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Residential Mobility of Paleoarchaic and Early Archaic Occupants at North Creek Shelter (42GA5863): An Analysis of Chipped Stone Artifacts

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by

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As chair of the candidate's graduate committee, I have read the thesis of Mark L. Bodily in its final form and have found that (1) its Format, citations and bibliographic style are consistent and acceptable and fulfill University and department style requirements; (2) its illustrative materials including Figures, tables, and charts are in place; and (3) the final manuscript is satisfactory to the graduate committee and is ready for submission to the university library.

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ABSTRACT

Residential Mobility of Paleoarchaic and Early Archaic Occupants at North Creek Shelter (42GA5863): An Analysis of Chipped Stone Artifacts

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Early human activity in the arid west has been of interest for many researchers over the last century. However, relatively little is known about Paleoarchaic occupants of the Colorado Plateau and Great Basin because stratified Paleoarchaic sites in these regions are rare. Linked with the climatic Late Pleistocene/Early Holocene transition, the Paleoarchaic to Early Archaic transition has also captured interest in the central Great Basin with recent data coming out of Bonneville Estates Rockshelter—a site containing Pre-Archaic and Early Archaic components in eastern Nevada. These new data provide a model for testing differences in the chipped stone assemblage inferring changes in residential mobility at a new Paleoarchaic site on the Northern Colorado Plateau. Recently excavated, North Creek Shelter (42GA5863) is the only known stratified Paleoarchaic site on the Colorado Plateau for which we have data. Located in south-central Utah, this site was occupied during both the Paleoarchaic (~10,000-9,000 rcybp) and Early Archaic (~9,000-8,000 rcybp) time periods. Differences in the chipped stone assemblage inferring residential mobility between these time periods will be evaluated using Ted Goebel's (2007) model from Bonneville Estates Rockshelter. Based upon

Bonneville Estates Rockshelter's lithic assemblage, Goebel inferred that the Pre-Archaic occupants exhibited higher levels of residential mobility than subsequent Early Archaic occupants. A similar tendency was expected for the Paleoarchaic occupants of North Creek Shelter; however, it appears that there is little difference between the North Creek Shelter Paleoarchaic and Early Archaic chipped stone assemblages inferring differences in residential mobility. What little difference there is may be the result of multiple factors, but if it is the result of residential mobility, then the data suggest that North Creek Shelter Paleoarchaic occupants were only slightly more mobile than the Early Archaic occupants.

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Chapter 1-Introduction

Reconstructing the lifeways of Paleoindian peoples (the classic definition portrays small groups of highly mobile people focused on hunting now-extinct megafauna during the terminal Pleistocene/Early Holocene) has long been the interest of many modern day researchers (Graf and Schmitt 2007:xvi). Paleoindian (~12,500-8,500 rcybp) sites are located across much of North America; except, west of the Great Plains where buried Paleoindian sites are rare (Pitblado 2003). Late Paleoindian sites exist in the Rocky Mountains (see Pitblado 2003 for a synthesis of these), and although numerous surface finds of Paleoindian diagnostic projectile points (fluted and stemmed) are reported for the Great Basin and Colorado Plateau, no stratified Paleoindian sites exhibiting an association of human activity with extinct megafauna have been found in these two regions (Geib 1996; Huckell 1996; Madsen 2007; Smiley 2002). On the Colorado Plateau, there are no reported stratified sites that date older than ~9,000 rcybp (Geib 1996; Huckell 1996; Smiley 2002). However, there are a limited number of stratified archaeological sites in surrounding regions that date between ~12,500-8,500 rcybp, but these contain neither diagnostic Paleoindian projectile points nor extinct megafauna (Table 1.1, Figure 1.1).

Table 1.1. Select Stratified Paleoarchaic Sites in the Region

Site	Physiographic Region	Earliest Radiocarbon Age	Source
Smith Creek Cave	Central Great Basin	11,140 ± 200 BP	Bryan and Tuohy 1999
Bonneville Estates	Central Great Basin	11,010 ± 40 BP	Graf 2007
Ventana Cave	Southwest	10,430 ± 70 BP	Haury 1950; Huckell and Haynes 2003
Danger Cave	Central Great Basin	10,310 ± 40 BP	Jennings 1957; Rhode et al. 2005
North Creek Shelter	Northern Colorado Plateau	9960 ± 30 BP	This text
The Pits	Southern Colorado Plateau	9780 ± 80 BP	Geib and Spurr 2002

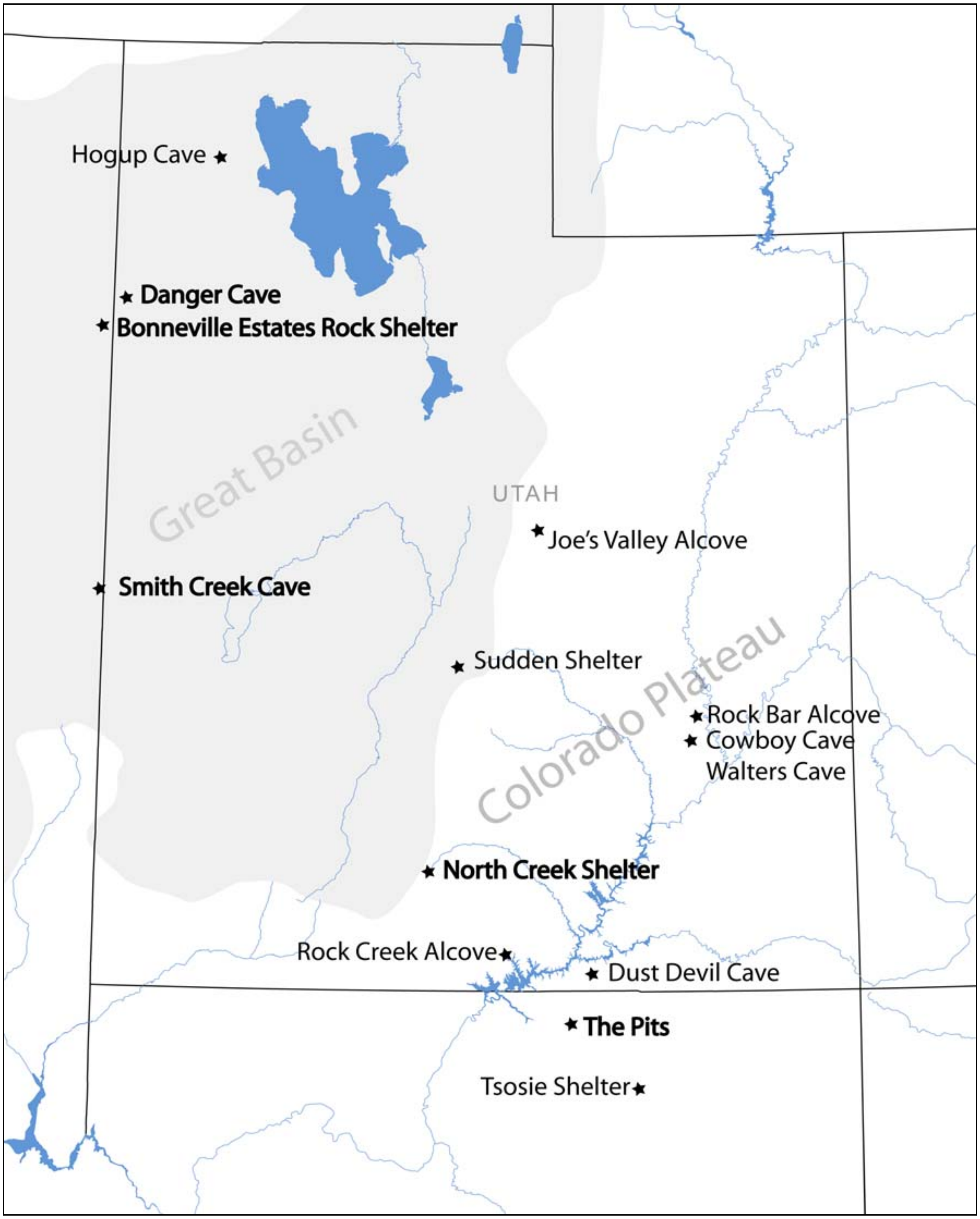

Figure 1.1. Select Paleoarchaic and Early Archaic sites in the Great Basin and on the Colorado Plateau. Paleoarchaic sites are bolded. Note that there is no data from The Pits other than the reported date.

Because no extinct megafauna or classic Paleoindian projectile points have been found in the cultural strata at any of these Great Basin and Colorado Plateau sites, the terms Paleoarchaic, Initial Archaic, and Pre-Archaic is currently being used to differentiate these early hunter-gatherers from Paleoindians. (Graf and Schmitt 2007:xv-xvii; Madsen 2007:14). Goebel (2007) uses the term Pre-Archaic to describe the early occupation at BER; however, I prefer and use the term Paleoarchaic for this time period (~12,500-8,500) in the Great Basin and on the Colorado Plateau. These Paleoarchaic hunters-gatherers are characterized as small mobile foraging groups which were focused on large-game hunting—but included smaller game as well—and are recognized primarily by Great Basin Stemmed projectile points (Madsen 2007:14-15).

