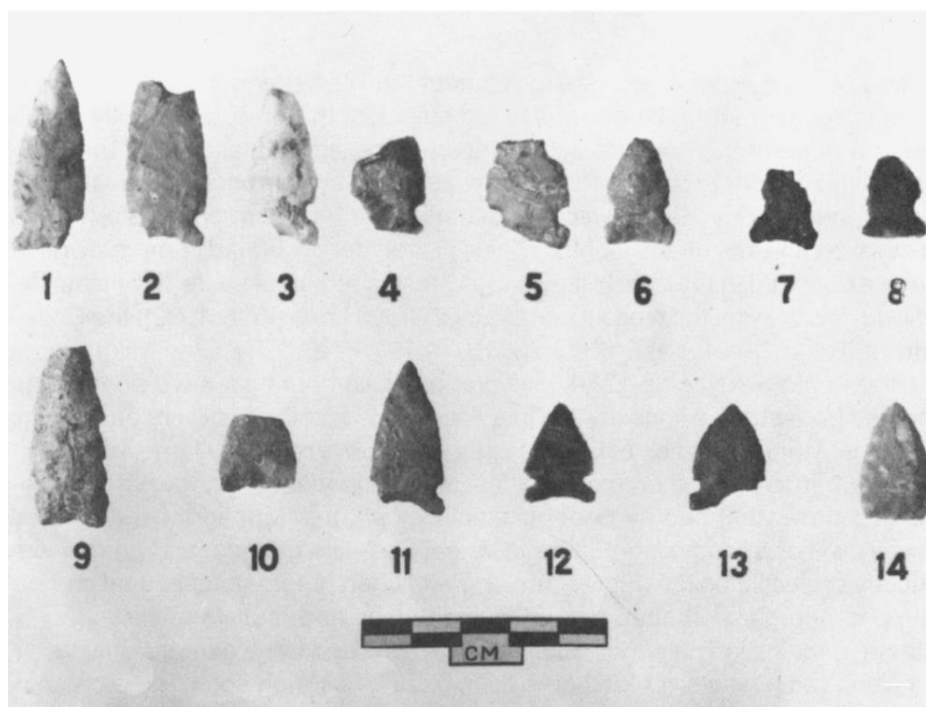


Figure 3.7 Logan Creek Points from Whitty (1957)



Figure 3.8 Logan Creek projectile points from the Logan Creek complex (Photo by author courtesy of History Nebraska)

Widga's (2003) analysis of the site's faunal assemblage identified 29 species within the Archaic zones. By NISP *Bison bison* comprised 88.9% of the total assemblage. Zones C and B are comparable to Spring Creek in terms of the slightly greater representation of species other than bison. Based on bison lower dental eruption sequences, Widga concluded that Zones A, B, and C were seasonally occupied in late spring and early summer, whereas Zone D was occupied in late winter to early spring (Widga 2003:149).

Hill Site

The Hill Site (13ML62) is located in southwestern Iowa on Pony Creek along the Missouri River valley. The site was found in 1959 when road construction exposed a deeply buried cultural horizon 17 ft below the surface. Frankforter excavated test pits but the Pony Creek flooded, resulting in severe site erosion. Frankforter later returned and excavated the rest of the site (Frankforter 1959, Nyce 2013). Only one of the four zones has been chronometrically dated: Zone 3 dates from 7470-7420 cal BP based on radiocarbon dating of collagen (Widga 2006:72).

The lithics of Zone 3 were all made of chert from Pennsylvanian-aged limestone that is sometimes called “fusilnid” chert. Zone 3 yielded six side-notched points all of the local Pennsylvanian chert (Figure 3.9) that have a triangular body and convex to straight base with grinding on the bases and notches (Nycz 2013:49). Also recovered from Zone 3 were 16 bifaces and 25 scrapers. Thirteen of the scrapers had distinct haft elements created by side-notching; the other 12 lacked this treatment but were presumably hafted in some other way. The debitage consisted of 850 pieces that included all stages of bifacial reduction, both thinning and sharpening. Faunal remains included bison, large ungulates with some deer, mole, bird and turtle (Widga 2006). Frankforter (1959) classified Hill as a habitation site.



Figure 3.9 Projectile points from Hill site (Nyce 2013:51)

Hawken Site

The Hawken site is a bison kill location in the Black Hills of Wyoming. The site has two radiocarbon dates from charcoal: 6470 ± 140 BP and 6270 ± 170 BP (Frison et al. 1976). The site is a natural arroyo trap with faces up to 35 feet deep. Analysis of the bison mandibles indicate that nearly 100 animals were trapped during one or more communal winter drives. Of the skulls that could be measured all were male (Frison et al. 1976: 33). The bison remains provided solid basis for inferring a good idea of what bison during the Early Archaic looked like: *Bison occidentalis* were very large with “massive horn cores in some individuals” (Frison et al. 1976: 36).

The lithic assemblage here is a good representation of what was used for specialized bison killing and processing, including both the type of projectile points used and the debitage left behind from tool maintenance. Since this site served but one purpose, the killing and butchering of bison, this assemblage can serve as an example of

what lithic material should be associated with these tasks. Some of the points at the site had previously been broken and then reworked to have new functional projectile tips (Figure 3.11). It is clear from Figure 3.10 & 3.11 that the Hawken site points are in a “single style with minor variations: elongate with concave to slightly convex base” (Frison et al 1976:42). One variation occurs in the blade edges. The notches were placed on the sides a short way up the base and grinding was common on the bases and inside the notches as well. Unmodified or first use points vary in length, width, thickness and weight but have “lenticular cross sections in both axes and they expand gradually from a ground, blunted base to the thickest part usually near the center and then taper evenly to a sharp point” (Frison et al. 1976:43).

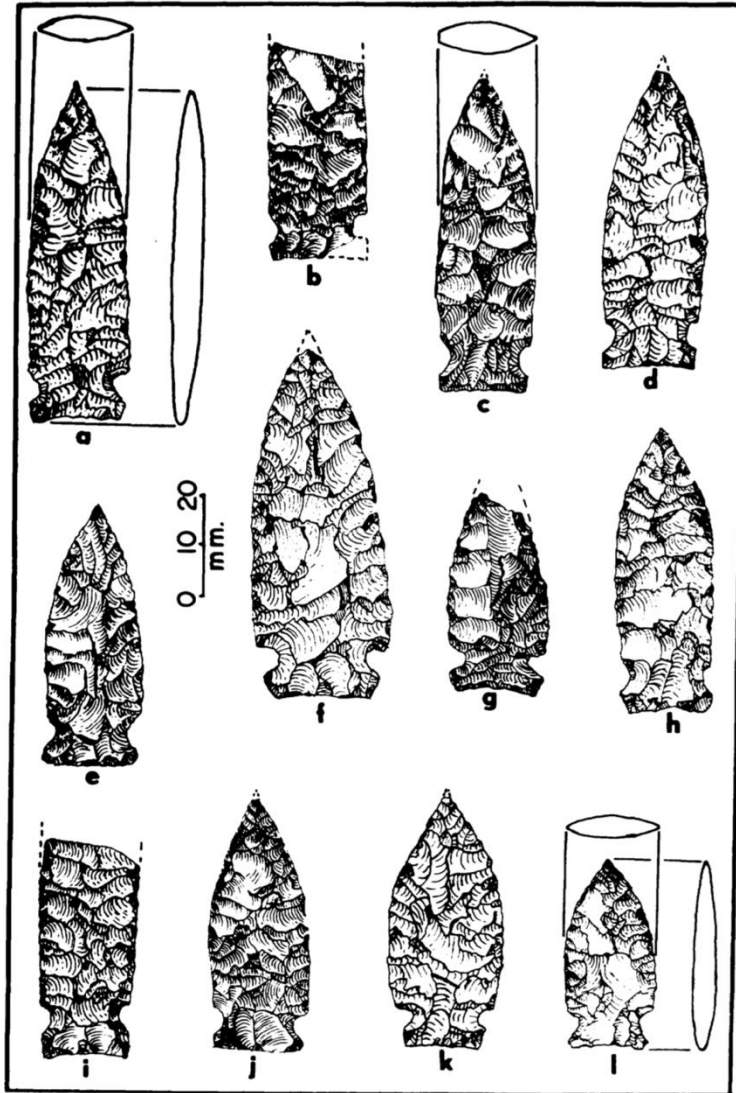


Figure 3.10 Unmodified projectile points from the Hawken Site showing the primary form of this tool (Frison et al. 1976:43)

Frison et al. (1976) found that the projectile points were broken in six ways: 1) the point shattered on impact, 2) blade edge snapped transversely or various angles at different locations but were extremely vulnerable across the notches, 3) notches had damage from impact, 4) breakage occurred from one or both notches to the base that sometimes causes triangular-shaped corner breaks off the base, 5) breakage from behind

the tip to one blade edge, and 6) impact flutes on one side of the point (Frison et al. 1976:44). From these breaks there is variation on the new point as seen in Figure 3.11.

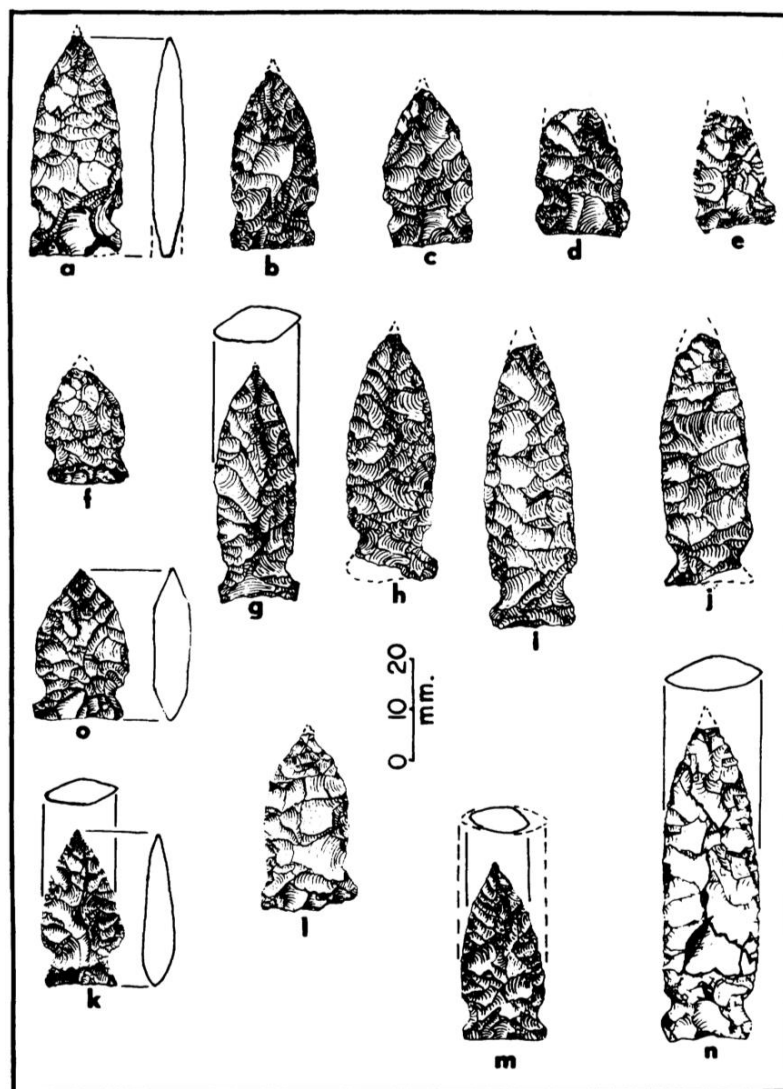


Figure 3.11 Modified projectile points from the Hawken site showing how broken points were reworked to make them serviceable again (Frison et al. 1976: 44)

Excavations also recovered 16 flake tools from the Hawken site in different sizes and shapes, all of which had been used for butchering, with retouch used to form useful cutting edges. Waste flakes from tool resharpening were found in the bone deposit. Another butchering tool form from the bone bed included eight choppers of

local quartzite with little modification except sharp points and hand holds. In addition, bone tools were also found, including tibia choppers and humerus tools. The raw material represented in the stone tool assemblage were visually identified as mostly derived from the local quartzite that is found in the Black Hills. Tools were also made of chert, shale, and silicified wood.

Frison and colleagues (1976:55) argue that the Black Hills because of water availability and a reduced impact of climate change, was a special area that would have supported bison continually during the dry Middle Holocene, perhaps more so than over other drier parts of the Great Plains.

The Growen Site

The Growen site (FaNq-25) consists of two adjacent components (1 and 2) 70 m apart located on a terrace of the South Saskatchewan River in Saskatchewan, Canada. They were occupied about 6000 BP with radiocarbon dates ranging from 6150 BP (S-1475) to 4725 BP (S-1526) (Walker 1992:182). The University of Saskatchewan along with members of the Saskatoon Archeological Society excavated this site in 1977, 1980, and 1981 with Walker reporting on it in 1992. The first site component was excavated in 1977 (site 1) with the second component (site 2) excavated during the other two field seasons.

3.1 The tool types of Growen Site 1 and 2 (Walker 1992:71)

| Tool type | Growen site 1 | | Growen site 2 | |
|-------------------------|---------------|------|---------------|------|
| | N | % | N | % |
| projectile point | 23 | 10.2 | 87 | 24.9 |
| preform | 1 | 0.4 | 5 | 1.4 |
| hafted biface | 4 | 1.8 | 3 | 0.8 |
| bifacial knife | 15 | 6.6 | 23 | 6.7 |
| end scraper | 35 | 15.2 | 55 | 15.5 |
| side-scraper | 5 | 2.2 | 0 | 0 |
| uniface | 11 | 4.9 | 18 | 5.2 |
| gouge | 23 | 10.2 | 37 | 10.6 |
| graver | 6 | 2.7 | 5 | 1.4 |
| drill | 3 | 1.3 | 3 | 0.8 |
| spokeshave | 2 | 0.9 | 0 | 0 |
| residual retouched item | 88 | 38.9 | 110 | 31.6 |
| anvil | 5 | 2.2 | 1 | 0.3 |
| hammerstone | 5 | 2.2 | 3 | 0.8 |
| Total | 226 | | 350 | |

Within Growen 1 assemblage, the projectile points are side notched with grinding on the bases. The end scrapers are minimally retouched to produce a steep working edge with some retouching along lateral margins. The residual retouched items are small thin flakes with unifacial secondary retouching, which is minimal on margins, and are the most common tool category (Walker 1992). The flake stone assemblage contained over 12,935 debitage items but unfortunately has received no analysis. This quantity however, implies significant on-site tool production especially in contrast to many of the other sites considered here. This site also had a diversity of other flaked tools including drills, side scrapers and biface knives along with preforms and hammerstones. Most of the raw materials consists of black chert from local river cobbles that were broken up with bipolar splitting. There were only 10 bone tools and five had hard-to-find cut marks while three

of the tools had evidence of flake removal. The activities that are inferred to have happened at the site include intensive bone breakage to extract bone marrow, scraping of hides, and also production and repair of flaked stone tools (Walker 1992).

Bison comprise 95% of the Growen 1 assemblage. Two very young animals with unfused vertebral ages suggest a late summer occupation of this component. Wolf, pocket gophers, pronghorn and an American Crow were also identified in the faunal remains. The bone within the Growen Site 1 assemblage is in a badly fragmented condition which indicates that site occupants had processed it for bone grease when the bone was fresh. Not just the bison bones but also the faunal remains of smaller animals were processed with stone hammers to obtain bone marrow.

Compared with Growen 1, Growen 2 had more remains overall with over 217 NISP bison, along with gopher, wolves, coyotes, and a large amount (N=149) of midsized canid that resembles wolf/dog or domestic dogs. Within Growen 2, 24% of the bones were burned and, like Growen 1, very broken up indicating intensive processing. It was hard to infer seasonality from the bison remains because of the broken condition and the absence of any immature dentition but analysts could tell that some bison died occurring about half a year removed from the calving season (Walker 1992).

This site is interpreted as a short temporary bison hunting and processing camp. The bison were killed in small numbers as they were going for water (Walker 1992).

Schudel Site Complex

The Schudel Site Complex (25GY12, 25GY12a, and 25GY14) is in the North Loup River Valley about 50 km southeast of the Sand Hills near where the river

originates. Three sites are all within 100-250 m of each other and thought to be all the same age, hence the designation of complex. Site age is based on typology of the lithic material because there was no organic material that could be radiocarbon dated. In July of 1984 archaeologists from Augustana College recorded 25GY12 during a survey of the Scotia Canal and Lateral System. They found side-notched projectile points along with some other tools and debitage (Lueck et al 1984). Then in 1986 and 1987 Gilbert/Commonwealth performed a data recovery excavation since the site was about to be destroyed by impact from the levee system for the river. At that time, four projectile points were recovered consisting of a lanceolate point, side-notched and triangular point. From the description and pictures provided by Roper (1998) the lanceolate is more likely a point form and was either in a very early stage of reduction or, more likely, was left unthinned (“clunky”) for chopper use. Roper (1998:7) states that the triangular point is possibly reworked from a broken blade or larger specimen and this certainly appears true based on the illustrations. The biface is made from gray-green quartzite sandstone.

Other tools included seven end scrapers, 26 retouched flakes, one bone awl, and several cores along with 1,382 unmodified flakes from the surface and excavation units. The faunal material included three bison, 18 artiodactyl, >48 large mammal, >180 medium to large mammal, 9 small to medium mammal, two rodent, two small mammal or bird, and two bird bones (Roper 1998:27). This site seems to be more than a kill or butchering site but less than a campsite, Roper (1998) compared it to Binford’s (1978a & 1978b) short-term hunting stand or overlook described for the contemporary Nunamiut Mask site. Yet the occurrence of the end scrapers, often associated with the female

gender, raises doubts such an interpretive account as the men/hunters were the ones making the masks.