Another focal point of regional research interest has been the transition from the Paleoarchaic to Early Archaic lifeways. As the cool and moist Late Pleistocene climate shifted to the warmer and drier climate of the Early Holocene (Huckell 1996), the Paleoarchaic lifeway of the central Great Basin gave way to an Early Archaic lifeway at about 8,500 rcybp (Madsen 2007). Similarly, on the Colorado Plateau, Early Archaic lifeways first appear at about 9,000 rcybp and lasted until about 6,000 rcybp (Geib 1996). Early Archaic peoples are generally considered to be hunter-gatherers who gathered plants and placed increased importance on small game hunting in contrast to earlier periods (Geib 1996). The Early Archaic is in part differentiated from the Paleoarchaic by a broadening of diet breadth (as evident by the appearance of ground stone and small seed processing), a slight decrease in residential mobility, and different types of projectile points (i.e. Pinto and notched projectile points) (Geib 1996; Goebel 2007; Madsen 2007). According to Madsen (2007), the single most important factor distinguishing the

Paleoarchaic from the subsequent Early Archaic is the appearance of groundstone around 8,500 rcybp. For the Northern Colorado Plateau, Phil Geib (1996:38) proposes a finer-grained Early Archaic subdivision by differentiating between what he calls the Initial Archaic (~9,000-8,000 B.P.) and the Early Archaic (~8,000-6,000 B.P.). Based upon his work around Glen Canyon, he suggests that the Initial Archaic time period exhibits lower population densities and higher residential mobility over the Early Archaic time period (see Geib 1996:36-38 for a detailed justification for the subdivision). Select Early Archaic sites in this region dating to the initial 1,000 years are listed in Table 1.2 (also see Figure 1.1).

Table 1.2 Select Early Archaic Sites in the Region

Site	Physiographic Region	Earliest Radiocarbon Age	Source
Joe's Valley Alcove	Northern Colorado Plateau	8940 ± 180 BP	Barlow & Metcalfe 1993
Walters Cave	Northern Colorado Plateau	8875 ± 125 BP	Jennings 1980
Dust Devil Cave	Northern Colorado Plateau	8830 ± 160 BP	Geib 1996
Hogup Cave	Central Great Basin	8800 ± 200 BP	Madsen & Schmitt 2005
Rock Creek Alcove	Northern Colorado Plateau	8660 ± 80 BP	Nickens et al. 1988
Rock Bar Alcove	Northern Colorado Plateau	8280 ± 160 BP	Geib 1996
Cowboy Cave	Northern Colorado Plateau	8275 ± 80 BP	Jennings 1980
Tsosie Shelter	Southern Colorado Plateau	8100 ± 80 BP	Christenson 1985
Sudden Shelter	Northern Colorado Plateau	7,900 ± 190 BP	Jennings et al. 1980

North Creek Shelter (42GA5863)

North Creek Shelter (NCS) is a newly excavated stratified site on the Northern Colorado Plateau containing a Paleoarchaic (~10,000-9,000 rcybp) component as well as an Early Archaic (9,000-8,000 rcybp) component. Being the only known stratified Paleoarchaic site on the Colorado Plateau, NCS can offer insight into Paleoarchaic lifeways for this region as well as provide the opportunity to look at the Paleoarchaic to Early Archaic transition.

Purpose

The purpose of this research is to examine the difference between the NCS Paleoarchaic (~10,000-9,000 rcybp) and Early Archaic (~9,000-8,000 rcybp) chipped stone assemblages and then make inferences regarding residential mobility using these data. This will be accomplished by analyzing the chipped stone assemblage (chipped stone tools and chipped stone debitage) from the site.

In this chapter, I will provide a description of the site, introduce a model from the Great Basin for evaluating the differences between the Paleoarchaic and Early Archaic components, and present the questions that I will be addressing in this research. In Chapter Two, I will explain excavation methods, sampling methods, tool analysis, and debitage analysis. Chapter Three will present the chipped stone data from NCS. Chapter Four will discuss residential mobility, length of stay, catchment, toolkits, and provisioning for the Paleoarchaic and Early Archaic at NCS. Finally, Chapter Five will summarize and synthesize the results of this research within the region.

Site Location & Description

North Creek Shelter is located on the Northern Colorado Plateau in south-central Utah (Figure 1.2). The site sits at the head of the Escalante River at the junction of three drainage systems (North Creek, Main Canyon, and Upper Valley) at an elevation of 6150 feet. Average precipitation for this elevation in the region is about 20-30 centimeters per year (Geib 2001:30). Modern flora surrounding the site consists of pinyon pine, juniper, Fremont barberry, prickly pear cactus, saltbrush, sage brush, and various grasses (an Upper Sonoran Community). Current fauna in the area includes mule deer, jack rabbits, cottontails, and various birds, fish, and rodents. The shelter is formed by a sheer south-facing sandstone cliff that slopes outward from the bottom to the top—thus providing shelter from the elements (Figure 1.3). There are various Fremont-age granaries on ledges in the cliff face above the shelter as well as Archaic, Fremont, and proto-historic style pictographs and petroglyphs on the shelter wall in addition to historic inscriptions. At the base of the shelter a layer of historic dung overlies sandy sediments containing cultural debris, which slope down to the Escalante River flood plain.

NCS is on the historic Riddle property which is currently owned by the Rex family. In 2004, Jeff and Joette Rex granted permission to Dr. Joel Janetski of Brigham Young University and archaeology field school students to test the site. Including the initial testing, Dr. Janetski and crews excavated for five seasons ending in 2008.

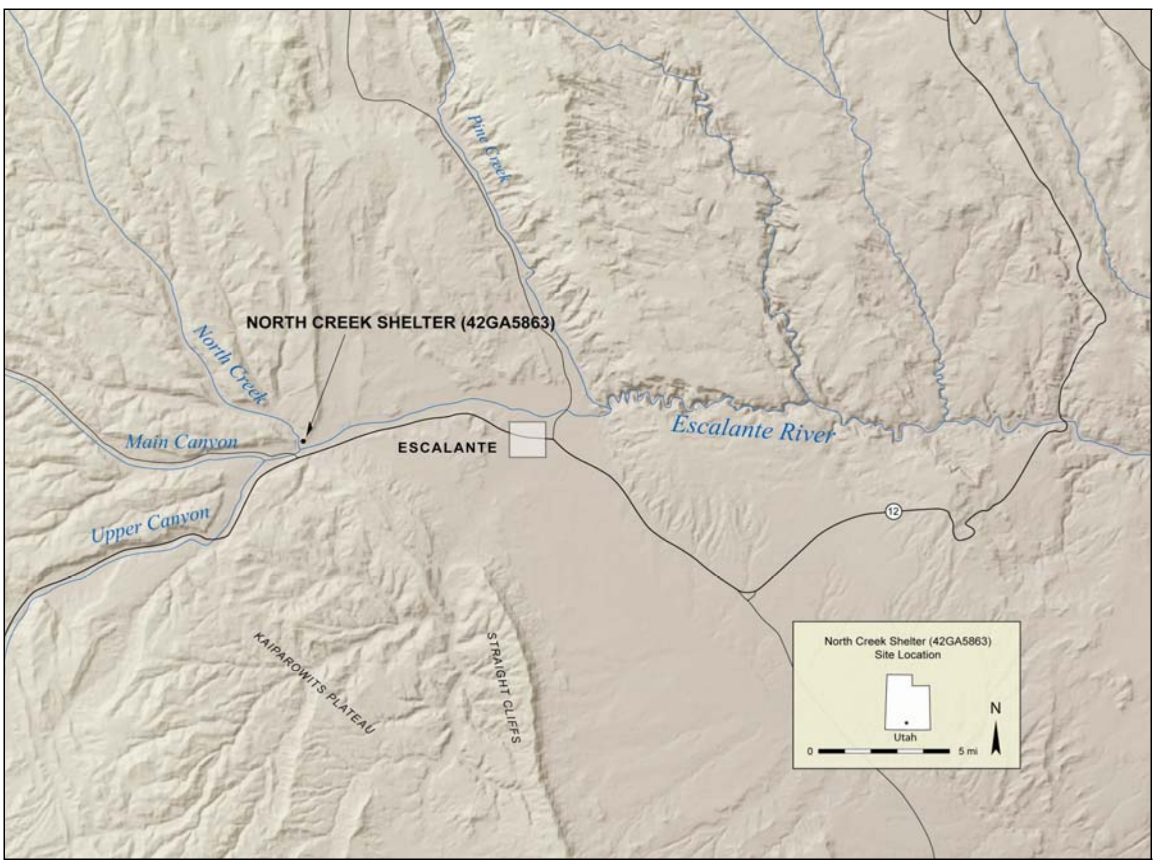

Figure 1.2. North Creek Shelter site location. Note that the site is located at the confluence of three drainage systems at the head of the Escalante River.

Figure 1.3. Site overview looking northeast. North Creek Shelter is located just left of center at the base of the overhanging Dakota Sandstone cliff.

Excavation of a portion of the shelter revealed cultural debris down to about 3.5 meters below modern ground surface as well as distinct cultural stratigraphic layers (Figure 1.4). Many cultural stratigraphic layers are sealed in by natural episodes of deposition—reflecting thin alternating bands of sands and silts. These thin bands likely occurred during seasonal monsoons that washed sediments from the overlying Dakota Sandstone mesa down through fractures in the cliff face and over the surface of the site (Morris and Hicks 2009). These alluvial episodes resulted in fine-grained stratigraphic deposition at a rate of about 0.18 cm per year.