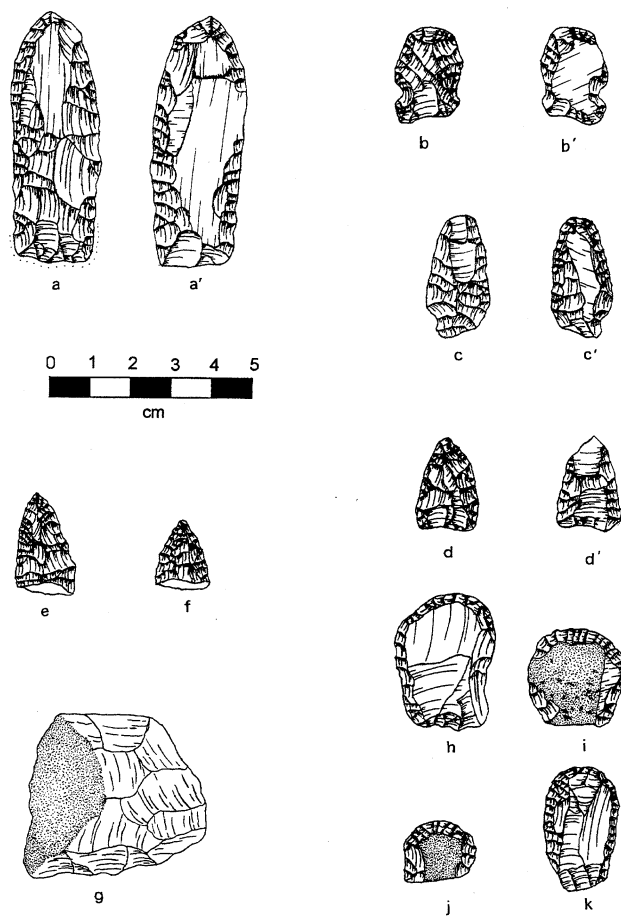


Figure 3.12 Site 25CY12 artifacts: a-d projectile points; e-f projectile point blade fragments; g biface; h-k end scrapers (Roper 1998:20)

25GY12a did not have any tools but cores, debitage, and bone. The technology is reflected to the debitage in 25GY12 and is 100 m away from the other site. 25GY14 is located about 250 m horizontally and 20 m vertically distant from 25Gy12 on a second terrace of the North Loup River. It is dated to the Early Archaic based on the presence of

a small side-notched projectile point. The raw material in the debitage is similar as well. Roper (1998:15) suggests that this site could have been more intensively occupied as a base camp and the other sites could have been hunting lookouts, through this seems unlikely for the main component of 25GY12 as just mentioned.

Summary

Table 3.2 summarizes some of the salient features of the Early Archaic assemblages presented above. All but the Hawken site are located on waterways. Bison comprise a large percent of the fauna assemblages but different species of small mammals and birds are seen during this time period. A lot of the raw materials are local to the site and the tool assemblages include the occurrence of side-notched points and some side-notched scrapers. Site functions vary between kill sites, short term or habitation sites. Season of occupation also shows a range including winter, later summer and early spring. Inferences about site function and seasonality have changed over the years as base knowledge about bison has increased and technological advances have been made. For example, archaeologists are now able to infer season on the basis of bison teeth eruption and the presence of calves. In sum, known Early Archaic sites are often located near waterways, local raw materials are used that are nearby and side-notched points are prevalent and likely an implication in taking down prey that are mostly bison but includes other species as well.

Table 3.2 Overall a comparison of the Early Archaic sites in this chapter

| Site | Location | Date | Fauna | Raw materials | Tools | Site Function | Season |
|-------------------------|--|------------------------------|--|---|---|-----------------------------------|--------------------------|
| Cherokee Sewer site IB | Alluvial fan-Little Sioux River Valley | 7430-7020 cal BP | 7 bison and 17 species | 42.8% Fusulinid chert | Longer side-notched points, end scrapers | Short term | |
| Cherokee Sewer site IIB | Alluvial fan-Little Sioux River Valley | 7930 cal BP | 13 bison and 52 small and micro mammals | Tongue River Silicified Sediment (89.7) | Side-notched and not notched points/ Grinding stone | Bison kill site but camp | Winter |
| Simonsen site | Little Sioux River | 7430-7270 cal BP | <i>Bison occidentalis</i> | Tongue River Silicified Sediment | Side-notched points | Bison Kill site | |
| Hill Site | Pony Creek | 7470-7420 cal BP | bison, large ungulates with some deer, mole, bird and turtle | Fusulinid chert | Side-notched Hafted end scrapers | Habitation site | |
| Logan Creek | Logan Creek | 6020-7350 cal BP | 29 species bison 88.9% | | Side-Notched Logan Creek | | Late Spring-Early Summer |
| Hawken Site | Black Hills-natural arroyo trap | 6470 ± 140 and 6270 ± 170 BP | bison | | Side-notched | Bison Kill site | Winter |
| Grownen site | South Saskatchewan River | 6150 BP | bison 95% 4 species | Local black chert river cobbles | Side-notched | Bison hunting and processing camp | Late Summer |
| Schudel Sie Complex | Loup River | - | 3 bison, range of large to small, bird | | Side-notched, end scrapers | Kill or butchering site | |

Chapter 4: Optimal Foraging Theory: Interpreting Early Archaic Sites on the Great Plains

This chapter introduces optional foraging theory and describes how it can be used to further our understanding of hunter-gatherers' use of resources on the landscape. It also permits us to consider the diet of the Early Archaic and how that diet may have been affected by the use of domesticated dogs to travel over the Great Plains, thereby reducing travel costs. Lithic sourcing can also tell us how they are using the resources around them and how far they are traveling to gain those resources.

Hunter-Gatherers

Occupants of the Great Plains during the Early Archaic time period likely pursued a hunting-gathering or foraging mode of subsistence. Sutton and Anderson (2014:167) define foragers as “people who move about the landscape with a seasonal round, occupy camps but have no permanent home.” Gathering is the collecting of “wild plants, small land fauna and shellfish” (Lee and DeVore 1968:41-42) and “collecting is a sometimes-used as a synonym for gathering” (Sutton and Anderson 2014:154). However, “collecting generally implies that resources are in known and predictable locations, such as many plants and shellfish, and that little searching is required” (Sutton & Anderson 2014: 154). Complementary, Winterhalder says (2001:13), “Foragers are those people who gain their livelihood fully or predominantly by some combination of gathering, collecting, hunting, fishing, trapping, or scavenging the resources available in the plant and animal communities around them.” Some other generalizations can be drawn about hunter-gatherers around the world and through time:

Despite exceptions, these features stand out as common patterns. They are: (1) apparent under-production, and a general lack of material accumulation; (2) routine food sharing; (3) egalitarianism; and (4) despite number 3, a routine division of labor between the foraging activities of males and females: men more commonly hunt while women more commonly gather. (Winterhalder 2001:13)

The Paleoindian subsistence strategy focused heavily on hunting megafauna, supplemented by some gathering. Into the Middle Holocene, the changing climate altered the number and type of animals available, requiring Archaic foragers to revise how they obtained resources. A possible indicator that some bands of foragers on the Great Plains during the Middle Holocene gathered more plants than earlier groups is the presence of groundstone, often utilized in plant processing. The appearance of these tools is seen earlier in areas outside of the Plains, such as the Great Basin and the Southwest, and in these regions there is direct evidence for small seed processing and consumptions (Geib & Joile 2008; Rhode et al. 2006).

Sutton and Anderson (2014:162) state that the group “must be well versed on the seasonality of the various resources they exploit.” Additionally, groups must move to the new resource area and establish a field camp or basecamp. Every season they move to a different area and these locations maybe the same each year or a series of different locations might be used (Binford 1983). This system of movement across the landscape is called a seasonal round. The foragers understood their environment well and most likely passed this knowledge down as part of a rich oral tradition. Bates (2005:61) states that “A low-energy budget is an adaptive strategy by which a minimum of energy is used to extract sufficient resources from the environment for survival,” essentially what can be found, killed, and processed with the least amount of energy expenditure. Furthermore,

“the primary source of energy that hunter-gatherers expend in food procurement is then contained in their own muscles” (Bates 2005:61).

What Bates and some others have not added to their calculations is the help that dogs may have provided for humans with transportation and hunting. Dogs can change the cost and benefit of hunting and movement across the landscape, assist with hunting, and alter how human activities are conceptualized and modeled.

Optimal Foraging Theory

All hunter-gatherers face decisions about which resources to choose for subsistence purposes from those available within their environments. One approach to thinking about and modeling this decision-making process is through Optimal Foraging Theory. This approach was first proposed in the 1960s and provides a useful means to conceptualize how Early Archaic foragers might have exploited the Great Plains. Winterhalder (2001:14) states, “All environments contain more species that are edible to humans than can be effectively harvested by them. Resource selection models attempt to analyze this situation by asking what environmental features most directly affect the evolution of foraging behavior, and what resource species a proficient forager will seek to harvest.”

According to Otárola-Castillo (2016:91) “Optimal foraging theory is a body of models developed to generate optimal expectations of organism faced with energetic cost/benefit tradeoffs when searching for, selecting, and consuming prey. The logic behind these models is centered on the increase of an individual forager’s fitness when foraging, as it maximizes the net rate of energy intake over the long-term time average.”

Within this theory there are two types of models, prey and patch. Prey models “focus on the predator’s decision to either attack a given prey or continue to search in order to maximize the long-term average. On the other hand, patch models are concerned with the forager’s decision of when it is most profitable to stop foraging a given resource patch and leave in search of another” (Otárola-Castillo 2016:91). Smith (1983: 631) is critical of these models, stating that “[t]he MacArthur-Pianka patch-choice model does not specify how long a forager should stay in each patch or what effect foraging has on the stock of the resources found in each.” It seems some of the models need adjustment to fit to humans but can be used to gain general ideas of how the hunter-gatherers would have used the landscape to capture the calories they needed.

Diet during the Early Archaic and Bison on the Plains

During the Middle Holocene it is thought that the Great Plains hunter-gatherers began to incorporate resources other than bison into their diet. Diet has been thought of as the “big” change from the Paleoindian to the Archaic, but some archaeologists (Kornfeld and Larson 2008) suggest this change is not real, but rather that large mammal bonebeds have simply been a focus of archaeological research leading to a bias even during the Pleistocene and early Holocene. The importance of bison as a main component of subsistence organization “is evident from a series of bison kill or processing sites distributed throughout the central Plains” (Widga 2003: 53). As Kornfeld and Larson (2008:21) suggest, the “Archaic broad-based subsistence . . . [is] a much more realistic perception of hunter-gatherer existence than the Paleoindian scenario.” With more faunal remains being analyzed in the Early Archaic but also Paleoindian sites, this idea of diet might change among archaeologists, because of a greater diversity of species from bones

within all assemblages. Additionally, “[g]reater diet breadth, apparently related to increased emphasis on smaller species of large game and riverine-basin resources such as fish, amphibians, reptiles, and birds appears to have characterized the Early Archaic” (Sheehan 2002: 138). Otárola-Castillo (2016: 27) argues that “[h]unter-gatherer land use and foraging strategies are strongly influenced by the ecological conditions and environmental feature of their surroundings.” The environment impacted the diet of the foragers during the Early Archaic. While bison still constituted a major proportion of the diet, new additions include many, albeit smaller proportions of smaller-sized species.

Widga (2006) describes strontium isotope analyses of bison tooth enamel suggesting that overall movements of bison were fairly localized during the Middle Holocene. Also, body-mass home range scaling estimates bison in small to medium groups had a foraging area of around 50-120 km. We can therefore speculate that the small bands of Early Archaic foragers followed the bison who moved with the seasons. Within the vicinity of most viable camp areas, a different small herd would have been around during most of seasons (Widga 2006:169-171).

The ecological framework constructed through stable isotope analysis for middle Holocene bison in the eastern Great Plains (~7– 8.5 ka) is actually very close to modern conditions. These bison had a diet that closely resembles the isotopic makeup of the historic vegetation present in the tallgrass prairies. They likely acquired most of their water intake from upland settings, rather than larger, more permanent lakes and rivers. Finally, they show fairly limited annual mobility and there is no evidence that they migrated long distances on a seasonal basis. (Widga et al. 2010: 461).

Research by Widga and colleagues (2010), has allowed a better understanding of how the bison herds moved across the Middle Holocene tallgrass prairies. Based on inferred herd movement, we can get an idea of how the hunter-gathers procured bison for food during different seasons.

Another important consideration for Middle Holocene foragers is the importance of water, which could have impacted the humans as well as the prey they were hunting. Meltzer (1999:410) suggests “[t]hat early and middle Archaic sites are so patterned suggests that water is important to foragers on the Plains, even in non-drought times (in effect, the pattern is so general as not to be attributable unequivocally to Altithermal drought).” With the elevated temperatures seen during the Middle Holocene, one adaptation it seems for the humans was to live along water sources no matter the season. According to Otárola-Castillo (2016: 56), “Climatic variables such as mean annual temperature, temperature seasonality, and annual precipitation had large effects on the diet choices of Paleoindian hunter-gatherers. However, annual precipitation seasonality did not appear to have an influence on Paleoindian diet diversity.” This pattern would have been true with the Early Archaic as well as the Paleoindian time frame. So far, a very large percent of the sites found during the Early Archaic are along streams and river beds (e.g., Walker 1992:144), which, parenthetically is also one reason it is harder to find them thousands of years later.

Domesticated Canid

Widga (2006) discusses the use of dogs since humans entered into the New World with hunter-gatherer movement patterns. Much of the interest has been on utility of dogs as a subsistence resource but he also considers the impact of dogs in terms of offsetting energetic costs associated with resource acquisition of large mammals and also movement of camps. According to Widga (2006:194), “As with other technologies, domesticated canid populations had to be maintained so that they could be used for either food or transport, as needed. This involved active human manipulation ... in much the

same way that chipped stone tools undergo retooling or rejuvenation.” Domesticated dogs played several key roles for humans living on the Great Plains landscape at contact and presumably also during the Middle Holocene. Perri (2014) found that intentional burials during the changing environment from the Pleistocene-Holocene transition that the dog gain social statuses.

As Fiedel (2005:14) explains, “In view of the demonstrated presence of dogs in farthest Northeast Asia (Ushki 1) only a few centuries after the presumed date of Paleoindian ancestors’ departure, the simplest explanation of the introduction of dogs to North America is that they accompanied Paleoindians as the latter migrated south of the ice sheets around 11,200 rcbp (13,200 cal BP).” Humans and domesticated dogs evidently had a long-established symbolic relationship in the Old World and human migrants brought them into the New World. Dogs were simply part of the forager groups, offering possible protection against the very large predators (i.e. hyenas and the giant short-faced bear) and possibly extra meat during times of shortage. Thousands of years later they were still part of foragers groups and were being used in a similar manners. One activity that Early Archaic foragers likely used dogs for was for transportation of all kinds of goods. Fiedel (2005: 17) explains that because dogs were able to carry items, meats, and even babies, they helped populate the New World at an increased pace, as women were able to move across the landscape much faster.

How wolves became dogs that had close reciprocal relationships with humans involves evolutionary questions that are still under investigation. Morey (1994: 339) suggests that dogs became domesticated because “[w]olves are also opportunistic scavengers; they were likely to have been familiar with human hunting practices and to

have hung around human settlements regularly.” From there Morey (1994) talks about how a couple of puppies were kept at the start and have to learn to eat different food and listen to their dominant human keepers, later becoming pets and workers, through breeding and human selection.

Throughout the Great Plains many of the Middle Holocene sites have remains of dogs and wolves in burial contexts or along with the bones of other animals. According to Widga (2006:208), “... Early Plains Archaic contexts suggests that domesticated dogs were relatively common members of the processing teams and residential units responsible for middle Holocene archaeological record in the eastern Plains.” The Spring Creek site in southwestern Nebraska has seven canid bones found without butcher cut marks on them, but are found within the bison bone piles (Widga 2006). The Koster Site in the lower Illinois River have isolated dog burials dating to 9,500 cal BP are dated to the earliest domesticated dogs and intentional dog burials (Perri et al 2019; Perri 2017). Walker, Morey & Relethford (2005) found four domestic dog burials from Dust Cave dating to the Early and Mid-Holocene in Northwest Alabama. Two of the burials had lower vertebrae that appear to have antemortem damage to the spinous processes due to weight bearing down on the area of the dog’s back (Walker et al. 2005:88). They interpret this condition as indicative of the use of the dogs as pack animals and from the ethnohistoric information they looked at the two different forms: the pulling travois or two side packs. Latham and Losey (2019) would disagree with this interpretation as they found in their research that spinal pathology Spondylosis deformans are found in both dogs and wolves, regardless of their work histories.

Snyder (1995:198) states that “Among the Assiniboin, for example, dogs wore packs that consisted of two skin pouches cinched around their middle. Assiniboin dogs could have carried loads between 30 to 50 pounds.” Ethnohistorically, another way that dogs assisted in transportation was the travois that was used across the Plains, which “consisted of two long poles attached at the dog’s shoulders, with the butt ends dragging behind the animals; midway, a ladder-like frame, or hoop made of plaited thongs, was stretched between the poles and served to carry loads that might exceed 60 pounds” (Fiedel 2005:14-15).

Henderson (1994) conducted an experiment to figure out what the maximum daily range of the travois on the Plains would have been. He found a short-haired Huskey name Serge, who was 25 kg and was mid-life and had pulled sleds previously. The experiments were done two times, one in summer and one in September in the Qu’Appelle valley area of Saskatchewan. The experiment used information provided by Buffalo-Bird-Woman about the dogs and the travois that the Hidatsa used (Wilson 1924). Henderson (1994:152) states that “Serge pulled fairly light loads of 11.3 to 13.6 kg (25 to 30lb) over varied terrain within the Saskatchewan-Manitoba Qu’Appelle valley and on adjacent land above the valley.” Serge was able to travel about two or three km per hour with 11.3 to 13.6 kg in warm weather or 22.7 kg in cool weather. During long travel in summer he carried 12 kg and in September 14 kg, completing 18 to 23 km a day. With short travel he carried 22.7 kg (50lb) for 2 km and 60 lb over a hundred meters (156). Within the historical record, the travois ranged in the historical records up to 45 kg (100 lbs) for the dog to pull. “. . . [T]he Coronado expedition of 1541 on the southern Plains, loads are described as being between 35 to 50 lbs (Windship 1896:571)” (Henderson 1994: 150).

Bradley (1923:278-279) notes that Blackfoot dogs were “capable of carrying all day a burden of some 30 pounds.” (Henderson 1994: 150). Buffalo-bird-woman said “that in summer, a dog travois could not be loaded as heavily as in winter, when it was so much easier for the dog to drag it over the snow-covered ground” (Wilson 1924:208).

As found in Morey and Wiant (1992), Clutton-Brock (1984:204) has suggested that the spread of the domestic dog played a key role in the development of human hunting technology and strategy during the Holocene. With a changing climate, people likely moved into new areas, carried more items (i.e., groundstone) and engaged in more hunting trips targeting small game; dogs likely facilitated these changes. According to Henderson (1994:17), “By relieving women of the burden of toting firewood, food stores, huts, and infants, dogs would have markedly reduced carrying costs, made residential relocations much easier, and thus allowed Paleoindian women to maximize their fertility.”

Another issue worth pondering is why so many dog burials occur during the Middle Holocene. Was the dog so helpful with the changing climate that it had a much higher status than before and after? Perri et al. (2019) say, that the Koster and Stilwell II dogs show the importance of hunting dogs with their intentional burial around 10,000 years ago. It can be seen from these examples just how important dogs likely were during the Middle Holocene on the Great Plains and the impact they may have had on forager daily life.

Stone Sourcing

The raw material used in lithics technology can be the factor that influences the end product and whether the raw material needs to be transported and the amount or if it

can be procured locally (Kelly 1988; Nelson 1991). Archaeologists have commonly argued that the rock used for flaked stone tools by Middle Holocene foragers was normally procured locally (Gregg et al. 1996). Heavy reliance on local stone is seen as an indicator of reduced settlement mobility and a reduction in territorial size that foragers travelled across seasonally. This pattern is often contrasted to that of material use during the earlier Paleoindian time period when assemblages often contained high-quality stone from several hundred kilometers away (Meltzer 1999). Gregg et al. (1996:82) suggest that the warm and dry Middle Holocene caused reduced biomass, which also reduced human carrying capacity, leading to a decline in human populations. Population reductions would have disrupted alliance and exchange relations related to the procurement of stone materials from great distances.

Identifying exotic raw materials at a site is a separate issue from inferring the behavior behind how a foreign material was introduced. It might have been acquired by direct procurement or by down-the-line exchange, two rather distinct means of acquisition. The means for differentiating between these two possibilities through analysis of archaeological assemblages are tricky but aggregate count and weight and extent of and type of cortex by stage of reduction can be useful. Lithic material can make it to a site through trade networks but also because of natural forces: glacier movement, streams and rivers can transport lithic materials a great distance from its source (Meltzer 1984). And, because of snow cover, some of the raw material is also only available during specific seasons (Knudson 1985).

Lithic Technology

Lithic technology can be used to better understand sites and the human groups themselves. Binford (1979) introduced the concepts of expedient or curated tools. Expedient tools are made when needed, used, and then discarded. Curated tools are not only planned for current but also future use; they are maintained, repaired and recycled. They are carried and used in many locations potentially far from source deposit, until unable to be used any longer.

Bifacial technology is common in the Early Archaic; bifaces, bifacially flaked cores, were curated and used as cores from which flakes can be detached for direct use or retouched into a more formal tool. As a biface becomes thinner it, too, can be transformed into a tool to meet the needs for the mobile group (Kelly 1988). Bifaces are smaller and lighter than cobbles or other cores because cortex has been removed. Another common tool found during the Early Archaic is end or side scrapers, typically, a unifacially flaked flake blank (Odell 2004).

Cortex on tools or on debitage can also give insights into the mobility of the group as foragers often reduce raw material at or near the source location to limit the burden of transportation (Dibble et al 2005; Douglass et al 2008). Cortex can be limiting since cortical flake edges are poorly suited for use; cortical flakes at secondary or later reduction locations would be absent or few in number (Dibble et al. 2005). Similarly, because “rocks are heavy,” stone cobbles are rarely carried far prior to bifacial core reduction (Beck et al. 2002).

Site Function

In the past, archaeologists commonly tried to distinguish the past “function” of a site with function equating to what that location was principally used for by a past society; did it serve as a kill location or one of raw materials extraction or perhaps as a camp for either a short or long duration? By definition, base camps and occupational camps were inhabited by the whole group, possibly for a longer term. Many different activities would take place and would result in an accumulation of different cultural materials and features in the archaeological record. Following Binford (1981), field camps are used to procure lithics, plants, or animals. Some Archaic sites have just one occupational layer and others have many different layers like Logan Creek and Cherokee Sewer. In some cases, the single occupation layer could correspond to a single behavioral event such as a month-long camp location, but they also could represent a palimpsest resulting from multiple behavioral events.

Since the Great Plains deposits do not preserve most of the organic materials that would have been used by the people at their different sites, most of the time lithics and the faunal remains are used to infer what happened at each site. Thus, it is crucial to make full use of both or as many different materials as available, in order to infer past behavior.

Summary

The Early Archaic hunter-gatherers would have used foraging techniques with a diet run by Optional Foraging Theory. They would have followed the bison that were used on the Plains for most of their diet resource in patch or prey models. Domesticated canids would have played a role in their movements by helping to transport the resources they used across the landscape. The lithic raw materials found on the sites can give an

idea of the distance traveled or trading routes, along with how they made their tools. With all of these and also location, materials left, and site deposits can give ideas of site function. These models can give an idea of how the foragers used the landscape of the Great Plains during the Middle Holocene.

CHAPTER 5: Spring Creek Research

The Spring Creek site (25FT31), an Early Archaic site in southwestern Nebraska, was excavated in the 1960s but never fully analyzed. The report resulting from these excavations is limited and contains minimal descriptions about the material recovered (Grange 1980). In 2003, Widga analyzed the faunal remains of the Spring Creek sites for his Master's thesis in an effort to better understand the diet of the Great Plains Early Archaic foragers. This chapter summarizes this earlier work.

Spring Creek 1960s

The Spring Creek Site (25FT31), excavated as part of a salvage archaeology operation, is located within the present-day Red Willow Reservoir in southwestern Nebraska. The site occupied a flat, middle terrace (1,200 to 1,600 feet) situated between Spring Creek, which flowed to the north and east of the site, and the Red Willow Creek, which flowed south of the site. The terrace extended from the river to the base of a hilltop, which itself overlooks the valley. During construction of the dam, the terrace was found to contain buried cultural deposits (Grange 1980; Kivett 1961).

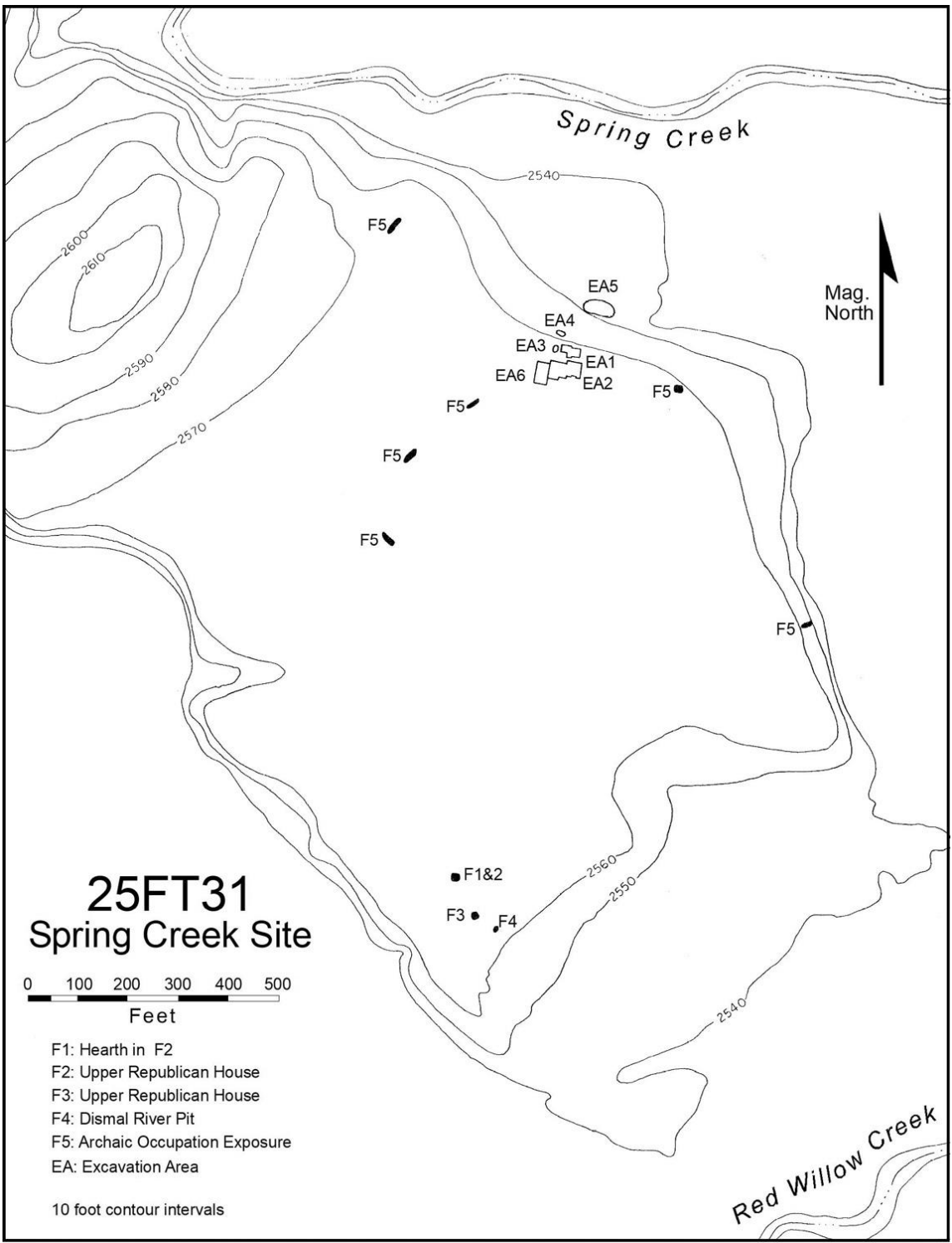


Figure 5.1. Site map of 25FT31- Spring Creek site adapted from Grange 1980:15

The site was discovered in 1948 by the Smithsonian Institution, as part of the River Basin Surveys, during an inspection for the proposed construction area for the Red Willow Reservoir. The survey crew found Plains Woodland and historic artifacts on the surface of the terrace.

Kivett inspected the site in the 1960s and identified a dugout structure and noted that the terrace showed evidence of historic plowing. This evidence was destroyed before the salvage effort took place the following year (Kivett 1961).

During these latter efforts, an historic Native American component was identified, with a flat iron projectile point collected from the surface. A Dismal River component, evidenced by one feature and a diagnostic rim sherd, was also documented. Some chipped and ground stone artifacts were recovered, as well as bone in a basin shaped oval pit (Feature 5.1). Two small triangular projectile points, one end scraper, and four waste flakes were found within the Dismal River complex, dated to approximately AD 1700 (Grange 1980; Kivett 1961).

In 1960, other materials were found, including one structure of an earthlodge. wattle and daub and a hearth. Borrow operations on the terrace occurred before more in-depth excavations were scheduled. The earthlodge featured a central fireplace (Feature 1) containing flint chips and bison bone. Feature 2 and 3 were the floors of the earth lodges. Feature 2 had a body sherd with cord roughened exterior surface treatment (Kivett 1961). The surface collection included 130 body sherds consistent with the color and temper of the classic Upper Republican type, along with eleven end scrapers, two knives, bifacially worked flakes, and 59 pieces of debitage (Grange 1980).

During dam construction, earth moving equipment removed a large amount of sediment from the terrace, thereby exposing the buried Archaic component. The alluvial terrace was the primary location of a borrowing pit for dam fill and this effort exposed hundreds of hearths and bone piles. Several hand excavation areas were established to salvage materials before they were destroyed (Grange 1980). All materials were collected and all sediments dry screened through ¼” mesh (Widga 2003:39).

A large area was excavated but the investigations were hampered by blowing dust from the nearby earth-moving operations, a service time limit, and summer heat. The hand excavations exposed 13 features that contained large concentrations of bison bone, a pit, and lithic materials (Grange 1980). The site map (Figure 5.1) shows all the features of the site from different time periods including the Archaic excavation areas. Figure 5.2 shows a more detailed look at the Archaic component exposed within the excavation areas. Excavation Area 1 measured approximately 20 by 25 ft with hand excavation ensuing after equipment operators saw buried hearths. Excavation Area 2 measured 30 by 50 ft and had a five-foot grid system. The overburden was removed after finding the cultural level in Area 1. Excavation Areas 3, 4, and 6 were all plowed off to reveal the Archaic level. In order to provide a large sample of the occupation zone, excavations were conducted to recover artifacts using limited locational information. Northwest of Excavation Area 1, a collection of artifacts was made during the borrow pit operations.

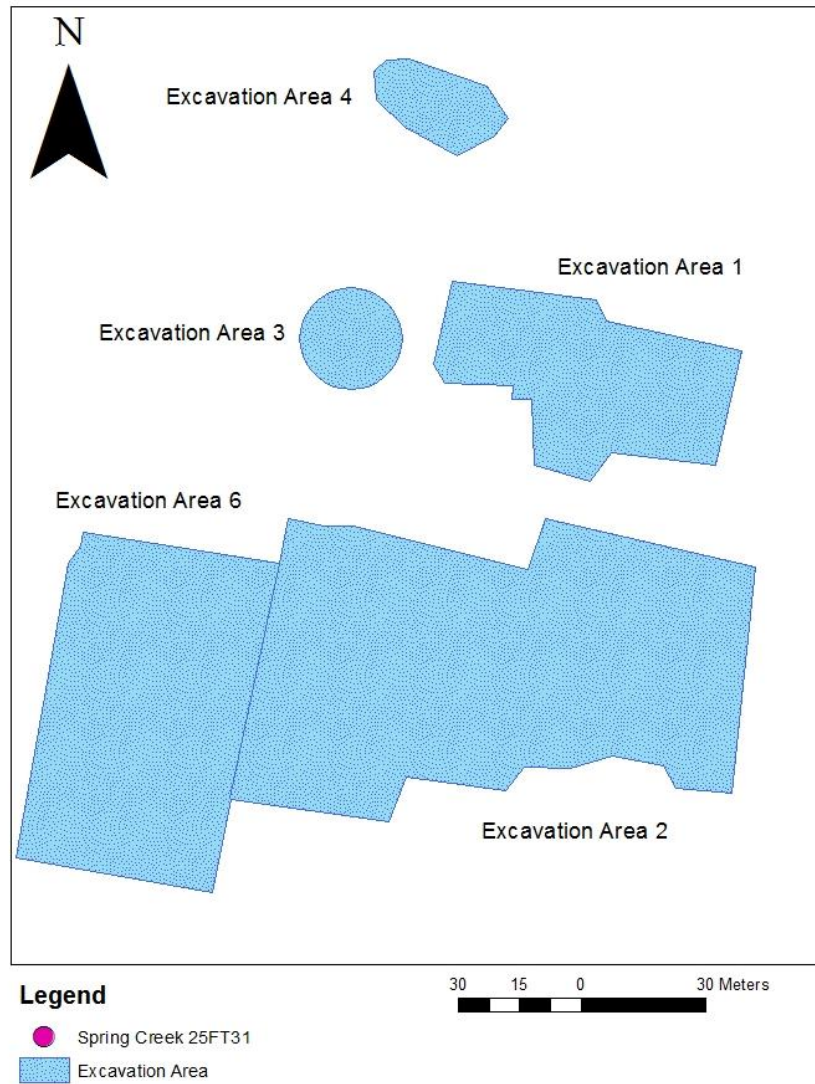


Figure 5.2 Excavation areas of the Spring Creek Archaic component

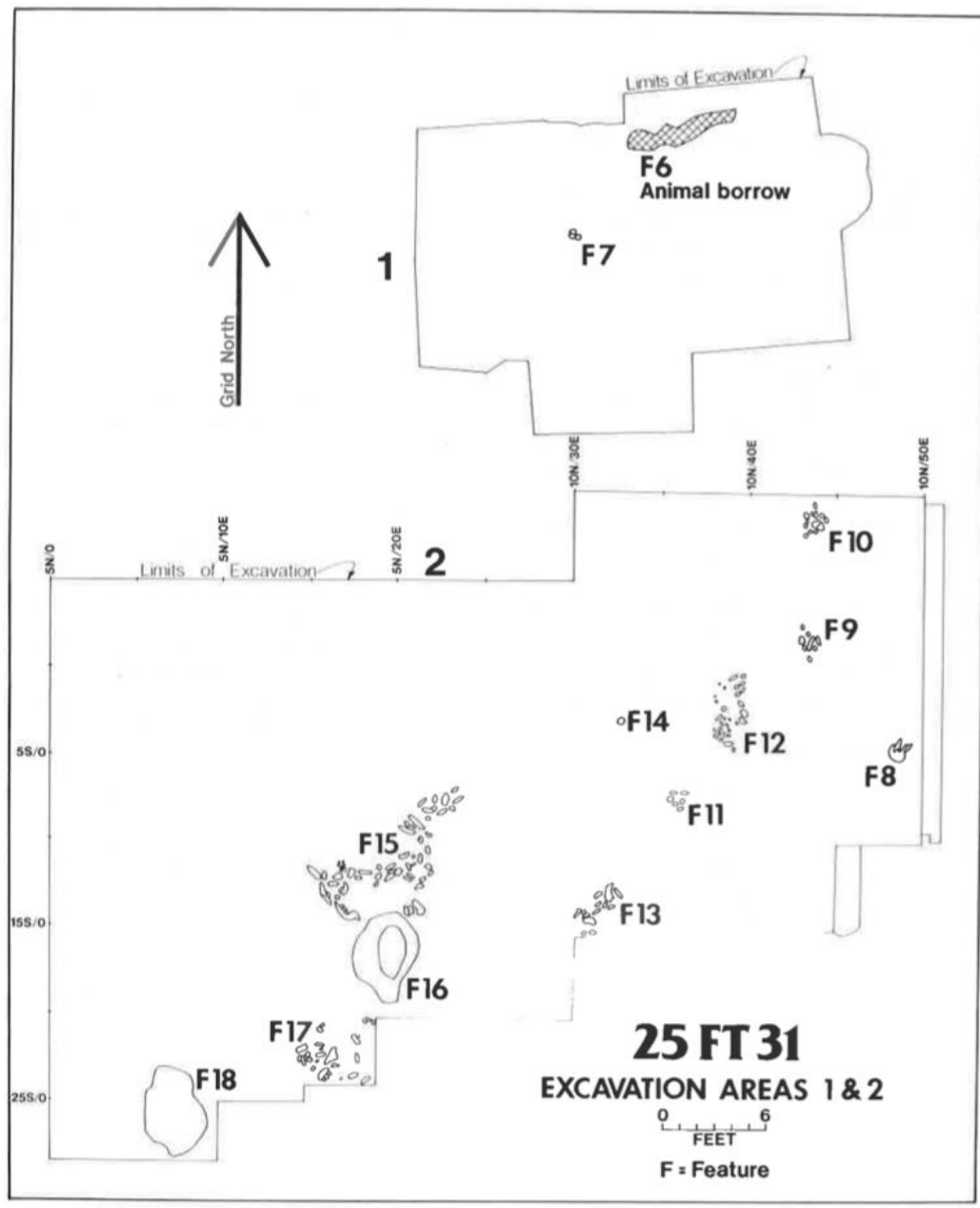


Figure 5.3 The map from 25FT31 with Excavation Areas 1 and 2 with Archaic features (Grange 1980:24)

From figure 5.2 and 5.3 the features are concentrations of bones, rocks, stone tools and stained soil. Artifacts recovered from Features 6 through 18 in Excavation Areas 1 and 2 are summarized in Table 5.1

Table 5.1 Explanation of artifacts recovered from each feature (Grange 1980: 25).

| | | |
|---------------------------------|------------|---|
| <u>Excavation area 1</u> | Feature 6 | some fragments burned with shell and stone flakes; possible animal burrow |
| | Feature 7 | cluster of 3 grinding stone within the occupational level |
| <u>Excavation area 2</u> | Feature 8 | splintered animal bone, a scraper and stone flakes with bone |
| | Feature 9 | splintered animal bone |
| | Feature 10 | broken and charred animal bone with stone artifacts and flakes |
| | Feature 11 | concentration of animal bone |
| | Feature 12 | worked bone, stone flakes and shell |
| | Feature 13 | worked stone, worked bone, red-stained bone present |
| | Feature 14 | shallow circular depression extending below the occupation zone that had stained soil with charcoal flakes, that could have been a firepit |
| | Feature 15 | broken animal bone, firecracked rock, stone artifacts, worked bone and hematite present |
| | Feature 16 | irregular oval basin shaped firepit filled with burned earth, traces of charcoal, animal bone, burned rock, extends below occupational zone |
| | Feature 17 | charred rock, worked stone and bone and charred bone |
| | Feature 18 | oval, basin-shaped storage pit with deeper oval basin, filled with animal bone and the fill had worked stone, worked bone and burned rock |

Table 5.2 Frequency of Tools recovered for the Spring Creek Site Archaic component as reported by Grange (1980)

| Tools | # | % |
|--------------------------------------|----------|----------|
| Projectile Point | 21 | 16 |
| Bifacial Flake Knife | 4 | 3 |
| Bifacial Cores, Scrapers or Chopper | 4 | 2 |
| Bifacial Scraper | 3 | 2 |
| End Scraper | 10 | 7 |
| End scraper fragment | 5 | 4 |
| Unifacial Flake Scraper, Tapered | 2 | 1.5 |
| Unifacial Flake Scraper, Oval | 9 | 7 |
| Unifacial Flake Scraper, Rounded End | 5 | 3 |
| Unifacial Flake Scraper, Pointed | 9 | 7 |
| Unifacial Flake Scraper, Curved | 6 | 4 |
| Unifacial Flake End and Side Scraper | 3 | 2 |
| Unifacial Side Scraper, Thick | 10 | 7 |
| Unifacial Side Scraper, Thin | 34 | 26 |
| Unifacial Flake Graver | 2 | 1.5 |
| Total | 127 | |

Grange classified the stone tools recovered from the Archaic component of the Spring Creek site according to standard morphofunctional types in use at the time (Table 5.2). Grange (1980) separated the projectile points into lanceolate, side notched, corner notched, and indeterminate fragments. He noted that “although some points exhibit well controlled flaking and careful workmanship, most of the points are relatively crude and display only a modest degree of craftsmanship” (Grange 1980:34-36). As I will discuss in Chapter 7, some of the points appear unfinished and are made on flake blanks with pronounced bulbs of percussion that cause irregular transverse cross-sections. Others showed one unworked side, with the single smooth detachment flake scar.