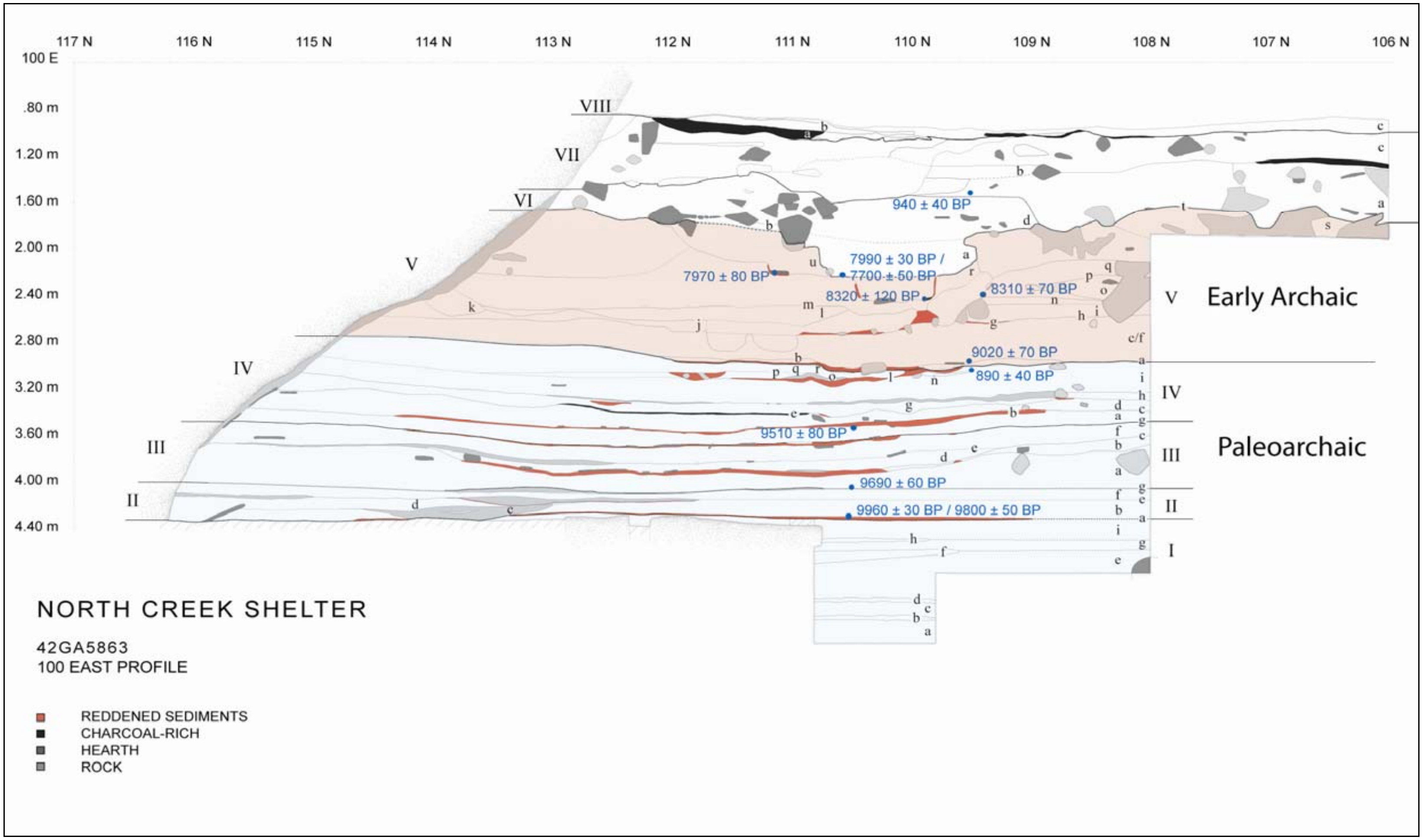

Figure 1.4. North Creek Shelter 100 East profile. The division between the Early Archaic and Paleoarchaic components is based primarily upon a distinct change of projectile points and the appearance of formal groundstone in Substratum Va.

The top 0.5 meters (Strata VII & VIII) contained evidence for Fremont and Late Prehistoric occupations below which is roughly 0.5-1 meters (Stratum VI) of bioturbated Archaic debris dating between ~7,500-6,000 rcybp. Stratum V is 0.5 to 1 meters thick and is the Early Archaic component of the shelter dating from ~9,000 to 7,500 rcybp.[1] Combined, Strata I, II, III, and IV are about 1.5 meters thick dating to ~10,000-9,000 rcybp. These comprise the Paleoarchaic component. Stratum I contains minimal amounts of non-diagnostic cultural debris near the top to culturally sterile sediments at the bottom. The date of 9960 +/-30 rcybp (sample number PRI-07-102-3716) associated with use surface IIa at the bottom of Stratum II makes this site the oldest known stratified archaeological site on the Colorado Plateau of which we have data by almost 1,000 years.

Great Basin Research/Model

Similar to NCS, Bonneville Estates Rockshelter (BER) is a large southeast facing shelter located near Wendover, Nevada, containing both Pre-Archaic[2] and Early Archaic components. The Pre-Archaic component dates to ~11,000-9,500 rcybp, while the Early Archaic component dates to ~7,400-6,000 rcybp (Graf 2007). Recent research at this site (Goebel 2007), along with the fine-grained control, makes it amenable for comparison to NCS. Yet, it must be recognized that there are some environmental and temporal disparities between the two sites.

First, BER and NCS are in different environments. BER is located at an elevation of 5,184 feet in a relatively arid environment (average of 12.2 cm/year percipitation) consisting primarily of shadscale, rabbitbrush, and Indian ricegrass vegetations (an Upper Sonoran community) (Graf 2007; Madsen 2007; Rhode et al. 2005). The nearest sources

[1] This analysis only deals with the Early Archaic chipped stone assemblage dating between ~9,000-8,000 rcybp, which excludes Substratum Vu.
[2] Goebel (2007) uses the synonymous term of Pre-Archaic for the Paleoarchaic deposits at BER.

of fresh-water are springs located about 6 km from the shelter. NCS is almost 1000 feet higher (6,150 ft) in a comparatively wetter region (average of 27.8 cm/year precipitation) of sage and pinyon/juniper vegetation. Abundant water is within a few hundred meters of the site in North Creek and the Escalante River.

Second, in addition to different environments, there is a time disparity between the two sites for the Early Archaic components. Intact Early Archaic deposits at NCS date between ~9,000-7,500 rcybp, while BER Early Archaic deposits date between ~7,400-6,000 rcybp (Goebel 2007). Apparently, BER does not contain Early Archaic occupation predating 7,500 BP, and NCS Early Archaic occupational deposits dating between 7,500-6,000 BP are highly bioturbated. Although Early Archaic deposits at both sites date to the Early Archaic time period (which spans about 3000 years), NCS Early Archaic deposits date to the initial 1500 years while the BER Early Archaic deposits date to the terminal 1500 years. Despite the time disparity, both sites contain Early Archaic deposits of similar material culture (i.e. formal groundstone and notched projectile points).

Ted Goebel (2007) described the differences between the Pre-Archaic and Early Archaic components through an analysis of the lithic assemblage at BER. He concluded that the BER Pre-Archaic people practiced a higher level of residential mobility than the Early Archaic (the notion of residential mobility is based upon Lewis Binford's work in 1977, 1979, and 1980). "The extensive lithic conveyance zone, long-distance transport of finished tools, and formal character of the Pre-Archaic lithic assemblage imply elevated levels of mobility…" (Goebel 2007:184). The Early Archaic peoples were less mobile and exhibited "locally oriented, place-provisioning behavior…" (Goebel 2007:184).

Thus, Pre-Archaic peoples stayed at BER for shorter lengths of time, used a larger lithic conveyance zone, had a more formal toolkit, and focused on rejuvenating stone tools that they had brought with them from non-local sources (Table 1.3).

Table 1.3. Characteristic differences that reflect mobility at BER (Goebel 2007).

Pre-Archaic	**Early Archaic**
Shorter stays at the site	Longer stays at the site
Extensive lithic conveyance zones	Reduced lithic conveyance zones
More formalized tool kit	Less formalized tool kit
Tool rejuvenation/non-locally focused provisioning	Tool manufacturing/locally focused provisioning

In order to come to these conclusions, Goebel (2007:176-183) looked at differences in chipped stone tools and chipped stone debitage assemblages by time period. While these data do not support either/or conclusions, the data do support more/less arguments through proportions of raw material, toolstone sources, cortex, debitage types, debitage size, striking platforms, tool categories, and biface stages (see Table 1.4).

First, proportions of lithic raw materials in the debitage were evaluated by time period (Goebel 2007:176-177). Raw material proportions were determined by dividing the number of pieces of a toolstone type by the total number of pieces of debitage for each time period. The Early Archaic showed a preference for toolstone of cryptocrystalline silicates (cherts) over obsidian and fine grained volcanic, while the Pre-Archaic did not have a strong preference for any toolstone type. A higher portion of the Early Archaic chert consisted of a poor-quality gray-colored chert coming from about 10 kilometers from the site; which Goebel used in part to infer a preponderance of local procurement during the Early Archaic.[3]

Table 1.4. Proportional differences by time period at BER (Goebel 2007).