Grinding tools were also recovered from the site, including a fine-grained sandstone grinding slab broken near its midpoint with one side rounded by pecking and the other side irregular-shaped. There are remnants of red pigment on the surface and the basin-like area is grounded smooth from use. Four manos were found at the site dating to the Archaic occupation. One is made of green fine-grained sandstone and features a flat and curved face with both sides ground and smoothed from use and red pigment on the flat side. The second is a fragment, also made of green sandstone, with both faces smoothed and red pigment on one edge. The third is coarse sandstone with both surfaces smooth and the fourth is coarse green sandstone with rounded edges, one flat face, and one convex face. Several fragments of hematite were found in Feature 15 in powdered form along with one in Feature 5 zone (which was the horizontal occupational level). Unworked local sandstone fragments were blackened from burning in hearths or hot-stone cooking with 14 found in the Feature 5 occupation zone and Excavation Unit 4 (Grange 1980:38).

Grange also reported bone tools at the Spring Creek Archaic level (Table 5.3). Bison ulnas served as picks with the shaft shaped to a blunt point and some abrasion and polishing from use. A scapula pick exhibited one edge smooth from use in addition to rounding and polish. Long bones from bison were used as fleshers and were cut and tapered to form a thin edge with smoothing and polishing visible and a possible hafting surface. A rib with a hole was used as a shaft wrench and had snapped across the hole likely when being used. Bone abraders, splinter awls, and long bone were hollowed out for a concave socket. There was also a bone bead from a possible bird (Grange 1980:41-42).

Table 5.3 Bone tools from the Archaic component of the Spring Creek site (Grange 1980)

| Boone Tools | # |
|---------------------|----------|
| Bone Tools | |
| Ulna Picks | 3 |
| Scapula Pick | 1 |
| Worked Scapula | 1 |
| Fleshers | 2 |
| Shaft Wrench | 1 |
| Bone Abrader | 2 |
| Spinter Awl | 2 |
| Flat Splinter Awl | 3 |
| Triangular Awl | 1 |
| Spocketed Long Bone | 6 |
| Splinter Flaker | 12 |
| Rib Flaker | 3 |
| Split Rib Flaker | 1 |
| Bone Bead | 1 |
| Spatula | 1 |

There were at least 64 hearth/bone loci on the alluvial terrace area within the Archaic component. Grange assumed these features were more or less contemporaneous and, from this and other material remains left behind, Grange (1980:160) estimated the occupying group consisted 300 to 600 people that stayed over a period of two to four months duration. Grange (1980) proposed a spring/summer occupation because of the presence of geese and duck remains within the faunal assemblage. According to Grange (1980:47), “[t]he assemblage represents a wide range of activities including food preparation and consumption as well as tool manufacture. Both hunting and collecting activities are represented at the site, and it most likely served as a general-purpose base camp rather than for more specific functions”. A 14C date of 5680 ± 160 RCYBP places

the site at the same time of the Logan Creek Complex (Grange 1980:45). Widga obtained a better estimate of the site age by radiocarbon dating a bone sample that Thomas Stafford chemically purified using XAD- KOH collagen hydrolyzate. This new age estimate of 6145 ± 35 BP (CAMS-10188; bone; Widga 2006, personal communication 2019) puts the Spring Creek Archaic component at approximately the same time as the upper Archaic zones at Logan Creek.

Spring Creek 2000s

Widga's (2003) detailed reanalysis of Spring Creek fauna documented 15 different species in the Archaic component (Table 5.3). Bison comprise the bulk of the faunal assemblage. The bison teeth supply a late summer or early fall season of site occupancy based on Dental Age Group (DAG) 2 mandibular and DAG 1 maxillary specimens. Widga (2003:73) states that "the Spring Creek Site is a relatively short-term bison processing site situated very near a kill. This group would have occupied the site for a series of days rather than weeks and spent their time processing animals from a nearby kill for transport to some other location."

Other large mammal species include pronghorn antelope in Excavation Area 2 and in Feature 17 of Excavation Area 1 along with deer or elk. Birds were a small component of the faunal assemblage, along with one fish bone and one turtle bone from Feature 18.

The second most common mammal by both NISP and MNI was canid, potentially representing either domesticated dog or wild coyote or wolf; differentiating genus is hard given the fragmented remains. Four of the canid specimens had evidence of human butchery on the lower limb elements. The small proportion of butchered canid remains

indicate only the occasional use of canid for subsistence compared to results presented by Snyder (1991). This pattern does not rule out the use of dogs as food but suggest that dogs may not have been eaten in late summer/early fall (Widga 2003: 132). The canid bones showed no evidence for pathologies from traction but three specimens had wear patterns on the distal cusp of carnassial molars. There is evidence of human use on at least one animal but has an unknown cultural factor. Unique wear patterns on the mandibular dentitions of the Spring Creek canids may indicate different uses of these animals.

Table 5.4 Spring Creek. all species, NISP and MNI (Archaic or surface contexts) from Widga (2003:57 Table 5.1)

| Class | Species | NISP | MNI |
|---------------------------|---|-------------|------------|
| Large Mammal (LM) | <i>Antilocapra americana</i> | 15 | 1 |
| | <i>A. americana</i> \ <i>Odocoileus</i> sp. | 8 | 2 |
| | <i>Bison</i> sp. | 1258 | 13 |
| | <i>Cervidae</i> usp. | 2 | 1 |
| | Large mammal usp. | 11 | - |
| | <i>Total</i> | 1294 | 17 |
| Medium Mammal (MM) | <i>Castor canadensis</i> | 1 | 1 |
| | <i>Procyon lotor</i> | 1 | 1 |
| | <i>Total</i> | 2 | 2 |
| Small Mammal (SM) | <i>Lagomorpha</i> usp. | 2 | 2 |
| | <i>Total</i> | 2 | 2 |
| Rodent (RO) | <i>Cynomys ludovicianus</i> | 2 | 1 |
| | <i>Geomys bursarius</i> | 5 | 3 |
| | <i>Microtus ochrogaster</i> | 1 | 1 |
| | <i>Total</i> | 8 | 5 |
| Carnivore (CV) | <i>Canidae</i> usp. | 89 | 6 |
| | <i>Vulpes velox</i> | 2 | 1 |
| | <i>Total</i> | 91 | 7 |
| Avian (BRD) | <i>Anatidae</i> sp. | 2 | 1 |
| | <i>Passerine</i> usp. | 7 | 2 |
| | <i>Avian</i> usp. | 1 | - |
| | <i>Total</i> | 10 | 3 |
| Reptile (REP) | <i>Chrysemys picta</i> | 1 | 1 |
| | <i>Total</i> | 1 | 1 |
| Fish (FSH) | <i>Fish</i> usp. | 1 | 1 |
| | <i>Total</i> | 1 | 1 |
| Total | | 1409 | 38 |

Evidence of butchering occurred on 11.43 % of the Spring Creek faunal assemblage including impact marks, cut marks, anvil abrasion, chopping, and notching (Widga 2003:122). These visible alterations were likely the result of meat removal and carcass dismemberment with the goal of transporting a large amount of dried meat back to the occupation site. Marrow retrieval was also evidenced by impact marks on long bones (Widga 2003:134).

Summary

Two interpretations have been proposed regarding the primary use of the Archaic component of the Spring Creek: either a small processing kill site occupied for 2-5 days (Widga 2003) or a base camp with possibly hundreds of people, possibly occupied for maybe up to 3 months (Grange 1980). The site has late summer or early fall seasonality based on the dating methods of the bison teeth. Fifteen different species were found in the Archaic component, indicating diet diversity (Widga 2003). Bison bones indicate processing with butchering and impact marks and the presence of various kinds of lithic materials suggests not only the processing of the meat but also of the whole body with hide scraping as well.

Chapter 6: Methods

The goal of this research is to better understand human occupation on the Great Plains during the Early Archaic. Through this analysis of lithic raw material, tools, and debitage types, which is largely based on conventional methods and techniques, I attempt to define the geographic range of the Spring Creek occupants across the landscape, the diversity of animal species they hunted and utilized, and site function and activities. Projectile point typologies can offer ideas of the kinds of prey the foragers were hunting, and evidence for recycling of tools can yield insights into the diversity of lithic technology at the site. Recognizing specific stages of biface production can reveal aspects of mobility and the use of resources across the landscape. Examining retouch can provide an idea of site function and activities within the camp, as can the study of use-wear.

Lithic Analysis

Lithic artifacts are one of few items of material culture that preserve well in the archaeological record, thus they deserve careful description and analysis to maximize their full research potential. The stone artifact assemblage provides one dataset for making behavioral inferences that can be compared against faunal remains. Examination of variables like use-wear, inferred function, type of flakes, and cortex, coupled with the review of past analyses, can provide an idea of the types of activities performed at the Spring Creek site. The raw material types and cortex can also provide an idea of the range of movement over the landscape or possible trade routes.

Archaeologists have developed a variety of methods to derive useful information from lithic artifacts, as summarized by Andrefsky (2005), Cotterell and Kamminga (1987), Kooyman (2000) and Odell (2004), I structured my overall approach was

structured by following the analytical format that Dr. Phil Geib has developed for an analysis of the Logan Creek flaked stone tool assemblage. Although this analysis is still in progress, the general structure is similar to his analyses of other assemblages (e.g. Geib 2014; Geib and Warburton 2007). For the present study, I combine these methods along with the methods of other researchers Odell (2004), for examining lithic tools and debitage. For data collection I used an Access database created by Geib (2014) that has two tables: one for flakes (Table 6.1) and one for tools (Table 6.2). These tables allow documentation of attributes as well as measurements and comments for each artifact. The Access database was transferred to History Nebraska for permanent curation and was also made available to the US Bureau of Reclamation.

I follow Odell (2004:64-65) in restricting flaked stone tools to those items that exhibit intentional retouch. This excludes flakes that were incidentally retouched: “Intentional modification by chipping for purposes of blunting, sharpening or shaping is known as retouch” (Odell 2004: 64). It is admittedly tricky to distinguish intentional retouch from that resulting incidentally from use-wear or from post-depositional damage during excavation or rough handling, “so the only real alternative is to develop your eye to the point that you can distinguish the different kinds of extraneous damage from one another, and especially from intentional modification” (Odell 2004:65). According to Geib (2014:2.9), “Used flakes are tools in the broadest sense but they lack ‘enhanced cultural input’ in the form of intentional edge modification.” Therefore, if the lithic object had evidence of retouch, it was placed into the tool category, and if retouch was not apparent and/or exhibited use-wear or other damage from improper handling, it was placed within the debitage category.

I used a dissecting type microscope at 7-45x power in order to examine details on flakes and tools, a digital scale for measuring weight to the nearest 0.1g, digital calipers for measurements to the nearest 0.1mm, and graph paper with marked grid square to estimate flake size. One of the principal attributes for debitage is technological flake type. This attribute supports an inference about the technological goal behind flake detachment, such as biface thinning or resharpening of a scraper (Appendix A). Aside from technological flake type other attributes include flake condition, platform type, flake size class, weight, cortex and raw material attributes (Table 6.1). I also examined each flake for potential traces of use-related damage, and if present made notes about these. Additional notes were added as relevant reference for myself or subsequent researchers in the future.

Table 6.1 The variables recorded for the debitage of Spring Creek site with some changes to accommodate Great Plains variation (Geib 2014:2.8)

| <u>Variable</u> | <u>Description</u> | <u>Values</u> |
|-----------------|---|---|
| Flake Type | | Indetere/nondescript, DFP Core, Biface thinning, Biface shaping, Notching, Alternate, Core Edge Prep, Core top prep, Scraper maint, Tool Spall, Erailure |
| Condition | | Chunk/Shatter, Flake Fragment, Broken Flake, Whole, Whole Split |
| Platform | | None, Cortex, Single scar, Double scar, Faceted/multiple, Crushed |
| Size Class | Size of the flake | <1/4", 1/4-1/2", 1/2-1", 1-2" >2" |
| Weight | Flake Weight | Nearest.01g, .05 for 0.0 |
| Raw Material | General geological classification of raw material | Obsidian, Chert, Chalcedony, Conglomerate, Silicified wood, Siltstone, Quartz, Quartzite, Rhyolite, Basalt, Coarse Igneous, Limestone, Sandstone, Meta-Sediment |

| | | |
|----------------------------|---|--|
| Color | The color seen over most of the body of the flake | White, Light Gray, Dark Gray, Yellow, brown, Pink, Reddish, Light banded, Dark Banded, Mottled, Green |
| Fossils | | None, Sparse, Moderate, Abundant |
| Material ID | Specific classification of raw material | Smokey Hill, White River, Hartville Chert, Spanish Dig Quartz, Bijou Qtz, Penn fossiliferous white, Penn fossiliferous yellow, Permian, Nehawka, Burlington, Knife River, Sioux qtz, Tongue River, Unknown |
| Cortex | Is dorsal cortex present? | None, Present, Indeterminate |
| Cortex Type | Identification of the type of cortex present | None, Alluvial (incipient cone); In Situ; Lag (smoothed even polished but not alluvial); Patina (Highly weathered but not alluvial) |
| Thermal Alteration | Identification of the thermal alteration to the raw material either intentionally or accidentally | Absent, burned (uncontrolled heat indicated by potlid and crenated fractures) Possibly heat treated (Overall high luster & possible change but no differential luster or color) Heat treated (differential luster among flake scars on dorsal or dorsal and ventral, perhaps accompanied by different color) |
| Used | If able to see use wear traces | yes/no |
| Verbal Description | Text description of above information | |
| Use-wear Observation/notes | Text description of use-wear traces | |

As with flakes, each tool was individually characterized according to the variables listed in (Table 6.2) along with the ID, feature number, level, and ID number. Potential use wear for each tool was examined using the dissecting microscope with an inference made if present. If use wear was present, I made sure the retouched occurred after flaking and noted if any use wear traces were present (rounding, polished surface, or micro-flaking).

Table 6.2 The variables recorded for the tools of the Spring Creek site with some changes to accommodate Great Plains variation (Geib 2014:2.8)

| <u>Variable</u> | <u>Description</u> | <u>Values</u> |
|----------------------------------|--|--|
| Prev Type | The type that was given in Grange 1980 if named | (See Grange 1980) |
| Morphological/ Function Class | Inferred overall morphological and functional classification of tool based on categories regular used by archaeologists but informed somewhat by use-wear | Unknown, retouched flake, scraper, unifacial knife, engraver, perforator, Drill, Biface, Bifacial chopper, Bifacial Chopper, Bifacial knife, Point preform, Projectile Point, Other |
| Subclass Specification | Refinement of the above groups to the extent possible based on production technology | None, Stage 1, 2, 3, 4, 5, Logan Creek, side notched, end scraper, side scraper |
| Technological Class | Technological classification of tool based on faces worked and whether flaking is marginal (edging) or invasive (thinning) along with the extent of facial thinning. | Unknown/Unidentifiable, Unifacially Edge, Unifacially thinned, Unifacially Thinned & Shaped, Bifacially Worked- NFS, Bifacially Edged, Bifacially Thinned Initial, Bifacially Thinned Advance, Bifacially Thing & Shaped, Bifacially Thinned Shaped & Stylized |
| Condition | What part of the tool is present for analysis | Indeterminate, Fragment-NFS, Internal fragment, Margin fragment, Corner fragment, Medial complete, <1/3 terminal, <1/3 tip, < 1/3 base, >1/3 terminal , >1/3 tip, >1/3 base, Nearly Complete, Complete |
| Use Phase | Assessment of tool use history | Unfinished & Unused, Unfinished but Used, Fished & Used but Broken or Exhausted, Recycled Tools Whole & Unexhausted, Recycled Tools Broken or Exhausted, Indeterminate |
| Resharpener | Assessment of whether primary finished tool form was modified by resharpener | Absent; Present; Indeterminate |
| Previous Function | For recycled tools an inference as to prior morpho-functional type | None, Projectile Point, Scraper, Knife, Drill, Indeterminate |
| Length | Complete length only measured parallel to long axis or for flake tools down axis of detachment | Nearest 0.1 mm |
| Fragment Length | For tools that have an incomplete length | Nearest 0.1 mm |
| Width | Complete width only measured orthogonal to length | Nearest 0.1 mm |

| | | |
|-----------------------------|---|---|
| Fragment Width | For tools that have an incomplete width | Nearest 0.1mm |
| Thickness | Maximum complete thickness | Nearest 0.1mm |
| Fragment Thickness | For tools with incomplete Thickness | Nearest 0.1mm |
| Weight | Tool weight | Nearest .1 g or .05g for .0 or lower |
| Blank Morphology | Assessment of the original blank form that the tool was made on | Indeterminate, Thin Slab, Split Cobble, Core, flake-NFS, DFP Flake, Bipolar Flake, Biface Flake |
| Percussion | Was Percussion flaking used to make the tool | Yes/no |
| Pressure | Was Pressure flaking used in the tool production | Yes/no |
| Raw Material | Same as debitage | Same as debitage |
| Material ID | Same as debitage | Same as debitage |
| Cortex | Same as debitage | Same as debitage |
| Thermal Alteration | Same as debitage | Same as debitage |
| Inferred Function (2) | | |
| Verbal Description | Text description to information above | Nearest 0.1mm |
| Use- Wear Observation/Notes | Text description about use wear traces | Nearest 0.1mm |
| Neck Width | For notched points measured across narrowest part of notches/stem | Nearest 0.1mm |
| Neck Thickness | For notched points measured across necks | Nearest 0.1mm |
| Stem Length | Top of notch to lowest part of stem | Nearest 0.1mm |
| Stem Width | Measured widest point of stem | Nearest 0.1mm |
| Notch Opening | Measured across widest point of notch at tool margin | Nearest 0.1mm |

Groundstone

A re-examination of the grinding tools was also completed. The tools were measured for thickness, length, width, and changes in depth from use wear and each was weighed to the nearest gram. I examined each to assess use wear in terms of direction of wear, either circular or linear. Dr. Geib sketched them as well including pecking, use wear, breaks, pigment residue and other information. They were also photographed.