Pre-Archaic	**Early Archaic**
More projectile points and flake tools	More bifaces
Higher formal to informal tool ratio	Lower formal to informal tool ratio
Higher late to early stage bifaces ratio	Lower late to early stage bifaces ratio
Higher secondary to primary flake ratio	Lower secondary to primary flake ratio
Higher complex to smooth platform ratio	Lower complex to smooth platform ratio
Higher small to large flake ratio	Lower small to large flake ratio
Higher percentage of non-local raw material	Lower percentage of non-local material
Greater distance to toolstone sources	Reduced distance to toolstone sources
Lower percentage of cortex	Higher percentage of cortex
Lower percentage of angular shatter	Higher percentage of angular shatter
Higher percentage of biface thinning flakes	Lower percentage of biface thinning flakes
Higher percentage of Soft-hammer percussion and pressure flake technology	Higher percentage of Hard-hammer percussion technology

Similarly, there is a major difference in proportions of obsidian sources by time period (Goebel 2007:177). Obsidian source percentages were calculated by dividing the number of samples from a source by the number of total samples sourced by time period. The Ferguson Wash obsidian source is considered local since it is within 6 kilometers of BER, while non-local obsidian sources range between 105-180 kilometers from the site. Goebel determined that BER Pre-Archaic peoples obtained the majority of their obsidian from non-local sources, whereas the BER Early Archaic occupants obtained most of theirs from the local Ferguson Wash source.

Additionally, cortex proportions showed that there were higher percentages of cortex in the Early Archaic component, which is indicative of local procurement. Cortex

[3] It is important to recognize that accessibility and quality of toolstone will affect proportions (Andrefsky 2005). This will be discussed later on in the thesis.

proportion categories consist of those specimens with no cortex, 1-10 percent cortex, 11-50 percent cortex, 51-90 percent cortex, and greater than 90 percent cortex. The number of specimens in each category was divided by the total number of specimens by time period. Goebel determined that these tests demonstrate an Early Archaic focus on local procurement of lithic raw material while the Pre-Archaic focused on procuring non-local toolstone. He also claims that this supports the argument that the Pre-Archaic lithic conveyance zones of the area were far-reaching, while the subsequent Early Archaic conveyance zones became more localized—essentially that the Early Archaic catchment area is smaller (Beck and Jones 1997; Goebel 2007:177).[4]

Next, flake type proportions were determined by time period (Goebel 2007:179). Here, the number of a flake type category was divided by the total number of debitage pieces in the assemblage by time period. This comparison showed that the Early Archaic assemblage had fewer debitage pieces reflecting secondary reduction (biface thinning flakes and retouch chip fragments), and more primary reduction debitage pieces (bipolar flakes, cortical spalls, and angular shatter) than the Pre-Archaic.

Likewise, Pre-Archaic flakes were significantly smaller than Early Archaic flakes, and the Pre-Archaic exhibited more complex striking platforms while the Early Archaic had more smooth and crushed platforms. These proportions along with those of flake type support a preponderance for secondary reduction activities (tool rejuvenation) during the Pre-Archaic and a focus on primary reduction activities (biface production) in the Early Archaic. Goebel (2007:180) infers from this data that most Pre-Archaic tools were made elsewhere and then transported to the site, while the majority of the Early Archaic tools were made on site.

[4] A possible reason for this may be due to transport costs (Beck 2008; Beck et al. 2002).

Stone tools also demonstrated similar patterns between time periods (Goebel 2007:182-183). Major tool categories were divided into bifacial points, bifaces, and flake tools. Proportions of these were compared to each other by time period and showed that, in the Pre-Archaic, there were more bifacial points and flake tools and fewer bifaces than in the Early Archaic.

An evaluation of biface stages (stages 1-5 after Andrefsky 2005) demonstrated all stages of bifaces were present but with a preponderance of early stage bifaces during the Early Archaic; whereas the Pre-Archaic is almost solely represented by late stage bifaces. These data suggest that most Pre-Archaic bifacial points were probably manufactured elsewhere while the Early Archaic points were made on site.

Goebel (2007:181-182) also claims that Early Archaic biface production was more expedient (exhibiting less time investment) than Pre-Archaic biface production because the Early Archaic bifaces demonstrated more evidence of hard-hammer percussion whereas the Pre-Archaic bifaces showed signs of soft-hammer percussion or pressuring flaking. In addition, almost half of the Early Archaic bifaces were expedient Stage 2 bifaces while most of the Pre-Archaic bifaces were formal (exhibiting more time investment) Stage 5 bifaces.

Taken together, Goebel (2007:182) concludes that the Early Archaic occupants of the shelter transported nodules of local raw material to the site and reduced them into chiefly expedient tools by means of hard-hammer percussion technology. Goebel (2007:183) claims that "[t]his implies relatively long stays in the Rockshelter or nearby area and low levels of residential mobility during the Early Archaic". The Pre-Archaic occupants primarily transported completed tools of non-local toolstone to the site where they were resharpened. Goebel (2007:184) argues that this implies relatively short and focused stays in the rockshelter for use of an extensive lithic conveyance system.

Additional Comparisons

In addition to the proportions that Goebel used, an evaluation of tool richness sheds light on mobility. Tool richness is measured by counts of the different tool type categories by time period. As prehistoric people stayed at a site for longer lengths of time, there should be a corresponding increase of different types of activities occurring there, which in turn requires different types of stone tools (Andrefsky 2005:218; Goebel 2007:167). Thus as the length of stay increases at a site, tool richness should increase as well.

Further tests using tool types can help with determining the formality of toolkits. Formal tools are those that exhibit a greater time investment for manufacture while informal and expedient tools exhibit almost no time investment (Andrefsky 2005:226-230). Higher proportions of formal to informal tools imply increased mobility, while the converse suggests decreased mobility (Ibid.). Tests of tool kit formality include comparing formal cores (bifaces) to informal cores (multidirectional and unidirectional), and modified chipped stone tools (projectile points, late stage bifaces, and unifaces) to expedient tools (early stage bifaces, cores, modified flakes, and utilized flakes). Likewise, higher proportions of biface thinning flakes and complex striking platforms indicate production of formal tools and can be used to evaluate tool kit formality.

Research Questions

The comparisons and conclusions made by Goebel (2007) provide a model that can be tested at NCS. Using this model with the additional comparisons outlined above, I will examine the chipped stone assemblage and infer levels of residential mobility for the Paleoarchaic and Early Archaic time periods at NCS to address this question: *Are the Paleoarchaic at NCS more residentially mobile than the Early Archaic?* If the Paleoarchaic people were more residentially mobile than Early Archaic peoples, and if the relationship between the chipped stone assemblage and residential mobility is correct, then I should see a notable difference in multiple areas (as outlined previously) of the lithic assemblage at NCS. Based upon Great Basin research on this topic (see Beck & Jones 1997), I expect to find that NCS Paleoarchaic peoples were indeed more residentially mobile than the Early Archaic peoples.

Supplementary questions will also be addressed as I gather supportive data for the main question. First, *Do the NCS Paleoarchaic occupations reflect shorter stays than the Early Archaic occupations?* If people of one component tended to stay at the site for longer periods of time, then it should be evident in the proportions of tools and debitage as indicated previously. Again, based upon previous work, I do expect to find that Paleoarchaic people stayed at the site for shorter lengths of time.

Next, *Are the catchment areas of the Paleoarchaic larger and more diverse than the Early Archaic at NCS?* Catchment area is reflected in the toolstone conveyance zones, and if the Paleoarchaic people at NCS did take advantage of larger or more diverse lithic conveyance zones, then this will be apparent in the number and proportions of toolstone sources. I specifically expect to find that the Paleoarchaic catchment area is larger and more diverse than the Early Archaic.

The next question, *Are NCS Paleoarchaic tool kits more formal than Early Archaic tool kits?* will evaluate the time investment prehistoric peoples put into their tool manufacture at the site. If Paleoarchaic tool kits are more formal than the Early Archaic tool kits, then I expect to see a higher proportion of finished and modified tools for that component. Through this research, I am expecting to see a higher proportion of formal tools during the Paleoarchaic time period over the Early Archaic.

Related to catchment area, diversity among local and non-local toolstone sources helps address the question of residential mobility. In this case, I will ask, *Do the NCS Paleoarchaic toolstones reflect non-local provisioning and the Early Archaic toolstones reflect local provisioning?* If one group of people focused on using non-local toolstone over local toolstone, then I should see that reflected in the proportions of toolstone material types. I expect to find that the NCS Paleoarchaic peoples utilized higher proportions of non-local toolstone than the Early Archaic peoples.

Chapter 2-Methods

In this chapter, I will discuss the methods, procedures, and definitions that were used to analyze the dataset pertinent to this research. First, I will briefly address excavation methods. Next, I will outline the sampling method used for the chipped stone assemblage. Then, I will describe the chipped stone tool and debitage analysis along with the category definitions.

Excavation methods

NCS was excavated for five field seasons from 2004 through 2008. A 1 by 1 meter grid system was placed over the site orientated to true north. Excavation began with a 1 by 1 meter test that was dug blind by arbitrary 10 cm increments, after which strata were designated. Subsequent excavation was dug by the designated strata in 10 cm or less layers. When natural or cultural strata were identified, these served as breaks in the arbitrary 10 cm increments. Stratum IV and below were dug in five cm increments following the same procedure for natural and cultural strata. On occasion, when significant use surfaces were encountered, the 1x1 meter squares were divided into halves or quarters. Artifacts on these use surfaces were point plotted whenever possible.

Rodent burrows were excavated separately when possible. All dirt removed from the excavation was sifted through 1/8 inch screens. All major use surfaces were drawn as plan maps, and artifacts discovered in situ were point plotted. The site datum was a floating datum 1.5 meters above a rebar stake, and all depths were recorded as meters below datum using a total station.