Summary

From the analysis of the lithic assemblage of the Spring Creek Site inferences can be formulated about the site activities, geographic range, and the diet. By looking at only tools that exhibit intentional retouch this will set a standard for what has cultural impacts within the lithic materials.

Chapter 7: Analysis of the Spring Creek Lithic Assemblage

This chapter presents results of my detailed analysis of the lithic assemblage from the Early Archaic component of the Spring Creek site. Grange (1980) reported on this component but neither the debitage nor the lithic tools were fully analyzed. Moreover, Grange adopted a typological approach, as was common at the time, so comparison with the assemblages are more problematic due to change in the distinctive aspects of lithic technology studies over the years. As Table 7.1 demonstrates, there are significant differences in the counts of debitage and some changes in categories for others artifacts: several of what Grange classified as flake tools were here identified as debitage and vice versa. For instance, I found the ear of a corner notched projectile point within a bag of flakes. Part of the tool count discrepancy is because of different definitions as to what is a tool and I have adopted Odell's definition of tool definition, where a flaked lithic object must have been purposefully retouched for it to be considered a tool.

Table 7.1 Differences in the quantity of lithic artifacts from the Spring Creek Archaic component by analyst

| Analyst | Category | Count |
|----------------|-----------------|--------------|
| Grange 1980 | Debitage | 59 |
| | Flaked Tools * | 132 |
| | Grinding Tools | 4 |
| | | |
| This Study | Debitage | 704 |
| | Flaked Tools | 134 |
| | Grinding Tools | 4 |

* Tools included 30 identified as “bifacially chipped” and 112 identified as “Unifacially Chipped”

In addition, some of the specimens Grange (1980) originally identified as tools such as side scrapers are actually used flakes and were not purposefully retouched. The difference between flake counts is unknown, since the process for identifying debitage was not noted in the report. The change in tool count is a result of differences in the methods of flake versus tool classification.

Debitage

My reanalysis of the collection identified 704 flakes within known proveniences in the Archaic component of the site. These 704 flakes from the Archaic component are diverse in size, shape, use-wear, and technological type, but have little variability in raw material. By count Smokey Hill Silicified Chalk (SHSC) accounts for 96% of the collection (Table 7.2) and comes in many different colors and quality. SHSC is local with outcrops occurring nearby (Bamforth 2007; Grange 1980). Silicified wood can be found in river cobbles along the Platte River, which is perhaps the closest source. The four flakes of sandstone are most likely derived from the grinding tools used at the site, which are described at the end of this chapter. One of these flakes exhibited part of a worn grinding surface on the dorsal. The other materials are from Tongue River, very common in South Dakota and also occurs in southwestern Iowa and southeastern Nebraska (Nycz 2013).

Table 7.2 Raw material of debitage

| Raw Material | Count | Percent | Total Weight | Percent |
|-------------------------|-------|---------|--------------|---------|
| Smokey Hill-SHSC | 687 | 96 | 873.95 | 91.4 |
| Unknown Chert | 11 | 1 | 9.55 | 0.9 |
| Chalcedony- Unknown | 3 | 0.4 | 19.6 | 2 |
| Chalcedony- White River | 1 | 0.1 | 10.9 | 1 |
| Sandstone | 4 | 0.5 | 16.4 | 1.7 |
| Spanish Dig Qtz | 1 | 0.1 | 0.1 | 0.01 |
| Quartz- Unknown | 1 | 0.1 | 1.4 | 0.01 |
| Rhyolite | 1 | 0.1 | 13.7 | 1.4 |
| Silicified wood | 2 | 0.2 | 9.2 | 0.09 |
| Tongue River | 1 | 0.1 | 1.2 | 0.01 |

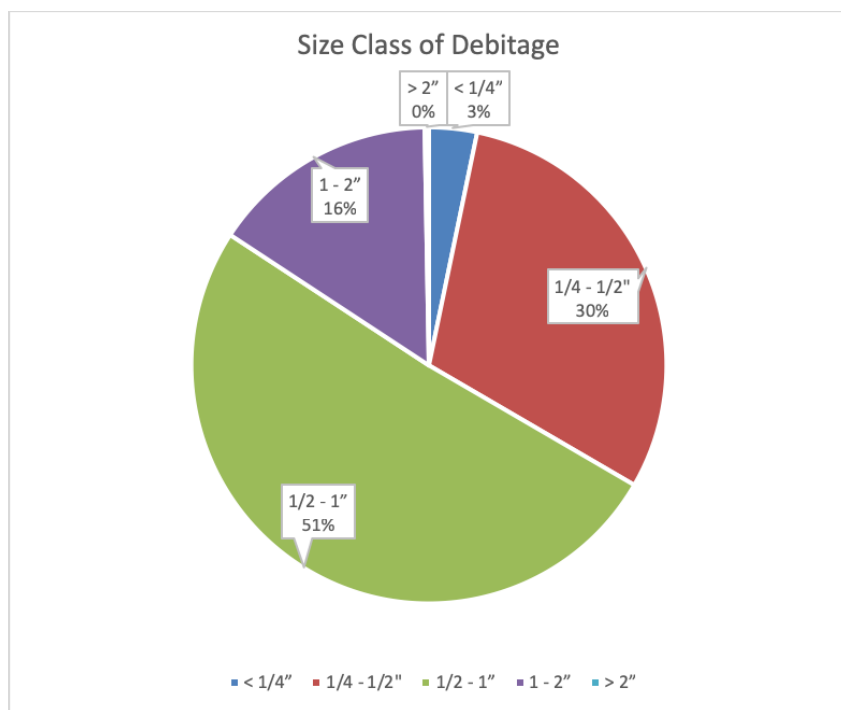


Figure 7.1 The size class of debitage of Archaic flakes

The size of the debitage is one way archaeologists compare lithic assemblages, as it can be informative of the relative placement where detachments occur within the reduction continuum for a tool or raw materials. As all lithic analysts stress, lithic production is a reductive process and debitage size becomes smaller as tool

manufacturing reaches completion (Andrefsky 2005: 98). This process is the same for core reduction when producing flakes or tools. Size can be quickly captured by weight and by measurements or size classification. The size class of the 704 flakes presented in Figure 7.1 shows that most (51%) are in the ½-1” class and 30% in the ¼-½” class. Very few were larger than 2” (n=2), which is likely indicates little on-site initial reduction. The low incidence of tiny flakes, those smaller than ¼” (3%) is most likely a simple reflection of screen size used during excavation; the site sediments were screened with ¼” mesh so small flaking debris was clearly lost. By weight (Table 7.3), 91% of the assemblage is SHSC with no other material more than 2% save for Chalcedony- Unknown other than SHSC. A total of 133 Smokey Hill flakes exhibited in situ cortex, which is 46% (Figure 7.3) of the flake total weight within the Smokey Hill material type.

Table 7.3 The Raw Material of the debitage of Spring Creek with cortex and total weight of raw materials with percent of total weight for each raw material

| Raw Material | # | In Situ | Alluvial | Lag | Total Weight | % |
|----------------------------|------------|------------|----------|----------|--------------|------|
| Chert- SHSC | 678 | 133 | 1 | 5 | 873.9 | 91.4 |
| Chert- unknown | 11 | 2 | 0 | 1 | 9.55 | 0.09 |
| Chalcedony- Unknown | 3 | 2 | 1 | 0 | 19.6 | 2 |
| Chalcedony- White River | 1 | 1 | 0 | 0 | 10.9 | 1 |
| Sandstone- Bijou Hills Qtz | 4 | 0 | 0 | 0 | 16.4 | 1.7 |
| Spanish Dig Qtz | 1 | 0 | 0 | 0 | 0.1 | 0.01 |
| Quartz- Unknown | 1 | 0 | 0 | 0 | 1.4 | 0.01 |
| Rhyolite | 1 | 0 | 0 | 0 | 13.7 | 1.4 |
| Silicified wood | 2 | 0 | 1 | 1 | 9.2 | 0.09 |
| Tongue River | 1 | 0 | 1 | 0 | 1.2 | 0.01 |
| TOTAL | 704 | 138 | 4 | 7 | 956.0 | |

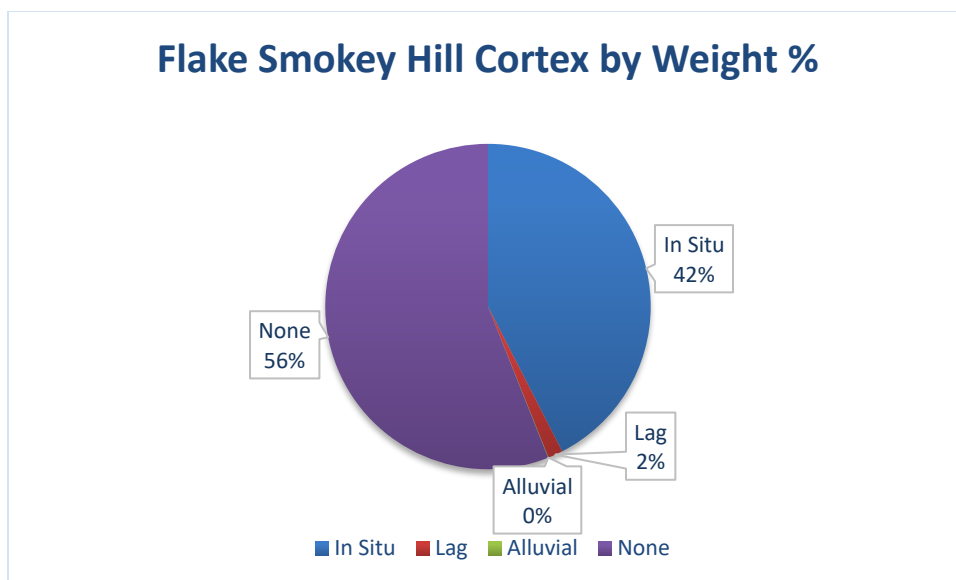


Figure 7.2 The weight by percent of Smokey Hill flakes and their cortex distribution

Table 7. 4 Total debitage type by flake condition

| | Whole | Whole Split | Broken flake | Flake fragment | Chunk/Shatter | Total | % | non ind % |
|-----------------------|-------|-------------|--------------|----------------|---------------|-------|------|-----------|
| DFP core | 3 | 0 | 3 | 3 | 1 | 10 | 1.4 | 2.1 |
| Core edge prep | 66 | 6 | 23 | 18 | 0 | 113 | 16 | 24.1 |
| Alternate | 33 | 0 | 2 | 4 | 1 | 40 | 5.6 | 8.5 |
| Biface thinning | 56 | 4 | 44 | 52 | 0 | 156 | 22.1 | 33.3 |
| Biface shaping | 82 | 9 | 26 | 12 | 0 | 129 | 18.3 | 27.5 |
| Tool spall | 2 | 2 | 0 | 1 | 3 | 8 | 1.1 | 1.7 |
| Uniface maint/rejuv | 4 | 0 | 0 | 2 | 0 | 6 | 0.8 | 1.2 |
| other | 3 | 0 | 1 | 1 | 1 | 6 | 0.8 | 1.2 |
| Indetere/nondesc ript | 2 | 0 | 4 | 156 | 74 | 236 | 33.5 | |

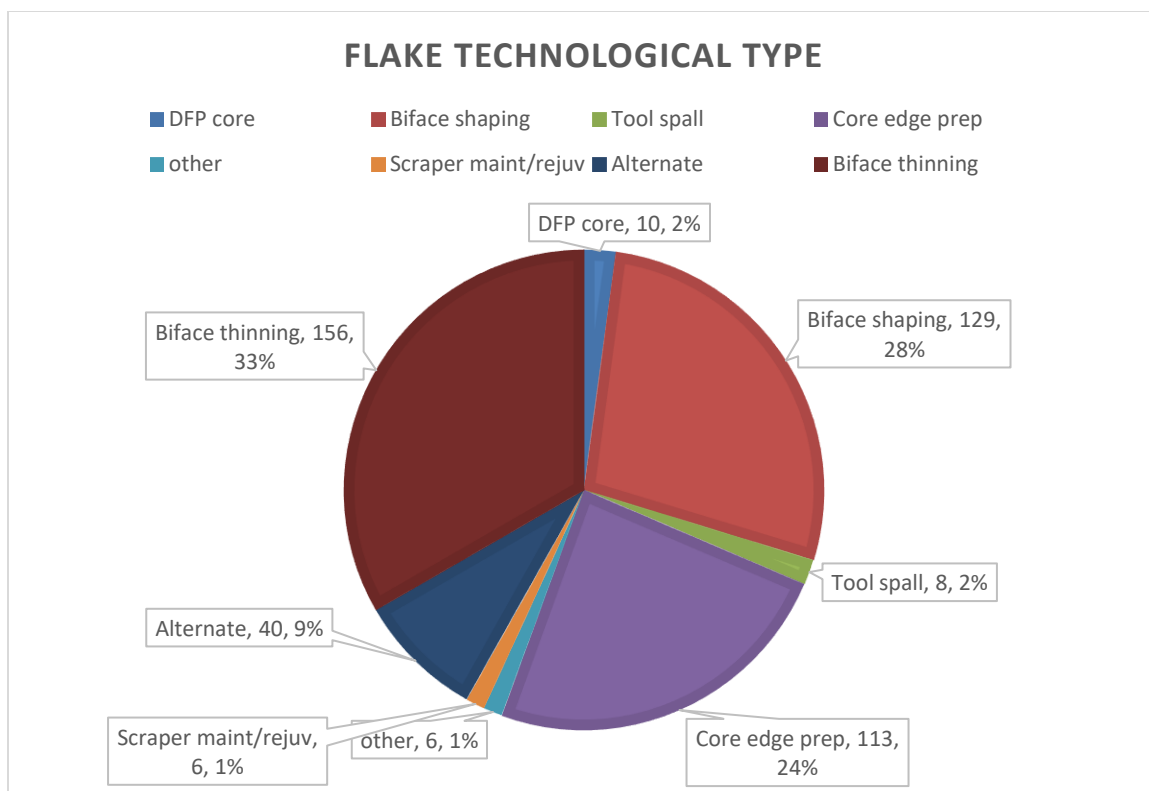


Figure 7.3 Flake technology type of the debitage of the Spring Creek Site Archaic component

A large number of flakes ($n=236$) were classified as indeterminate, at 33% of the flake assemblage. This was expected since not all detachments from a core/tool retain sufficient or distinctive characteristics in order to make an inference about the technological type. In some cases, flakes were considered indeterminate due to damage either in prehistoric times, especially from fire, or more recently by excavation or laboratory damage. Many of these unclassifiable items consist either of flake fragments ($n=156$) or chunk/shatter ($n=74$), both of which the reduction process is difficult to determine (Figure 7.3). Without an identifiable platform along with other characteristics for which flake type can be known, it is placed within the indeterminate. This can also be

because there is a tendency for more items to be indeterminate either during early reduction stages or later when items may have been damaged by fire or post-depositional processes.

Excluding indeterminate or nondescript debitage, the predominate identifiable flake type within the Spring Creek Archaic assemblage are those of biface thinning flakes, accounting for 33.3% by count. Other than biface thinning flakes, the other high production flakes were biface shaping at 27.5% and core edge prep a 24.1%. These two types had a higher number of flakes that were whole, as opposed to fragments, which might be due to the means of detachment, which involves the amount of force. Alternate flakes totaled 8% and DFP core at 2%, followed by scraper maintenance, tool spall, and other at 1%. One of the other flakes was a pot lid fragment and some were bending breaks off bifaces. Overall, the flakes reflect a heavy emphasis on biface reduction especially compared to simple core reduction to produce flakes. There is not only a high proportion of biface thinning flakes but also biface shaping flakes, with many of these likely from resharpening.

Table 7.5 Platform type of the debitage of the Spring Creek Archaic component

| Platform Type | Count | Percent |
|-----------------------|--------------|----------------|
| Cortex | 2 | 0.04 |
| Single Scar | 122 | 26 |
| Double Scar | 23 | 4 |
| Faceted/multiple scar | 151 | 32 |
| Crushed | 70 | 14 |
| None | 100 | 21 |
| Total | 466 | |

Table 7.6 The Platform for each technological flake type of the Archaic assemblage

| Flake Type | cortex | Single Scar | Double scar | Faceted/multiple scar | crushed | none |
|-------------------|---------------|--------------------|--------------------|------------------------------|----------------|-------------|
| Alternate | 0 | 30 | 2 | 0 | 4 | 4 |
| Biface shaping | 0 | 31 | 5 | 56 | 24 | 13 |
| Biface Thinning | 1 | 14 | 5 | 60 | 26 | 50 |
| Core Edge Prep | 1 | 37 | 11 | 29 | 13 | 22 |
| DFP Core | 0 | 2 | 0 | 2 | 1 | 5 |
| Other | 0 | 2 | 0 | 2 | 0 | 2 |
| Scraper Maint | 0 | 2 | 0 | 1 | 2 | 1 |
| Tool Spall | 0 | 4 | 0 | 1 | 0 | 3 |
| TOTAL | 2 | 122 | 23 | 151 | 70 | 100 |
| TOTAL % | 0.04 | 26 | 4 | 32 | 14 | 21 |

Flake detachments were made on varied platforms with faceted/multiple scars, with the most frequent at 32% (n=151), which conforms with the number of biface thinning and shaping flakes. Single Scar platform type makes up 26% (n=122), which correlates with alternate and core edge prep flake types. Crushed platforms total 14% (n=70) with most identified as biface shaping, biface thinning, and core edge preparation flakes. Crushing of the platform can happen when the knapper hits the core too hard or too close to the edge, thereby producing thin flakes; the type of raw material being used also plays a role in this.

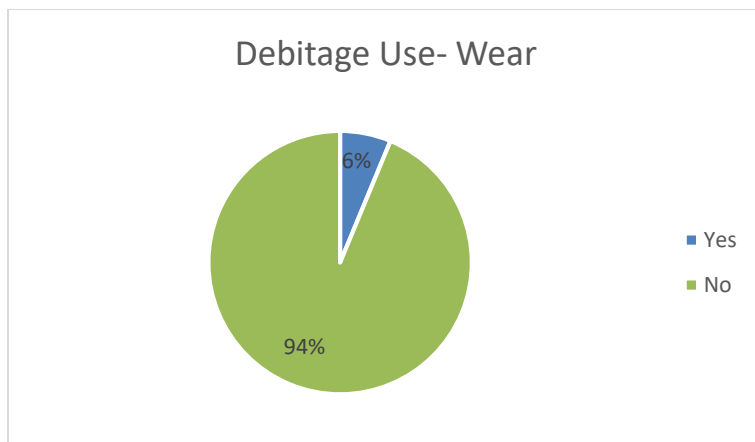


Figure 7.4 The use-wear found ondebitage

There are several confounding issues with trying to identify use-wear traces on the Spring Creek flakes. One of the bigger issues is the extent of weathering to the raw material and accumulation of what appears to be some sort of precipitated residue on many of the flakes, which appears as a shiny nail polish-like or resin accretion. This accretion was usually restricted to one surface rather than both faces and not on all flakes; it predates artifact labeling since it was present on some labeled surfaces as well as surfaces lacking labels. It made use-wear characterization hard to undertake and would need to be removed for an adequate use-wear analysis. In addition to this issue is recent edge damage, especially to thinner flakes, along with that resulting from excavation trowel retouch and rough handling. The recent damage was easily detected in almost all cases owing to the “fresh” appearance of the resulting flake scars.

Identifying use-wear on flakes and tools is a difficult task even in the best of circumstances. The Archaic component of the Spring Creek site is not one of these as alluded to earlier. My attempt at use-wear identification was restricted to a low power approach using a dissecting microscope with a maximum magnification of 45x. Identification was aided by some experience with flintknapping and with using tools for different purposes to understand what micro-flaking patterns result from tasks such as

scraping, cutting, or sawing. Even at low power it was possible to see polish or striations, if tools have been well used but this depends on the raw material. I identified 44 of the 704 flakes or 6% as exhibiting bonafide use-wear that was patterned and not resulting from recent damage.

Flaked Tools

I identified a total of 134 flake stone tools in the Spring Creek Archaic lithic assemblage. Consistent with the total number of flakes, most of the tools (91%, n=122) were also made of local Smokey Hill silicified chalk (Figure 7.5). Non-local material was poorly represented within the tool assemblage and occurred as small end-of-life tools. Most of the 134 tools were of a higher quality material, but some of the SHSC exhibited extreme weathering and desilicification that resulted in the material breaking up and swelling; this made some of the variables difficult to examine (Figure 7.21).

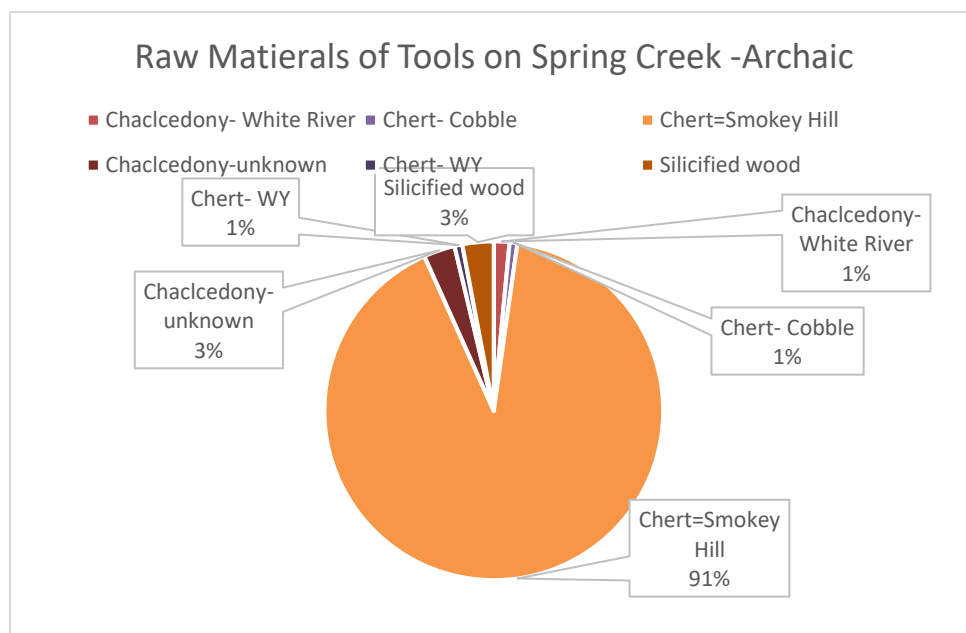


Figure 7.5 The raw materials of tools on Spring Creek within the Archaic component

The different types of conditions and the use-phase of the flaked tools are presented in Table 7.7. The majority of tools (65%) are classified as the category *finished and used but broken or exhausted*, an inference made by the lithic analyst. A high incidence of broken or exhausted tools is expected at a base camp where tools were used and repaired with unserviceable items discarded as trash before moving on to a new site location. Tools classifiable as *finished and used but whole and unexhausted* represent 12%. These are items that are whole and seem serviceable but were not transported to the next place. They might represent inadvertent losses (such as at least two whole points), items that fulfilled their tasks (many of the retouched flakes), items that did not work well or some other reason. Tools classified as *unfinished and unused* totaled 11% (n=15), and represent the items that were discarded prior to completion or use in some cases because of breakage. For seven of these whole items, completion was arrested possibly due to factors like poor material inclusions or incipient fracture planes or other issues. Included in this group are four bifaces identified as projectile point preforms.

Table 7.7 Condition and use-phase assessment of the flaked facial tools from the Spring Creek Site Archaic component

| Condition | Indeterminate | Unfinished & Unused | Unfinished but Used | Finished & Used but Whole & Unexhausted | Finished & Used but Broken or Exhausted |
|------------------|----------------------|--------------------------------|----------------------------|--|--|
| Indeterminate | 2 | 0 | 0 | 0 | 1 |
| Fragment-NFS | 4 | 1 | 0 | 0 | 2 |
| Margin fragment | 0 | 0 | 1 | 0 | 1 |
| Corner fragment | 0 | 2 | 1 | 0 | 4 |
| <1/3 base | 0 | 1 | | 2 | 7 |
| <1/3 terminal | 2 | 1 | 2 | 0 | 5 |
| <1/3 tip | 0 | 0 | 0 | 0 | 8 |
| >1/3 base | 0 | 0 | 0 | 0 | 6 |
| >1/3 terminal | 0 | 2 | 0 | 0 | 1 |
| >1/3 tip | 0 | 0 | 0 | 0 | 5 |
| Nearly complete | 0 | 1 | 1 | 3 | 18 |
| Complete | 0 | 7 | 3 | 11 | 29 |
| TOTAL | 8 | 15 | 8 | 16 | 87 |
| % | 5.9 | 11.1 | 5.9 | 11.9 | 64.9 |

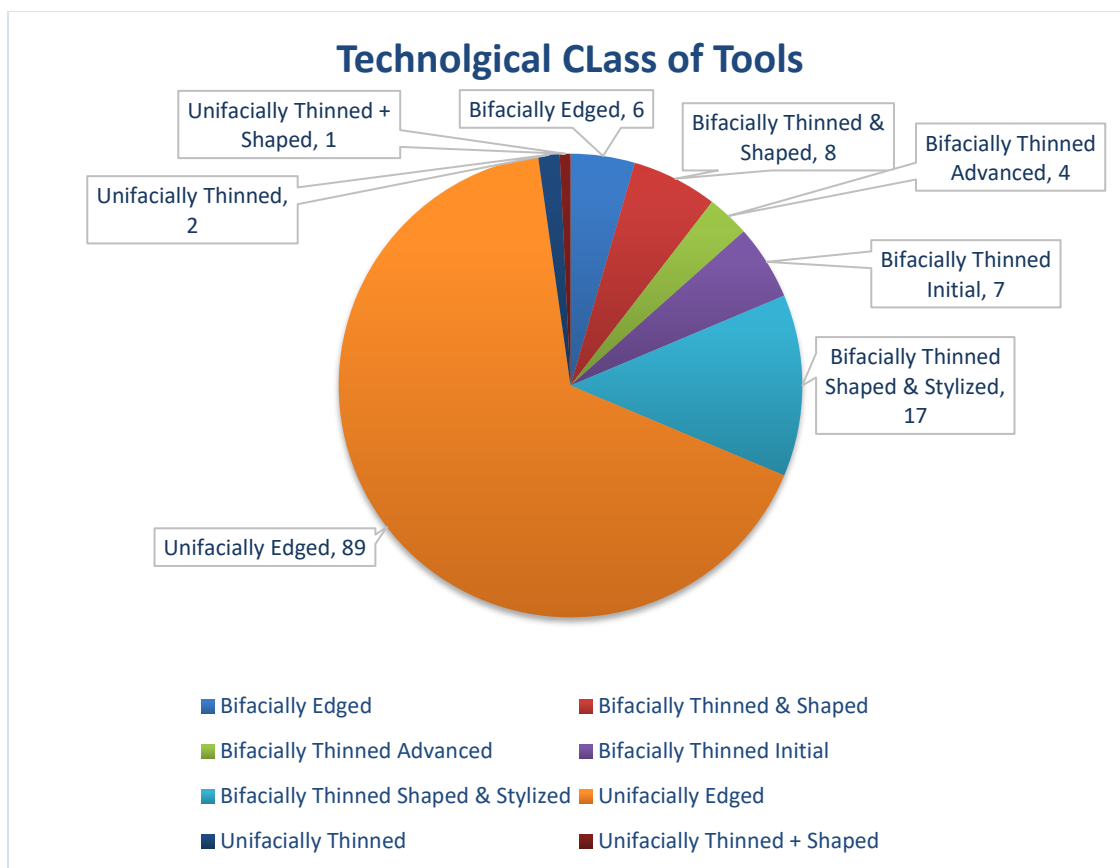


Figure 7.6 Technological class of tools Spring Creek Site Archaic component

Table 7.8 Technological class by reduction technique for the flake facial tools from the Spring Creek Archaic component

| Technological Class | Percussion Flaking | % | Pressure Flaking | % | Total |
|--------------------------------------|--------------------|------|------------------|------|-------|
| Unifacially Edged | 3 | 3.3 | 86 | 96.6 | 89 |
| Unifacially Thinned | 0 | 0 | 2 | 100 | 2 |
| Unifacially Thinned + Shaped | 0 | 0 | 1 | 100 | 1 |
| Bifacially Edged | 0 | 0 | 6 | 100 | 6 |
| Bifacially Thinned Initial | 3 | 42.8 | 5 | 71.4 | 7 |
| Bifacially Thinned Advanced | 2 | 50 | 2 | 50 | 4 |
| Bifacially Thinned & Shaped | 1 | 12.5 | 7 | 80 | 8 |
| Bifacially Thinned Shaped & Stylized | 1 | 5.8 | 17 | 100 | 17 |

The flaked tools were produced by either unifacial or bifacial flaking, with the majority consisting of unifacially worked items 69% (n=92). The tools produced by unidirectional marginal retouch (unifacially edged) have the lowest level of investment, whereas the bifacially thinned, shaped and stylized items (projectile points) have the highest level of knapper investment. The flaking method used to produce tools included percussion and pressure with the latter accounting for the vast majority of the Archaic assemblage. No items were identified as reflecting bipolar technology at the site. The unifacially edged technological class (66% of the collection, n=89) was mostly made with pressure flaking (Figure 7.6 & Table 7.8). The next largest class of items is the bifacially thinned, shaped and stylized at 13% (n=17) of the collection, with all but one of these were made by pressure flaking. In this collection most of the tools were produced by pressure flaking.

Table 7.9 Blank morphology by technological class of the flaked facial tools from Spring Creek Archaic component

| Technological Class | Biface flake | DFP flake | Flake-NFS | Indeterminate | Total |
|--------------------------------------|---------------------|------------------|------------------|----------------------|--------------|
| Unifacially Edged | 23 | 8 | 45 | 13 | 89 |
| Unifacially Thinned | 1 | 0 | 1 | 0 | 2 |
| Unifacially Thinned + Shaped | 0 | 0 | 0 | 1 | 1 |
| Bifacially Edged | 2 | 2 | 1 | 1 | 6 |
| Bifacially Thinned Initial | 0 | 0 | 2 | 5 | 7 |
| Bifacially Thinned Advanced | 0 | 0 | 0 | 4 | 4 |
| Bifacially Thinned & Shaped | 0 | 0 | 4 | 4 | 8 |
| Bifacially Thinned Shaped & Stylized | 1 | 1 | 6 | 9 | 17 |
| TOTAL | 27 | 11 | 59 | 37 | 134 |

Blank morphology as technological class in Table 7.9 shows that 72% (n=97) of the tools in the Spring Creek Archaic component were produced on flake blanks. These are tools that retained obvious traces of ventral or dorsal characteristics because they had not been extensively flaked. Flakes detached from bifaces were commonly used (25%) to make tools, especially unifacially edged ones. Based on overall thinness it seems likely that more tools could have been from biface flakes but retouching or breakage removed features that allow such an inference; hence 44% are made on flakes of indeterminate type. Blank morphology was indeterminate for 27% because extensive flaking removed all diagnostic features of pre-tool morphology.

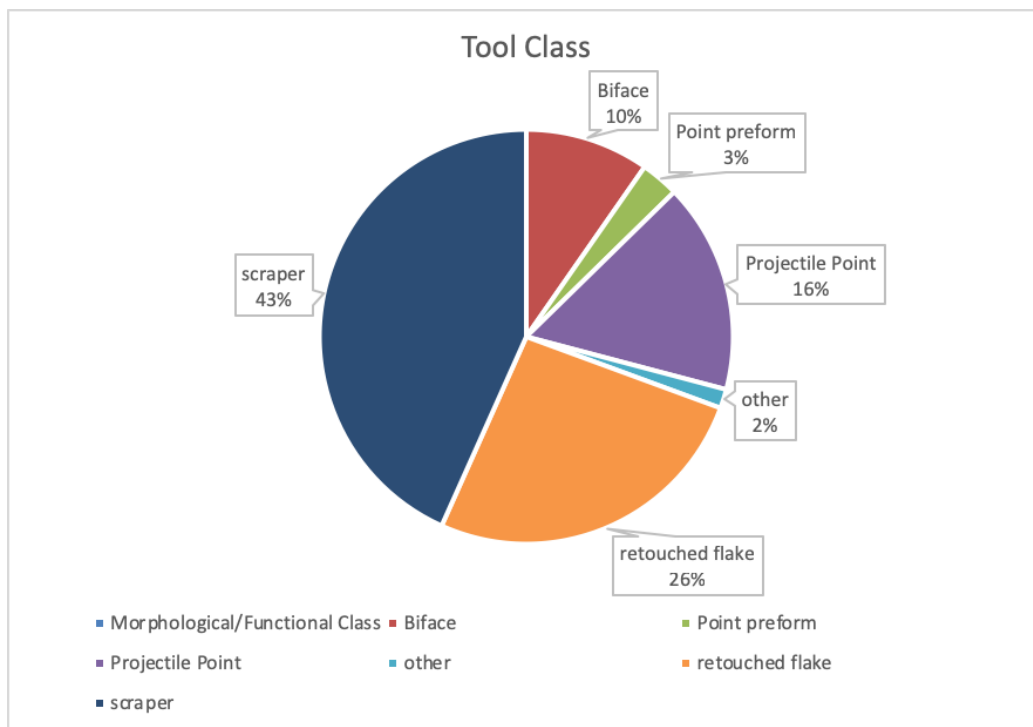


Figure 7.7 The tool classes of the Spring Creek Archaic component

Based on a general classification of morphological type, scrapers are the most common tool in the Archaic assemblage at 43% (n=58). The scraper subclasses (Table 6) totaled 10 end scrapers, 31 side scrapers, and 27 not further specifiable. The latter includes tool fragments that could not be distinguished as either end or side scraper. Retouched flakes comprised 26% of the assemblage (n=35). Projectile Points comprised 16% (n=22), which were grouped in the subclasses of Side Notched at 7, Corner Notched at 1, Logan Creek at 5, and 9 lacking specification. There were four point preforms that were in the process of being formed but were unfinished and perhaps never could be finished because of major section symmetry. Bifaces other than the projectile points and point preforms totaled 10% (n=13) and these were classified into reduction stages 1-4, as specified by Whittaker (1994) where Stage 1 is an edged biface (n=2), Stage 2 is an initially thinned biface with (n=5), Stage 3 is an advanced thinned biface (n=3), and Stage 4 is an thinned and shaped biface (n=3).

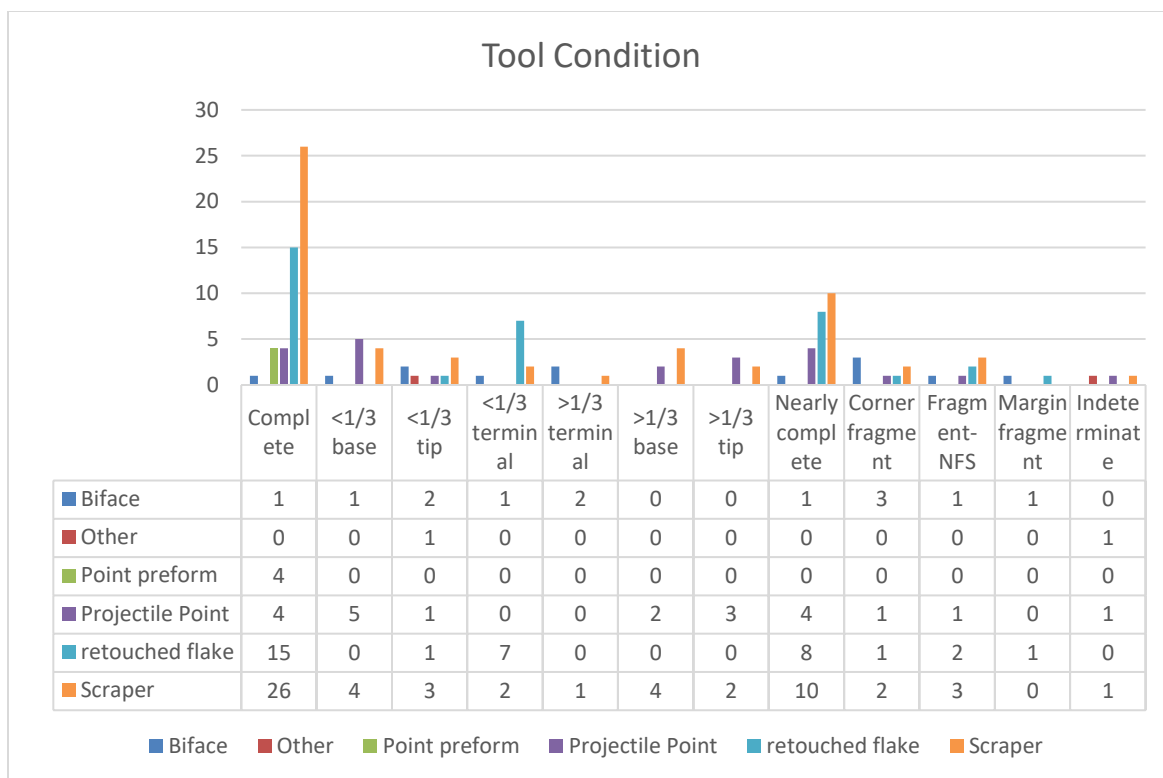


Figure 7.8 The tool condition of each tool morphological type

In terms of tool condition, I identified 50 as complete and 23 nearly complete with the rest consisting of various fragments. There were only 3 indeterminate tools that could not be assigned a certain condition and burning was a factor as well. In what follows, I discuss each of the morphological types more specifically.