Sampling methods

This dataset consists of the chipped stone tools and chipped stone debitage from the Paleoarchaic (Strata I, II, III, and IV) and Early Archaic (Stratum V) components. All identified chipped stone tools from these components were analyzed and included in this dataset; however, due to the large quantities of debitage pieces and limited time, I decided to sample the assemblage horizontally and vertically. First, debitage from 17 identified use surfaces were analyzed (substrata Vt, Vp, Vm, Vh, Ve, Ve, IVm, IVj, IVg, IVc, IIIg, IIIe, IIIc, IIg, IIe, IIc, and IIa) (see Figures 1.4 and 2.1).

Next, debitage from eight excavation columns were analyzed for both components (108N 100E, 109N 100E, 110N 100E, 111N 99E, 112N 99E, 113N 99E, 114N 99E, & 115N 98E) (Figure 2.2).[5] Columns were strategically selected to sample the toss zones against the cliff face and activity hotspots reflected in both the Paleoarchaic and Early Archaic use surfaces. Additional debitage material for the Early Archaic component was analyzed in three additional squares to increase the sample size of the Early Archaic activity hotspot (109N 98E, 109N 99E, 110N 99E).[6]

Lithic Material Type

Chipped stone specimens were first typed by raw material. A comparative lithic collection of Morrison petrified wood, Paradise chert, and Boulder jasper was consulted at the Museum of Peoples and Cultures. If there was uncertainty in material type, but if the classification was probable, then the material type was recorded as such and the uncertainty recorded in the comments as CF. Toolstone types that I identified in the

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[5] Excluding Substratum Vu (which was later added to the Early Archaic component).
[6] Paleoarchaic and Early Archaic component columns excluded were 110N 98E, 111N 98E, 112N 98E, 113N 98E, 114N 98E, and 115N 99E. Additional Paleoarchaic columns excluded were 109N 98E, 109N 99E, and 110N 99E. The sample excluded about 5,600 debitage pieces from these columns.

collection are described below. Obsidian was readily identifiable and ranged from transparent, to opaque black, to mahogany. Multiple obsidian sources are located to the west of NCS with the nearest being about 100 km away. Green speckled rhyolite is a fine grained rhyolite that borders on volcanic glass. It is light green colored with dark green speckles or clouds. Although its source is unknown, I speculate that it comes from rhyolite flows to the west where the obsidian is coming from.

Quality local toolstones include Morrison petrified wood, Boulder jasper, and Paradise chert. Morrison petrified wood is a cryptocrystalline silicate of various colors (generally red, yellow, purple, black, gray, brown, and white) (Geib et al. 2001). This material usually exhibits tree rings and tends to break along these on flat planes, although variation among this toolstone includes high-quality chalcedonic nodules that are not necessarily affected by the fibrous structures. A major source of Morrison petrified wood lies about five miles to the east of the site. Boulder jasper is a cryptocrystalline silicate found in nodule form on the southern slopes of Boulder Mountain to the northeast of NCS (Ibid.). Boulder jasper is opaque, but variable in color. It tends to range from yellowish brown to red often with the colors being mottled. Most specimens contain intricate swirls or speckles of patterned semi-translucent silica (Geib et al. 2001:185). This material is tough in its raw form, but the quality is vastly improved through heat treating. Paradise chert is another cryptocrystalline silicate found in nodule form on the southern end of the Kaiparowits Plateau (Ibid.). It is a variable chert that grades from opaque white to translucent chalcedony. The toolstone is “usually mottled with abundant angular or amorphous cream to yellowish to pale brown opaque inclusions (or blotches) within a matrix that is more translucent and chalcedony-like (Geib et al. 2001:175).

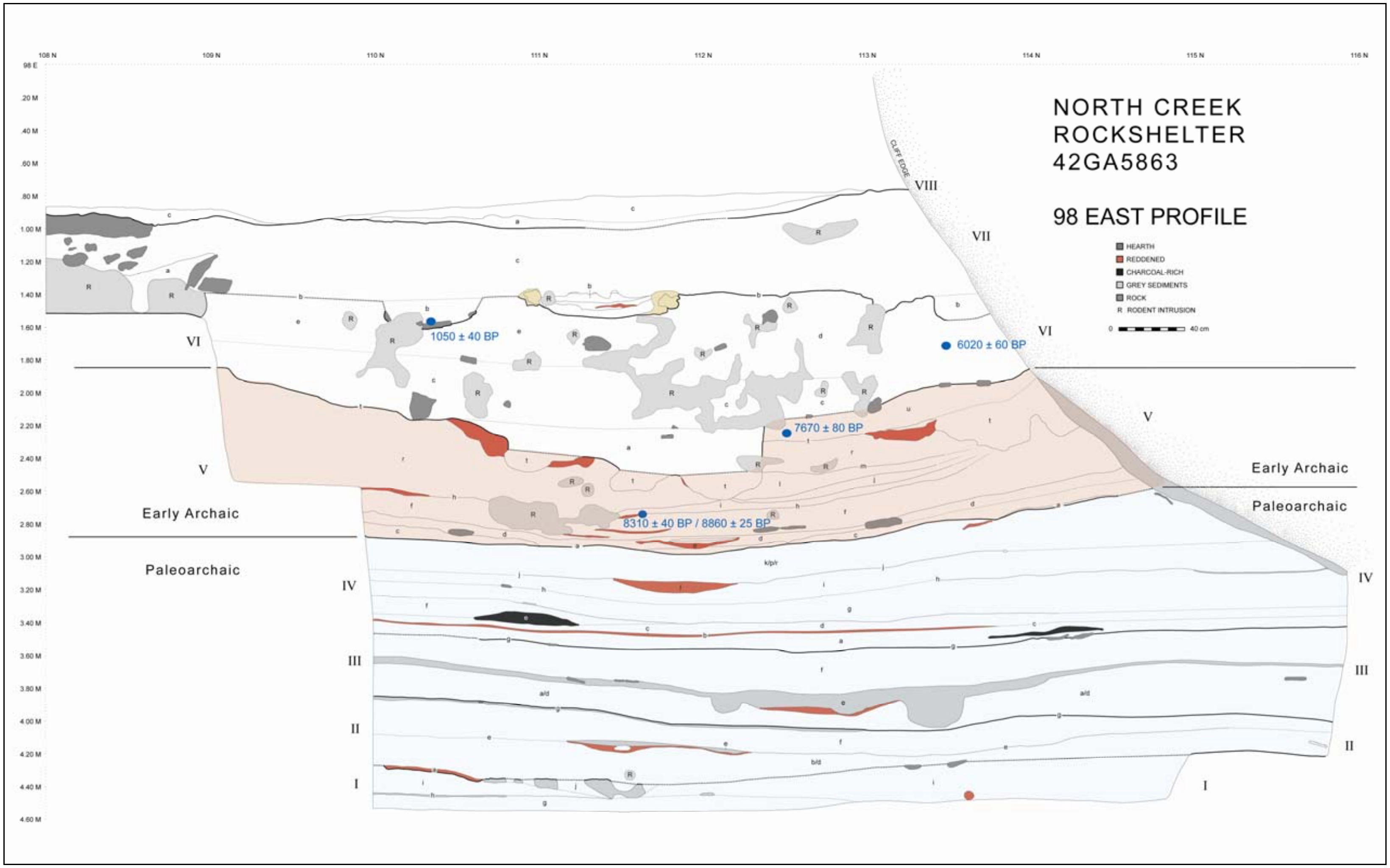

Figure 2.1. North Creek Shelter 98 East profile. Again note that the distinction between the Early Archaic and Paleoarchaic components was based primarily upon the appearance of formal groundstone and a distinct change in projectile point beginning in Substratum Va.

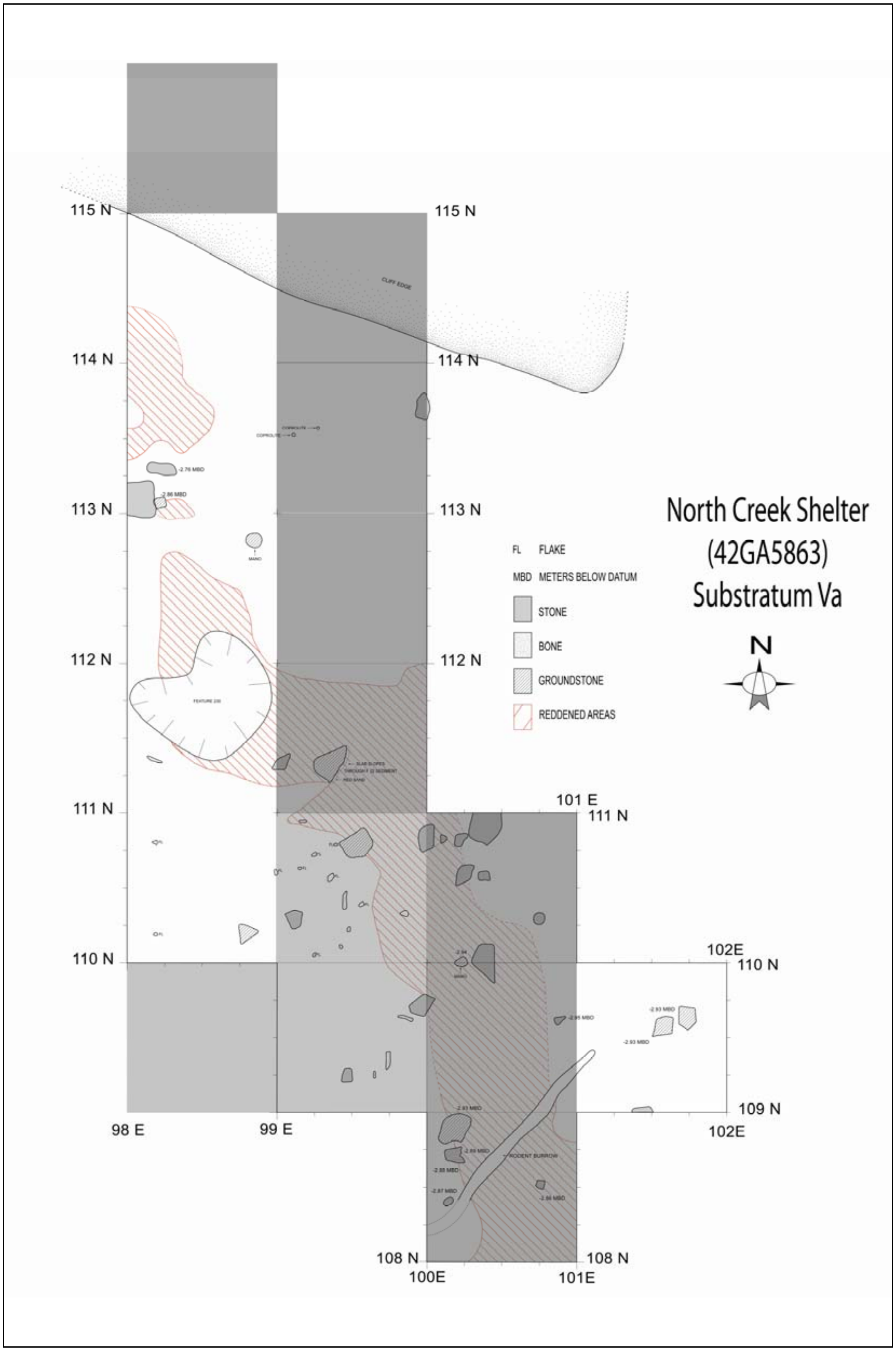

Figure 2.2. Early Archaic Substratum Va identifying columns sampled. Columns shaded in dark grey were sampled for both components. Columns shaded in light grey were only sampled for the Early Archaic component.

Heat treatment changes the yellowish and brownish colors of this toolstone into pink and reddish colors.

Quartzite and siltstone are differentiated from the quality local toolstones based on two assumptions. First, these two toolstones are found on site or within a few hundred meters of the site. Second, they are of inferior quality for knapping or durability than the cryptocrystalline silicates. Therefore, these two toolstones will be referred to as highly localized toolstone. Quartzite consisted of various colors and was differentiated between coarse and fine grained. Siltstone is opaque, ranges from gray to black, has a dull finish, and is very soft (easily chipped with a fingernail).

There were a number of flakes that were clearly cryptocrystalline silicates; however, they were generally so small in size that it was impossible to type them into one of the previous categories. These were placed into an unidentified cryptocrystalline silicate category based upon their color and opacity. Although small in number, some toolstone material was unidentifiable and is verbally described in the analysis comments.

Tool analysis

Prior to analysis, all tools were washed and labeled. Each tool was analyzed and tool edges were examined for use-wear at 8X power magnification under a microscope. I followed a standard Museum of Peoples and Cultures tool analysis procedure with a few modifications and recorded the data in a database.[7] Chipped stone tool definitions generally followed Andrefsky (1998) and are explained below.

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[7] See Appendix D for the tool analysis and database key.

Tool Types

Unifaces are defined as lithic specimens that exhibit modification and/or wear on one surface (this is Andrefsky's [1998:76-79] unimarginal flake tool). If the specimen exhibited modification on more than one surface, but on different tool edges, then it was still considered as a uniface. These were distinguished by the location of the modification and wear on the tool as well as by the angle (greater or less than 45 degrees) created by the modification/wear.

Bifaces exhibit modification on both surfaces that nearly circumscribes the entire piece. Bifaces are differentiated by manufacturing stages that follow the definitions outlined by Andrefsky (1998:187-193). The Stage 1, or *flake blank*, is the objective piece selected for modification into a biface. However, since it has not yet been modified, it is impossible to identify this stage in the assemblage. It potentially could be any debitage flake or core large enough to make a biface. Stage 2 is an *edged biface*. This is the initial edging of the objective piece. The piece is usually fairly thick and the flake removals are large, generally not crossing the midline of the biface, and creates a sinuous edge. Stage 3, or *thinned biface* exhibit flake removals that are intended to thin the objective piece, thus they tend to cross the midline; however, the biface is still somewhat thick. Stage 4 is a *perform* that contains patterned flake scars that cross the midline. The biface is now thin and begins to take a formal shape. Stage 5 is the *finished biface*. It is usually thin, has superimposed and overlapping negative flake scars, and has a formal shape. This stage lacks evidence of hafting elements (thus it is not classified as a projectile point), but broken portions may have come from a specimen that was hafted.

Projectile points are finished bifaces that contains a hafting element (Sutton & Arkush 1996) (Andrefsky [1998:76-79] lumps these with hafted bifaces) and were intended for propelling, thrusting, and/or piercing. Projectile points were typed using a standard typology following Holmer and Weder (1980) and Holmer (1986) with some reference to Thomas (1981).

Hafted bifaces are also finished bifaces containing a hafting element, but in this analysis, they are differentiated from projectile points primarily based upon size and use wear. An example of this is a knife—it is significantly larger than an atlatl point and exhibits wear suggesting cutting rather than piercing.

Cores are pieces from which flakes have been removed (the flakes generally being the intended tools). Cores must exhibit at least three negative flake scars and are classified by the direction of the flake removals. Unidirectional cores have flakes removed in a single direction and multidirectional cores flakes are removed in multiple directions.

Hammerstones are usually cobbles that exhibit pounding or crushing wear on their surfaces, but do not contain flake scars. These usually were used to strike cores or other lithic pieces to remove flakes.[8] Sometimes, cores exhibit pounding wear from use as a hammerstone, and if this was the case, they were called core/hammerstones. Cobbles that exhibited large primary or secondary negative flake scars that form an edge exhibiting pounding wear (Whittaker 1994:5) were classified as choppers.

Utilized flakes exhibit use-wear, but no intentional modification (Andrefsky [1998:79] classifies these as unimarginal flake tools without distinction between

[8] Although not fitting in Andrefsky's (1998:76) chipped stone classification, they are still included in the chipped stone tool analysis (Ibid.:12-14).

intentional and use-wear modification). These generally do not have a formal shape, and the type of wear was described by number of edges exhibiting wear and the location and shape of the wear.

Modified flakes contain intentional bifacial flaking on their edges while still retaining their flake characteristics (Andrefsky's [1998:79] bimargial flake tools). These are differentiated from Stage 2 bifaces because they do not have a formal shape and have not been modified on all or nearly all edges. These may also contain some slight use-wear, but the intentional modification dominates.

Drills and awls generally contain hafting elements, but differ from projectile points in their shape and probable function (Sutton & Arkush 1996:49). They are usually narrow with parallel sides which gradually come to a point. Typically, there will be use-wear on the tip and edges near the tip. It is not uncommon to find projectile points that have been modified into drills.

Gravers are lithic objects that contain a fine modified point—one that is small and sharp (Odell 2003:65-66). These are different from the tips of projectile points and bifaces (which tend to be more robust); however, it is possible that a biface or projectile point tip may have been modified into a graver tip. Generally, graver tips are found on flakes, but they may be found on any tool edge as well.

Notched flakes exhibit one or more notches. The notches are not the result of use-wear; rather, they were intentionally made on a flake blank. If the notches exhibit use-wear on the interior, they were likely used as spokeshaves.

Tool Characteristics

Once the chipped stone tools were morphologically typed, I examined each specimen for use-wear. Use-wear is defined as modification on a tool edge which generally results from cutting and/or scraping. The wear identified in this analysis is visible to the naked eye; however identification was aided using a microscope set at 8X magnification. To be considered culturally related, the wear had to be uniform and regular. Wear type was recorded first by the number of tool edges exhibiting wear, then by the location of the wear on the tool, and then the shape created by the wear. I also noted if the wear tended to be a smoothed/polished or crushed/abraded edge. If the edge exhibiting very small negative flake scars resulting from use, then I indicated if they were stepped or feathered terminations (after Andrefsky 1998:174-175).

Next, I recorded size and weight measurements for each tool. Measurements of length, width, and thickness were recorded in mm for all specimens using an electronic caliper, and weight was recorded in grams using a manual dial scale. For projectile points, additional measurements were made that included maximum stem width, maximum stem length, neck width and basal indent. For Pinto points, measurements also included proximal shoulder angle and notch opening index after Thomas (1981) (Figure 2.3). Measurements for notched flakes included the diameter and depths of the notches.

Specimen completeness was also recorded. If the tool was broken, then the portion represented was indicated.