Retouched Flakes

Flakes with no obvious tool form and with flaking on at least one edge were classified as retouched flakes. Function might be clearly evident in use-wear but cannot be inferred in morphology.

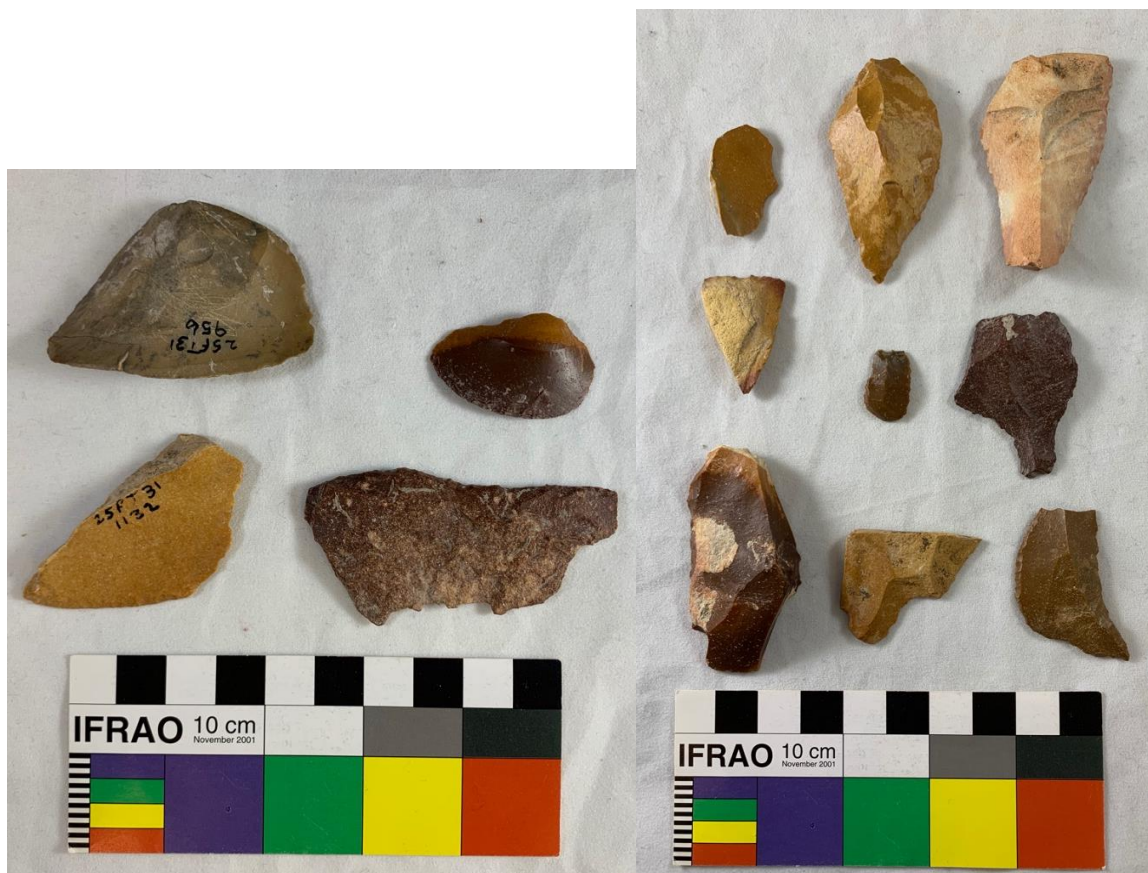


Figure 7.9 Retouched flakes from the Spring Creek Site Archaic component (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Scrapers

Scrapers comprise the largest proportion (43%) of the Archaic tool collection, with a total of 58. They were grouped into different subclasses based upon which portion of the flake blank had been retouched to form the tool edge: side or end. Figure 7.10 shows examples of these which include end, side, and unspecified. The Spring Creek assemblage does not have any examples of the side-notched hafted scrapers that occur at Logan Creek or Simonsen. This pattern could be an indication of somewhat distinct regional forager bands.

Some of the end scrapers (Figure 7.11) are quite small and clearly at the “end of life” and hence discarded as “trash”. A few of these are of Hartville Uplift chert a non-local raw material that comes out of Wyoming. Other scrapers were likely made quickly with minimal flaked edging (Figure 7.12). Some scrapers had whole sides that were flaked, or almost the whole blank, but others had only few retouch flakes removed. The smaller end scrapers were well flaked and are typical of the classic “hide scraper” shape. Some scrapers were not flat, but had a curve due to the flaking process or from use-wear. This was seen on the corner or part of the edge. There are both distal (working edge) and proximal (haft area) portions of end scrapers with transverse breaks initiated by bending stresses. One example of a distal portion is shown in Figure 7. 11 while Figure 7.13 shows two examples of the proximal haft portions.



Figure 7.10 Scrapers from the Spring Creek Archaic component (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)



Figure 7.11 End scrapers of non-local materials and non SHSC raw material (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)



Figure 7.12 Unifacial edged scrapers from the Spring Creek site (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)



Figure 7.13 Retouched flake blanks identified as the proximal haft portions of end scrapers (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Bifaces

Bifaces are tools that were flaked on both faces, often to achieve tool thinning and some symmetry with shaping in the later stages of production. If a thin tool such as a knife blade or projectile point is desired then it can be helpful to start with a thin flake blank, but depending on raw material and curve of flake, it can be more difficult to finish the biface. The thinning and shaping of a biface are conceptualized as occurring stages, and according to Callahan's (1979) model, each step in the process gets more complex and requires more time. The first step in his model is a flake blank or nodule of raw material. I followed Whittaker's (1994) stages, as an item needs to be flaked to be considered a tool. Whittaker's stage 5, which is notched biface, was not used, since I considered these projectile points, discussed below in the next part.

Table 7.10 Characteristics of the four biface stages recognized in this analysis (Whittaker 1994)

| |
|--|
| <p>Stage 1- Bifacially Edged: Nodules or flake blanks that have flake scars on both faces that were removed most common with percussion but some pressure on thinner blanks. Thinning is not started or very limited. Some cortex on at least one side.</p> |
| <p>Stage 2- Bifacially Thinned, Initial: Bifaces with major cross section irregularities removed. Thinning has started and are flatter than stage 2. Most of the cortex is removed</p> |
| <p>Stage 3- Bifacially Thinned, Advanced: Flake scars commonly extend past the midsection. Symmetry is well established.</p> |
| <p>Stage 4- Bifacially Thinned and Shaped: Flakes are smooth and flat. Flake scars past midsections and short scars with pressure and percussion. Edges are regularized and sharpened.</p> |

I identified a total of 13 bifaces from the Archaic component of the Spring Creek Site that reflect a mix of reduction stages: Two bifaces within Stage 1, five in Stage 2 and three in both Stage 3 and Stage 4. One of the Stage 3 bifaces shown in Figure 7.14 reveals the size for facially thinned tools that the Archaic foragers were producing. This item is a corner fragment that has a broken width of 62.4 mm and weighed 72.7 g. The cross-section of this item indicates that the longitudinal break occurred past the midline so it probably had an original width of 140 mm. Thinning flakes removed from such a large biface as it transitions from Stage 2 to 3 are just the sort that got used for many of

the retouched flake tools. This tool also appears used so it seems to exemplify Kelly's (1998) argument about the multiple utility of large bifaces.



Figure 7. 14 A biface from Spring Creek site (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)



Figure 7.15 Some of the bifaces from Spring Creek site (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)



Figure 7.16 Broken biface (#1327) in Stage 3, one of the larger tools from the archaic component (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Projectile Point Preforms

Four bifaces were different from the rest and classified as projectile point preforms (Figure 7.17). Grange (1980) had classified these items as projectile points and specifically identified them as lanceolate points, however they were not completely finished. Two are made on flake banks with large bulbs of percussion that the knapper tried to flake away but failed in doing so, leaving a thick and misshaped cross section. Additionally, they were not fully shaped or stylized, like the other points from Spring Creek and other Early Archaic sites. The thinning phase was not complete and some had flake blank surfaces still not removed. Others appeared to be in mid-production, resulting from issues with finishing the tools, the knapper's lack of experience in tool production,

or issues with the raw material during flaking. At least three of these appear to be the work of someone who was rather inexperienced in point production. This might be expected at a residential camp where novice flintknappers were learning the craft. All the bifaces were of SHSC and three had cortex on them. Three of them had burning present, that could have occurred during the flintknapping process.



Figure 7.17 Bifaces identified as projectile point preforms from the Spring Creek Site Archaic component (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Projectile Points

The projectile points from the Archaic component of the Spring Creek site fit the overall typical pattern of Early Archaic projectile points on the Great Plains in that they are side notched and often with a somewhat concave base, though at least one has a

relatively flat base. Grange (1980) reported them as side-notched, corner notched and his inaccurate typology of lanceolate points. The lanceolate examples that were just discussed have examples of finished products within the Spring Creek assemblage. If the lanceolate points had been finished then it is likely they would have been sided notched. Two of them show evidence of heat treatment during the manufacturing process and one is burned.



Figure 7.18 Projectile points from the Spring Creek site (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Logan Creek Projectile Point

The Logan Creek Complex point type is derived from the Logan Creek Site in Nebraska during the Early Archaic, as seen in figure 5.1 and 5.2. The Logan Creek points are concave-based, side-notched and triangular in body shape.



Figure 7.19 Logan Creek points from the Spring Creek site (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Side-Notched Projectile Point

The side-notched subclass includes a point that could not be positively identified as Logan Creek type (Figure 7.18b), since it was broken and in the process of recycling retouch. Others were not of the Logan Creek type, but of a non-named side-notched point. At other sites in the Early Archaic on the plains most are called simply side-notched, while some are called “name of site” side-notched, but the typologies are not fully described.



Figure 7.20 Side-Notched projectile points from the Spring Creek Archaic component (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Corner Notched Projectile Point



Figure 7.21 Corner notched base point from the Spring Creek Site Archaic component (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

There was only one corner notched base in the collection for the Archaic component. The location of this point is in an area without a grid system and was collected before the machinery destroyed the area, are therefore could have been from another occupation time period.



Figure 7. 22 Radial tool breaks (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

One type of distinct tool fragment are those with radial breaks as seen in Figure 7. 22. It was not possible to tell if the pointed tip of the breaks had been used as an engraver. This shows the possibility that more than just hunting and processing was done on site. Another different type of tool is one that looks like two tiny axes together with notches. It has two notches in the middle (Figure 7.21). The two side thin edges have flaking and the middle has a blub in the middle between the notches.



Figure 7.23 A unknown type of tool with notches and flaking on edges (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Cores

There were three cores found within the site, but none match up to typical cores since all are small and two have heat damage, which make it difficult to discern flaking patterns. Two are of SHSC and one is plate chalcedony. Two were found in extra excavation area 6 and the other in excavation area 4. They weigh 31.5 g and 8.5 g for the SHSC cores and 10.9 g for the chalcedony piece.



Figure 7.24 Cores from Spring Creek Archaic component (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Cortex and Heat Treatment

Cortex was present on relatively few tools except for those of SHSC; 18 of the latter had in situ cortex on them. Alluvial cobble cortex occurred on a tool of chalcedony and two of chert. This pattern is an indication of the foragers using biface technology to move raw materials into new camps, reducing the amount of weight they carried over the Great Plains.

Table 7.11 The cortex of the raw materials of the tools within the Spring Creek Archaic component

| Cortex Tools | none | alluvial | in situ |
|-------------------------|-------------|-----------------|----------------|
| Chalcedony- White River | 1 | 1 | 0 |
| Chert- Cobble | 1 | 2 | 0 |
| Smokey Hill | 104 | 0 | 18 |
| Chalcedony- Unknown | 2 | 0 | 0 |
| Chert- WY | 1 | 0 | 0 |
| Silicified wood | 4 | 0 | 0 |

Within the Spring Creek Archaic component, there was relatively little evidence for purposeful heat treatment of stone, however accidental burning of stone was rather common (10% of the tools). Heat treatment was lower, with 1% for flakes and only 2% for tools. Determining whether a specimen was heat-treated was difficult due to the color range of Smokey Hill chert and heavy weathering on some of the objects. Burning was readily apparent as pot lids, crazing and dark red and brown discoloration and exhibited raw material degradation.

Table 7.12 The thermal alteration of flakes within the Spring Creek Archaic component

| Thermal Alteration | Debitage # | % | Tool # | % |
|---------------------------|-------------------|----------|---------------|----------|
| Absent | 618 | 87.7 | 121 | 90.2 |
| Possibly heat treated | 4 | 0.05 | 0 | 0 |
| Heat treated | 9 | 1.2 | 2 | 1.4 |
| Burned | 73 | 10.3 | 11 | 8.2 |



Figure 7.25 Pictures of the SHSC weathering along with some extreme breaking up of the material (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

One of the problems with analyzing this assemblage was the poor quality of some of the material (Figure 7.27). Portions of SHSC had desilicified and expanded from the inside breaking the tools a part. There is also a weathered appearance on the surface, as these images show. There was weathering (Figure 7.25) on a large percentage of lithic flakes and tools, as well as on bison bones (Widga 2003).

Use-Wear

I examined each tool for use-wear in order to make an inference regarding the function of the tools. The use-wear on some tools was readily visible, especially on those with use-wear deposits or micro-flaking, and on scrapers and points. Points were not counted as used unless they had been broken from use (impact snapped) or recycled into a new point.

Table 7.13 The inferred function of the tools in Spring Creek Archaic component that had use-wear

| Inferred Function | Main | Second Use |
|--------------------|------|------------|
| Chopping | 1 | 0 |
| Cutting/sawing | 10 | 2 |
| Indeterminate | 6 | 1 |
| Piercing (proj pt) | 14 | 0 |
| Scraping | 51 | 1 |
| Other | 1 | 0 |
| Engraving | 0 | 1 |

Examining use-wear can reveal patterns associated with specific activities, although inferred function can be difficult to determine. Table 7.13 summarizes the primary and secondary, if any, tool function inferred from use-wear observations, with particular attention to micro-flakes, polish, or striations. Scraping was the most common inferred function, with 52 exhibiting heavy polish as a result of working dry hide. Red pigment and other residue from use-wear was also seen on some of the tools.

Grinding Tools

A reexamination of the grinding stones was also completed with basic measurements, descriptions, and photographs. Three of the grinding stones were found as a cluster in Feature 7 of Excavation Area 1, and one was found in the occupation zone (Feature 5). The grinding stones were all made of green sandstone possibly derived from the Ogallala Formation (Bijou Hills) because of the greenish coloration to the matrix. All of the tools are fragments of once larger tool forms but all had continued to be used for grinding and crushing activities. All exhibited red pigment staining on one long edge indicating that one of their roles was in crushing and preparing ochre paint. The metate (grinding slab) fragment (Figure 7.26), recovered from Feature 7, is a recycled corner

portion with a small basin and exhibits red pigment in the middle and on the edges. Both the transverse and longitudinal broken edges are abrupt, along with no abrasion or worn corner end that had been rounded through use-wear and pecking. The use-wear within the basin is oriented in the width direction. The middle has a buildup of calcium carbonate that interferes with examining use traces in the basin. The thickness differs at either end, measuring 33.2 mm at the thickest portion of the intact edge and 9.9 mm at the bottom of the basin along the broken edge. The non-basin side was also pecked, but overall was smoother than the basin. The sandstone consist of coarse to semi-coarse quartz.



Figure 7.26 Grinding slab fragment showing cross-section and both sides (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Table 7.14 Measurements for grinding tools for Spring Creek Site Archaic component

| Number | Type | Length | Width | Thick | Weight |
|--------|------|--------|-------|-------|--------|
| 1118 | Slab | 120 | 111 | 33.2 | 630 |
| 208 | Mano | 96.3 | 107.9 | 1.1 | 403.4 |
| 1119 | Mano | 88.2 | 78 | 22.8 | 317.1 |
| 1117 | Mano | 84.3 | 104.5 | 40 | 725 |

I only examined the manos that were recovered from within the buried Archaic component, since the mano collected from the surface cannot be positively placed within the Archaic occupation of the site. Mano 208 was found in Feature 5 of Excavation Area

1. It consists of coarse quartz and other grains in a greenish matrix including a large quartz pebble inclusion, as seen in Figure 7.27. A trace amount of red pigment is visible on one edge. The mano is broken but continued to be used since the broken edge is rounded over from use in abrasion.



Figure 7.27 Mano #208 both sides (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Mano #1119 was found in Feature 7 and is made of coarse quartz and sandstone, that is well cemented with a green silica matrix. It also has red pigment on an edge and also in the middle on one face (Figure 7.28). This mano is broken but like the other ones continued to be used resulting in use rounding of the edge. It also had spalls detached on the three sides of the edges along on one face. These detachments seem fortuitous and occurred from use of the tool as a hammer for crushing something. Within this site context, likely activity would be breaking long bones to extract marrow, as all the long bones had showed impact fractures (Widga 2003).



Figure 7.28 Mano #1119 tool (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Mano #1117 was found in Feature 7 as well and consists of semi-coarse to coarse quartz and feldspars grains. This mano is 40 mm thick and very heavy (725 g) yet is just a portion of the original tool. There is red pigment residue on one edge and it exhibits grinding striations from use in one direction on one face.