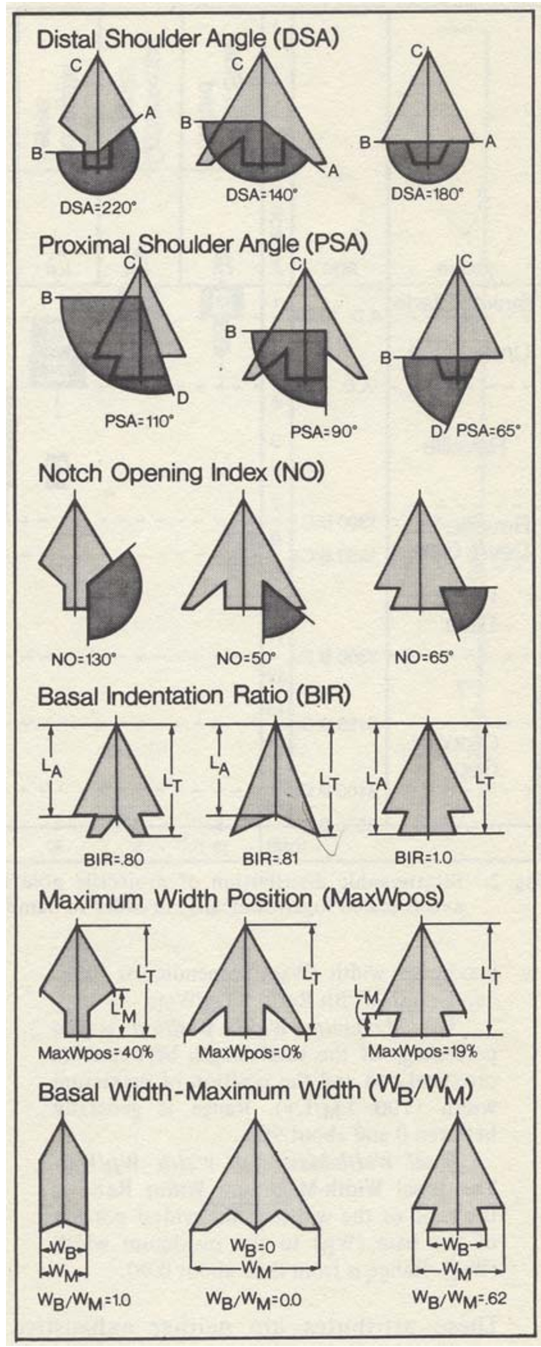

Figure 2.3 Projectile point measurements
(after Thomas 1981:14, Figure 3).

Finally, observations of heat treated specimens were recorded as crazed, potlidded, exhibiting a matte or glossy finish, and/or color changed (see Geib et al. 2001:174-186; and Whittaker 1994 for a discussion of heat treatment). Crazing results from overheating and exhibits geometric lines running throughout the specimen. Potlidding also results from overheating. These are generally small oval shaped negative scars on the surface of an overheated specimen. Matte versus gloss finish refers to the surface luster of the tool. The outer layer of a heat treated tool will generally take on a matte finish (one that does not evenly reflect light). When the matte layer is removed, the resulting surface appears glossy or takes on a waxy appearance. Often, both surfaces are evident on a single specimen. With heat treatment, the color of the toolstone will often change. Color change is variable and is dependent upon the pre-heat treated color and upon temperature as well. For example, Paradise chert changes from a cream to a pinkish color when heat treated properly, but changes to a dark gray or white when overheated. In order to facilitate the identification of heat treatment, a comparative heat treated collection was created and consulted for Boulder jasper, Morrison petrified wood, and Paradise chert.

Debitage analysis

Debitage was washed and labeled before being analyzed. Each bag was then inspected for any worked tools and utilized flakes—if found, these were removed and analyzed as tools. The remaining flakes were then sorted by material type and size. The first step was to sort the specimens by material. This division was carried throughout the remainder of the analysis. Next, the pieces were sorted by size—this division also carries through the analysis. The pieces were sorted through a 1/2" screen. Those that did not pass through the screen were classified as macro debitage, and those that did were grouped as micro debitage. Finally, the flakes in each group were analyzed according to their flake type (following Andrefsky 1998 unless indicated otherwise). Again, I followed a basic Museum of Peoples and Cultures debitage analysis procedure; however, I recorded additional observations in various areas.[9]

Flake Types

Flakes that did not contain any cortex were differentiated into mutually exclusive categories of internal flakes, biface thinning flakes, or shatter. Internal flake is a catch-all category for a variety of flake types without cortex. These may be complete or broken, but they must have a striking platform to qualify for this category. Biface thinning flakes are usually thin, fan-shaped, curved, have multiple dorsal negative flake scars, and a multi-faceted (complex) striking platform with a lip. If a specimen exhibited a combination of most of these characteristics, then it was classified as a biface thinning flake. Shatter consisted of broken flakes and angular waste that do not have striking platforms. These were differentiated between flake shatter (flake fragment) and angular shatter.

Flakes that exhibited some cortex were classified as primary, secondary, or primary shatter. Primary flakes result from primary reduction of a nodule where nearly all (75-100%) of the dorsal surface is covered with cortex. These flakes seldom have more than one negative flake scar, and cortex is commonly found on the striking platform. Secondary flakes are the next flakes removed in a decortication sequence and have less than 75% of the dorsal surface covered by cortex. These generally have more than one negative flake scar on the dorsal surface. Primary shatter consists of flake fragments and angular waste exhibiting some cortex, but lacking striking platforms. These are also differentiated as primary flake fragments and primary angular shatter.

[9] The debitage analysis and database key is located in Appendix D.

Other flakes identified in this analysis consisted of potlids. These are flakes that pop off a piece when it is overheated. They tend to be circular and do not have striking platforms.

Flake Characteristics

Once the flakes were typed, observations were made on the flakes that included recording striking platform types and heat treating characteristics. Striking platforms are the portion of the flake where pressure was applied to remove the flake from an objective piece. These were recorded in mutually exclusive categories of complex, simple, prepared, or cortical. Some flakes had striking platforms that were too small to positively classify, therefore they were simply left unclassified.

A complex striking platform is multi-faceted. Typically, the multi-faceting is negative flake scars resulting from previous flake removals from a bifacially flaked edge. These typically originate from a biface. Simple striking platforms have a single facet and are also called flat or smooth platforms. The simple platform is usually perpendicular to the remainder of the flake. These are generally struck from a unidirectional and sometimes a multi-directional core. Prepared platforms show evidence of preparation—usually in the form of abrasion—prior to flake removal. Cortical platforms are those that have cortex on the striking platform.

In conjunction with striking platforms, flake lips were also observed and recorded separately. Lips are distinct ridges located just below the striking platform on the ventral site of a flake. These are usually associated with soft-hammer percussion or pressure flaking bending forces. They are commonly found in conjunction with complex striking platforms, but may be found with any of the striking platform categories.

Heat treated flakes were noted and recorded following the same procedure as discussed previously for the chipped stone tools. Heat treated flakes were recorded separately from unheated flakes.

Flakes from a single bag and category were grouped together and counted. If broken flakes refitted, then they counted as one specimen. Weight was recorded for each category of analyzed flakes and recorded in grams. If the weight registered less than 0.1 grams, then the weight was rounded up to 0.1 grams or down to 0.0 grams.

Chapter 3- Data

C14 Dates

To date, a total of 17 radiocarbon dates have been obtained for North Creek Shelter (Table 3.1). Ten of these dates were derived from charcoal samples in the Early Archaic component, while four dates are from charcoal samples in the Paleoarchaic component. These dates tend to ladder up nicely from the bottom to the top with the exception of one anomalous date of 890+/-40 BP (Beta-195226) that was recovered from the lowest level of the Early Archaic component. This date was taken on charcoal from the bottom of the first test pit in 2004 and is rejected based upon probable sample contamination (charcoal falling in from the top of the test pit). The first four dates (7670+/-80 BP to 7990+/-30 BP) in the Early Archaic component are from substrata that were not included in this analysis.

Table 3.1 Radiocarbon Dates from North Creek Shelter (42GA5863)

Stratum	Square	Sample Number	Matr.	Radiocarbon Age	2 sigma Calibrated Range
VIIa	109N 100E	Beta-197358	corn	940±40 BP	760-940 BP
VIIb	110N 98E	Beta-221411	corn	1050±40 BP	920-1050 BP
VId	113N 98E	Beta-221414	char.	6020±60 BP	7000-6710 BP
Vt*	110N 101E	Beta-239024	char.	7700±50 BP	8590-8400 BP
Vt*	110N 101E	PRI-07-102-4364	char.	7990±30 BP	9000-8720 BP
Vu	112N 98E	Beta-221412	char.	7670±80BP	8600-8350 BP
Vt	111N 100E	Beta-207167	char.	7970±80 BP	9030-8590 BP
Vt	110N 100E	Beta-210253	char.	8320±120 BP	9010-9530 BP
Vq	109N 100E	Beta-197359	char.	8310±70 BP	9490-9100 BP
Vh*	111N 98E	Beta-239023	char.	8310±40 BP	9940-9250, 9170-9140 BP
Vh*	111N 98E	PRI-07-102-4029	char.	8860±25 BP	10,160-9860 BP
Vc/f	109N 100E	Beta-194030	char.	9020±70 BP	10,250-10,120 BP
Vi**	109N 100E	Beta-195226	char.	890±40 BP**	710-920 BP**
IVa	110N 100E	Beta-207168	char.	9510±80 BP	11,140-10,560 BP
IIIa	110N 100E	Beta-221415	char.	9690±60 BP	11,200-11,060 BP
IIa*	110N 100E	Beta-239022	char.	9800±50 BP	11,260-11,170 BP
IIa*	110N 100E	PRI-07-102-3716	char.	9960±30 BP	11,420-11,260 BP

*Dates from different labs (Beta Analytic and Paleo Research Institute) on split charcoal samples.