Figure 7.29 Mano #1117 both sides of the tool (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Raw Material Overall Assemblage

Both the flakes and the tools were produced from different types of lithic materials, although most are derived from sources in close proximity to the site. The raw material within the collection was predominantly Smokey Hill Silicified Chalk (Republican River Jasper) (Figure 7.29). SHSC ranges in quality and color, often in the yellow or brown, but also occurring as pink, green, and white varieties. Holen (1991:401) argued for Smokey Hill Silicified Chalk as the name for the raw material because it has been called many names: Republican River jasper, Graham jasper, Niobraraite, Niobrara jasper, Alma, Smokey hill jasper (Banks 1990:96; Wedel 1986:28; Wright 1985). SHSC can be found (Figure 7.28) in south-central Nebraska and north central Kansas. It is part of the Niobraraite formation of the Upper Cretaceous series (Stein 2004). Hattin (1982) stated that Smokey Hill was made up of fossil remains of fish, mosasaurs, plesiosaurs, turtles, pterosaurs, birds, and dinosaurs and the least weathered chalk is olive green, dark olive gray or olive blank, while weathered pieces turns shades of yellow, orange, or brown.

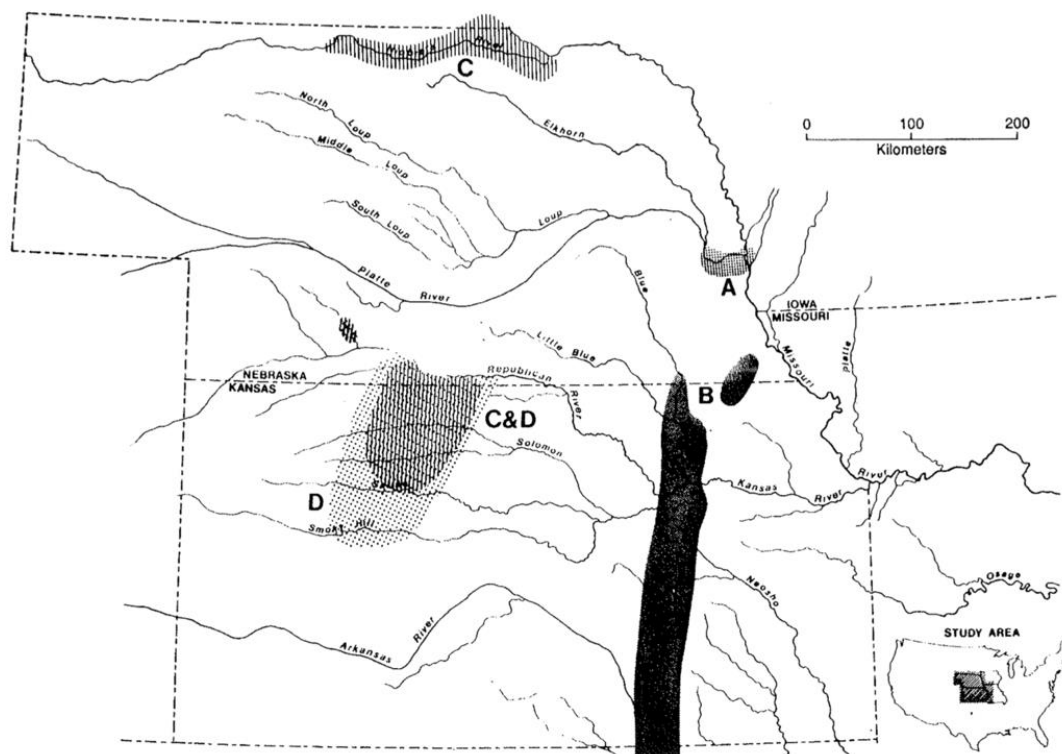


Figure 7. 30 The area of local raw material near the site from Holen (1991: 400)

A. Pennsylvaniaian chert, B. Permian chert, C. Ogallala Formation quartzite, D. Smokey Hill silicified chalk



Figure 7.31 The color range of Smokey Hill Silicified Chalk found at the Spring Creek Archaic component (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

The grinding stones might be from the Ogallala formation silicified sediment (Quartzite) which can be found in north central Nebraska and south-central South Dakota. It is green, greenish brown or greenish-gray silicified sand found in the lower part of the Ogallala formation. It is fine grained quartzite to a soft sandstone but can also have coarse grains (Holen 1991:401).

Some of the tools were made from material originating outside a 50 km range, with the exhausted end scrapers made out of high-quality chert or chalcedony from Wyoming.

Discussion

From this analysis of lithic material, tools, and debitage types I can attempt to answer the research questions regarding site function, diet diversity, and geographic range for the Early Archaic on the Great Plains.

Site Function

The results of lithic analysis suggest the Archaic component of the Spring Creek site served as a camp to process the bison that were killed nearby. The lithic debitage exhibits characteristics of biface manufacturing, including biface thinning and shaping, which are processes employed in the production of bifaces, projectile points, and point preforms. The relative abundance of scrapers in the Spring Creek Archaic assemblage points to the occurrence of hide processing, which would have been a primary activity due to the presence of 13 bison on the site during this one time period. The grinding stone tools also bring some important aspects into the record as they were cached within Feature 7. The most interesting parts of the grinding tools are the amount of use-wear present on the surfaces, and that they are all fragments with red ochre on them.

The repair of broken hunting tools is an activity that occurred at the Spring Creek site, as demonstrated by the presence of many points with broken bases, missing ears, and missing tips (Figure 7.30). The dart foreshafts and main shafts would have been collected from the killed bison or other animals, and then brought back to camp where broken

points would have been cleaned out and repaired back into darts. The size of these broken points range from very small to over half a base of a possible point. Point fragments of sufficient size were probably re-utilized or recycled as needed but some were damaged beyond reworking. Tip portions could have been recovered when butchering animals and cutting meat up for consumption or drying.



Figure 7.32 Broken projectile points from Spring Creek Site Archaic component (Photo by author, collection of the U.S. Department of Interior, Bureau of Reclamation)

Scrapers were abundant on the site, indicating that it served not only as a kill site, but also where the processing of bison hides occurred. Research has found that end-scrapers have been used around the world to work hide, bone, wood, and antler (Dumont 1983; Meltzer 1981). Siegal (1984) found that end-scrapers from two collections were mostly used on wood rather than hide. Therefore, with these studies in mind, the true function of scrapers from Spring Creek cannot be known for certain, although it seems likely they were used for processing bison hide due to the large amount of bison remains

on site. Moreover, some of the scrapers exhibited use wear that seemed typical of hide scrapers (Hayden 1979).

Bifaces make up 10% of tool types at the site, and a large amount of biface thinning flakes was reported as well. Bifaces are a flexible tool form that can be used for different purposes (Odell 1981). Andrefsky (1993) and Bamforth (1991) agree that bifaces are not only flexible but also portable and can be transported to new camps. If Spring Creek served as a field camp, then it would be likely that even with the local sources of chert available in all the creeks and rivers around the site, they were making bifaces for their next move or trying to find good raw material to take with them. They also likely produced bifaces to be used in the processing of bison.

Based on Binford's (1980) study regarding the mobility of people and their subsistence strategy, it seems that Spring Creek might be considered a foraging camp, where the site's occupants moved to the bison camp for a short time, then following a creek, carried local raw materials to their next location. Chatters (1987) suggests that tool diversity should be higher at base camps and residence camps than at field camps due to the greater diversity of activities occurring on each site. The Hawken site is a good example of a bison kill site and its limited tools. Andrefsky (2005:222-223) is not an advocate for interpretations into tool functions, as the archaeological and ethnographic records show that tools could have different functions throughout their use lives through resharpening and use-wear. If the individual artifacts and information about them can be determined with some confidence, it is easier to make an interpretation about site function.

The grinding stones also reveal an interesting insight into site function, since there must have been a reasonable benefit in carrying these heavy stone tools over the landscape. The examples from Spring Creek are made of raw material not found in the area. All four of them had been broken but continued to be used and were clearly still functional. Therefore, why were they left behind? Did foragers carry more of these tools to the next site and thus the broken ones were no longer needed? In this environment stones like this are at a premium and are valuable, so it is far more likely that they were cached for future use rather than simply discarded. The grinding slab had extensive use-wear in its basin and other surfaces indicating it was used heavily for some purposes over its use-life. The grinding slabs were left in a cluster (Feature 7), indicating they were likely cached for future use, or possibly that they were working in this area and decided they did not want the burden of transporting them to the next base camp. Feature 7 is also set off a bit from the bison butchering location and the hearths/fire pits. Given this relatively large number of grinding tools, it is more likely that this site served as a base camp. Besides red pigment, it is unknown whether they were grinding seeds or crushing bones. The use traces on the tools support use in seed grinding, although it also seems evident from the removal of percussion spalls that the tools were used in heavy percussion work, such as bone crushing. The importance of carrying these items over the landscape only to purposefully deposit them in one spot is yet to be determined. The grinding stones may have served as “site furniture,” which are items meant to be used again and thus are deliberately positioned in a very specific location at a commonly returned to site (Binford 1978a).

Grange (1980) notes that since the site was in a borrow pit, it was hard to determine the occupation fully. Most of the terrace area had a small layer of stained soil with sporadic hearths and piles of bison bone throughout. The lack of clearly stratified levels indicates that the site may have been occupied over a few weeks at one time, a duration that is consistent with that of a base camp. There was no evidence of shelters or structures other than hearths and a possible storage pit. A total of 64 hearths were present at the site, and with an estimated five people for each hearth, between 300 and 600 people could have occupied the site. According to Grange (1980:160), “. . .the food resources reflected by the faunal remains could have supported them for a period of two to four months.” Grange admits that this estimate is highly speculative but it serves as a hypothesis that can be examined based on the lithic assemblage. Given what archaeologists have commonly thought about the social group size of pre-horse foragers on the Great Plains, perhaps especially during the warm and dry Middle Holocene, 300-600 people would have come from a large region surrounding Spring Creek. This seems like a large number of people given the time period yet most of the raw material was local, with little from distant areas. If this site was used for a special event before winter started with various regional bands of gatherers coming together, one expectation would be that lithic raw materials would be relatively diverse reflecting the other areas of where the assemble people came from. The only tools made of non-local raw materials are the exhausted scrapers, which serve as scant evidence of nonlocal groups. Missing are materials from eastern Nebraska or South and North Dakota or more materials from Wyoming or Colorado. One possibility is that the area that was excavated was occupied by the local population and the other parts of the site were occupied by other groups of

people from more distant areas. Regarding the scrapers of nonlocal material, they point towards a women-associated activity. Another hypothesis to account for this pattern is that the women came from other bands from Wyoming to join in marriage with this new group.

The site was used to not only butcher the bison and process bone grease with the grinding stones, but also to perform hide processing. Unfortunately, this site was not completely excavated but based on the material remains from the section that was dug, the site was likely a camp for a small family group getting ready for the next season of winter.

Diet Diversity

An accurate reconstruction of plant and animal resource distributions for the Middle Holocene on the Great Plains does not yet exist. Douglas (2015) starts to answer plant use with use-wear on chipped stone tools from Coffey site in Kansas and the possible use of plant processing during the Archaic. It is possible that the Great Plains lacked the extensive stands of seed-producing plants edible by humans as in the Great Basin and the Southwest, but more importantly, based on optimal foraging theory, the plains likely had higher paying resource options. Grinding tools start to appear during the early Archaic, including the Spring Creek site, but their representation is minor compared to sites both west and east of the Great Plains. Another significant difference is that the examples present at the Spring Creek site are massive compared to typical examples of the Great Basin and Southwest, at least for manos. In those regions manos are typically small and light and easily fit in one hand. The Spring Creek Archaic manos are large and

heavy and seem well suited for crushing and percussion such as might occur with cracking open bison bone.

Occupants of the Spring Creek site, as well as all sites except for Hawken, incorporated different species into their diet in addition to bison. Based on Optimal Foraging Theory it should be no wonder why the energy used for spent ratio with calories from bison make much better use of those calories. According to Widga (2004:28), “while a total of 15 different species are represented in the Archaic portion of the Spring Creek faunal assemblage, non-bison species represent a small proportion of the overall NISP (13.7 percent).” Despite the warming and drying of the Middle Holocene which caused major environmental impacts on humans and animal species, bison continued to comprise a very large percent of the forager diet during this interval.

Range

An estimation of forager range relies on information about the locations of lithic sources. Lithic manufacture on this site is making use of local sources or by well-worn hafted tools appearing to come from distant sources. The rest of the tools and debitage were obtained from the local source of Smokey Hill Silicified Chalk, located in the Republican River basin and northern Kansas, just south of the Spring Creek site. The Spring Creek site compares to the other Early Archaic with more local raw material than other time periods, but even higher at 91%. The material sources of the tools as well as the debitage are within 80 km (50 miles) of Spring Creek, if not closer since the location of SHSC is hard to determine. The local cobbles would have come from the nearby rivers and streams. A few of the tools made of different materials came from Wyoming which is

around 482 km (300 miles) away. The groundstone are possibly from areas that are around 482 km (300 miles) from the site. The presence of a diverse range of raw material points to a moderate degree of mobility across the landscape, with groups acquiring these resources either via trade networks or by frequently moving across the Plains. The biface technology in this assemblage also suggests a mobile group occupied the site.

CHAPTER 8: CONCLUSION

Future Research

Debitage was commonly ignored in lithic studies and site reports in the past, with researchers sometimes not even noting counts or the type of raw material. This has changed over the years, but since flake waste is often far more abundant than tools and represent the most common artifact recovered, archaeologists can obtain a better idea of site activities and the organization of technology by detailed analysis of this material. With experimental flintknapping and guidance from experts in lithic production and use, the ability to understand how cores were worked with flaking technology can guide type classifications and use wear for analysis.

The grinding tools from Spring Creek and other sites also need future research into what type of items were used on the stones and if use-wear can be better understood. Along the lines of Jenny Adams (2014) there needs to be detailed use-wear analysis coupled with experimental research. This would help determine the extent to which items such as manos were used for processing small seeds or other plant resources versus animal resources such as crushing bone to extract marrow or rending it further in the process of extracting grease.

Future research is needed for the Middle Holocene with the completion of detailed analysis for the materials recovered from known sites. For many sites, we only have a site form or CRM reports. Few are completely examined and many have not been researched again with new approaches and techniques. Most of the information that is available is buried in poorly accessible CRM reports (grey literature) or worse still in field notes within file cabinets. Therefore, additional grey literature needs to be published so data is more accessible and can be readily used.

With new methods in faunal remains it seems that many sites need to be re-analyzed especially when it comes to dogs. Many sites have wolves listed within the faunal remains, but additional research might reveal these remains are in fact domesticated canid. It would be useful to conduct new experiments to determine the carrying capacity of dogs and examine these results with an optimal foraging model framework to test how humans on the Plains could have benefitted from the support of dogs.

Conclusion

The Spring Creek Site lithic analysis yields several interesting results. Raw materials used were obtained from local sources; by count, the debitage and tools assemblage is composed predominantly of Smokey Hill Silicified Chalk, accounting for more than 91% of the assemblage. There were some tools made of materials from outside the local area but these tended to be small and greatly reduced and readily interpreted as exhausted of all utility. This finding accords with what both Nycz (2013) and Widga (2006) found that human foragers had a rather restricted range of residential movement on a scale of less than 100 km between camp locations. The non-local raw materials could have been gathered during other seasons or rotations on a five or ten-year basis. Their presence could also indicate that Spring Creek foragers participated in a trade network with other groups. The Spring Creek foragers were still mobile but not on a vast scale, primarily using the local resources around them including raw materials, bison, and other species.

At the Cherokee Sewer Site, the only difference in flake stone technology between the lower horizons from the Paleoindian time period and those of the Archaic is the

hafting methods used on projectile points as indicated by the switch from unnotched to notched points (Anderson 1980:230). The other significant change that transpired between these periods is the appearance of grinding slabs and manos. These could have helped to process nuts and seeds but also perhaps to breakdown bones of mammals in an effort to maximize all energy from animal carcasses through intensive processing. Kornfield and Larson (2008) believe seed procurement and processing began more than 9000 radiocarbon years ago during the mid to late Paleoindian time period. Since the grinding stones are large and heavy they would have also worked quite well for bone processing. It is also the start of more time spent in camps, or at least thought to be, because moving across the landscape with these heavy stones would have been burdensome.

Further study of the Middle Holocene could provide better information about how humans have adapted to climate change in the past whether that is man-made or natural. According to LaBelle (2005:287), “The Central Plains Paleoindian of the Early Holocene appear more as “place-oriented foragers” rather than as groups randomly moving across an empty landscape in narrow pursuit of a single species of game.” The consideration of the Early Archaic as unique transition period can help improve how we conceptualize cultural and adaptive transitions not as abrupt shifts from one steady state to another (Paleoindian to Archaic), but as one of gradual incremental changes in diet, resource use, and overall way of life.

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Appendix A: Debitage Flake Key

Author Note: This key is to help explain how I reached flake types. It is more a reference tool for myself than anything else. Includes flake types with examples of photos. Ideas here are from Geib (personal communication) during this project along with Cotterell and Kamminga (1987), Odell (2004), Andrefsky (2005), Geib (2007, 2014).

Indeterminate / nondescript

Not enough characteristics to make a call. No platform, cannot determine ventral or dorsal. Chunk or Shatter.

DFP Core

First off, the Core that is big, thick, and possible cortex. Hard Hammer with a big ring crack.

Bipolar core (None in the collection)

Biface shaping

Smaller size, used to shape or re-sharpen the flake/ biface. A lot of the time has more than one single platform. Can be pressure or percussion hammer.



Biface thinning

Trying to get thin, longer flakes. Might have a curve with it. Not always whole because of hinge fractures, or snap from thin material. Has scars from different directions on face.

Geib (2014: 2.49) “Flakes from percussion biface reduction. . . Flakes often have the following characteristic: faceted (multi-scar) platforms: bending initiations (although Hertzian invitations also occur), hence Platform lips and diffuse bulbs of force; multiple and complexly patterned dorsal flake scars; expanding flake outlines with relatively narrow platforms and maximum flakes widths midway or more distally; ventral flake curvature. They are also moderately thin, with maximum thickness usually away from the bulb of force, especially if the flake recovered precious step or hinge terminations”

**Notching**

Very small flakes, from the notching of points.

Alternate

Single scar platform a lot of the time. Trying to get square or irregular edge off. Wider than long.

**Core edge Prep**

Large, single platforms, maybe has Cortex. Sometimes short and wider.

Geib (2014: 2.56) “The characteristics of core flakes are their large, often flat, single flake scar or cortical platforms, Hertzian-cone initiations, common large bulbar swelling, simple dorsal flake scar pattern with scars often oriented in the same direction as the axis of percussion, low dorsal scar count, comparatively great thickness that occurs at the bulb of force, often straight-sided margins, and often minimal flake curvature except perhaps near the distal termination.”



Scraper maintenance

Cortex at the distal end, platform flake, whole a lot of the time, platform wide also the width of flake, use wear, smaller scale

Tool spall

Flakes off tools to make them sharper, retouch, shaping. Flakes because no retouch after this flake.



Flake Condition

Whole- Platform with feathered or hinged distal termination and intact lateral margins

Split- Whole flake but down the middle broken in half

Broken- Platform but Platform with step or broken distal termination; lateral margins don't matter

Fragment- no platform, but clearly part of flake, either terminal or lateral or medial

Angular shatter- by product of flaking but can't orient or determine dorsal/ventral