**Anomalous date is rejected due to probable sample contamination.

Tools

A total of 345 tools were identified in the sampled chipped stone tool assemblage. Of these, 135 are from the Early Archaic component and 210 are from the Paleoarchaic component (Tables 3.2 and 3.3). Tool counts divided by volume excavated demonstrate that there are more tools in the Paleoarchaic component (9.7 tools per cubic meter) than the Early Archaic component (7.3 tools per cubic meter) (Table 3.4). Early Archaic tools consisted of projectile points (n=32), bifaces (n=32), one hafted biface/knife, unifaces (n=7), utilized/modified flakes (n=42), drills (n=4), cores (n=5), hammerstones (n=6), and gravers (n=6). Paleoarchaic tools included projectile points (n=15), bifaces (n=36), one hafted biface /knife, unifaces (n=50), utilized/modified flakes (n=77), cores (n=11), hammerstones (n=10), gravers (n=2), and notched flakes (n=8). Differences are apparent in the lower proportions of projectile points and bifaces and higher proportion of unifaces in the Paleoarchaic component over the Early Archaic component. It is also important to note the absence of drills and presence of notched flakes in the Paleoarchaic component (the opposite is true for the Early Archaic component).

Table 3.2. Tool Category by Component

	Component				
	Early Archaic		**Paleoarchaic**		
	n	**%**	**n**	**%**	**Total**
Projectile point	32	23.7%	15	7.1%	47
Biface	32	23.7%	36	17.1%	68
Hafted biface (knife)	1	0.7%	1	0.5%	2
Uniface	7	5.2%	50	23.8%	57
Utilized/modified flake	42	31.1%	77	36.7%	119
Drill	4	3.0%	-	-	4
Core	5	3.7%	11	5.2%	16
Hammerstone	6	4.4%	10	4.8%	16
Graver	6	4.4%	2	1.0%	8
Notched flake	-	-	8	3.8%	8
Total	135	100.0%	210	100.0%	345

Table 3.3. North Creek Shelter Paleoarchaic & Early Archaic Tool Provenience

	Projectile Points									Bifaces				Unifaces							
Provenience	Elko corner-notched	Rocker side-notched	Pinto	Untyped	Reworked Jimmy Allen/Frederick	Scottsbluff	North Creek Stemmed	Hafted Biface (Knife)	Stage 2 (Edged Biface)	Stage 3 (Thinned Biface)	Stage 4 (Preform)	Stage 5 (Finished Biface)	High Angle	Low Angle	Both Angle	Utilized/Modified Flakes	Drill	Core	Hammerstone	Graver	Notched Flakes	Total
Stratum V	2	2	25	2	1	-	-	1	8	6	2	16	4	1	2	42	4	5	6	6	-	135
Stratum IV	-	-	1	3	-	1	-	-	6	7	5	-	5	1	3	13	-	6	3	-	-	54
Stratum III	-	-	-	-	-	-	1	1	1	3	3		18	3	8	43	-	2	5	1	1	90
Stratum II	-	-	-	-	-	-	9	-	1	2	6	2	10	1	1	20	-	2	2	1	7	64
Stratum I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	2
Total	2	2	26	5	1	1	10	2	16	18	16	18	37	6	14	119	4	16	16	8	8	345

Table 3.4. Tool Count/Volume

	Components		
	Early Archaic	**Paleoarchaic**	**Total**
Tool Count	135	210	345
Excavation Volume (cubic meters)	18.5	21.6	40.1
Count/Volume	7.3	9.7	17.0
Percent	42.9%	57.1%	100.0%

Projectile Points

Projectile points were typed following Holmer and Weder (1980), Holmer (1986), and Thomas (1981) (Table 3.5). The Early Archaic component is dominated by Pinto points (n=25); however, two Elko corner-notched points, two Rocker side-notched points, and a reworked Jimmy Allen/Frederick[10] point are present (Figure 3.1). The Paleoarchaic component consists almost solely of ten large stemmed points that do not fit into any common type (Figure 3.2). These are different from other early stemmed points (although somewhat reminiscent of Silver Lake Great Basin Stemmed points) in their stem widths and lengths, as well as for the distinct tangs and overall blade width and length (this will be discussed in more detail in a following section). These points are also tightly dated between 9,960+/-30 to 9,510+/-80 rcybp; thus I propose a new morphological category called North Creek Stemmed for these points. In addition to the North Creek Stemmed points in the Paleoarchaic component, there are one probable Scottsbluff[11] point, one Pinto fragment (which is from the top most level of the component and likely an intrusion from the Early Archaic component), and three untyped points (one broken large-side notched point, one broken unfinished stemmed points, and one fragmentary point). As far as projectile points are concerned, it is apparent that the

[10] The Late Paleoindian Jimmy Allen/Frederick point (Pitblado 2003) is reworked and was likely found and brought to the site by later Early Archaic peoples.
[11] Comparable to Scottsbluff points in Pitblado 2003.

Early Archaic and Paleoarchaic components are represented by distinctly different projectile points.

Table 3.5. Projectile Point Type by Component

	Component				
	Early Archaic		Paleoarchaic		
	n	**%**	**n**	**%**	**Total**
Elko corner-notched	2	6.3%	-	-	2
Rocker side-notched	2	6.3%	-	-	2
Pinto	25	78.1%	1	6.7%	26
Untyped	2	6.3%	3	20.0%	5
Reworked Jimmy Allen/Frederick	1	3.1%	-	-	1
Scottsbluff	-	-	1	6.7%	1
North Creek Stemmed	-	-	10	66.7%	10
Total	32	100.0%	15	100.0%	47

Figure 3.1. Projectile points recovered from the Early Archaic component. Untyped (a-b); Elko corner-notched (c-d); Rocker side-notched (e-f); Jimmy Allen/Frederick (g); Pinto (h-ff). Note that specimens i&f are clearly serrated.

Figure 3.2. Projectile points recovered from the Paleoarchaic component. Pinto (a); Scottsbluff (b); Untyped (c,d,f); North Creek Stemmed (e, g-o).

Elko Points

The two Elko points recovered from the top levels of the Early Archaic component are corner-notched (Figure 3.1c-d).[12] Both are made from Paradise chert, one is fragmentary, and the other is nearly complete.

Rocker Points

Two Rocker side-notched points were also found in the Early Archaic component (Figure 3.1e-f). Both specimens are complete. One is an unidentified white chert, and the other is an unidentified dark cryptocrystalline silicate.

[12] Seven other Elko points were recovered in the excavation; four from Stratum VI, two from Stratum VII, and one from Stratum VIII.

Pinto Points

Twenty-five points (Figure 3.1h-ff) that I have typed as Pinto were found in the Early Archaic component and one fragment (Figure 3.2a) in the top level of the Paleoarchaic component.[13] Unlike typical Pinto points, these specimens have slightly flaring bases that are reminiscent of Elko-eared points. When the mean measurements (see Table 3.6) of the NCS specimens are evaluated using the key created by David Hurst Thomas (1981), they classify as Elko-eared points based solely upon one criteria—*Proximal Shoulder Angle (PSA)*[14]. However, there are several issues with calling these points Elko-eared rather than Pinto. First, Thomas's classification does not include data from points commonly recognized as Pinto—the closest similarity in the key is the Gatecliff split-stem. Second, the NCS specimens barely classify as Elko-eared instead of the Gatecliff split-stem in Thomas's key. He has the Elko-eared PSA set as ranging between 110 and 150 degrees (Thomas 1981:25-26). The mean PSA for points from NCS is 112.4 degrees; therefore, they barely meet these criteria. Finally, the third issue is the associated dates of ~9,000-8,000 rcybp for the points recovered from NCS. This makes these points much older than the date range proposed by Thomas for both Elko-eared and Gatecliff stemmed points. In sum, Thomas's classification system is not useful for typing the NCS points because there are distinctions between these specimens and later Elko-eared and Gatecliff split stemmed points, from farther to the west, that Thomas's system does not take into account.

Vaughan and Warren (1987) modified Thomas's (1981) key to include a distinction between Pinto points and Elko and Gatecliff series. Not only did they include

[13] Three additional Pinto points were recovered from the excavation—one complete specimen from Stratum VII, and two from Stratum VIII (one complete, one fragmentary). These are included in Appendix B.
[14] Proximal Shoulder Angles and Notch Opening Indexes are recorded in Appendix B.

stem and basal measurements, they incorporated maximum thickness as well. When the NCS points are evaluated using the key devised by Vaughan and Warren, they classify as Elko or Gatecliff series based upon thickness alone.[15] Although all other characteristics fall within the variability of Pinto points, Vaughan and Warren would say that the NCS specimens are too thin (mean thickness of 4.8 mm) to fit their classification of Pinto points. It is possible that the Awl site data—where the Pinto points tend to be rather crude, thick, and primarily made out of fine grained basalt— that Vaughan and Warren used to create their key standard could have biased Pinto point thickness by not considering variable thickness across sites.

Next, when the NCS points are compared to the mean measurements for length, width, and thickness of Pinto and Elko-eared points on the Kaiparowits Plateau (Geib 2001:193), then the NCS specimens are more similar to Pinto than Elko-eared. Caution must be applied here since the data from the Kaiparowits Plateau is based on a small sample size (Pinto, n=11; Elko-eared, n=31), and these data do not include stem measurements (specifically PSA which discriminated between Elko-eared and Gatecliff split stem in Thomas's key).

While considering whether to type these NCS points as Pinto or Elko-eared, it becomes apparent that Pinto points are morphologically variable and grade into Elko-eared points. Morphologically, it can only be said that the NCS specimens are Pinto-like; however, they are temporally more like Pinto points than Elko-Eared points.

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[15] According to Vaughan and Warren's (1987) key, Pinto points are greater than or equal to 6.4 mm thick, while Elko and Gatecliff series are less than 6.4 mm thick.

Table 3.6. NCS Pinto Point Measurements

Catalog No.	Material	Measurements in mm Max. Length	Max. Width	Max. Thick	stem width	stem length	neck width	basal indent.	Weight (g)
83.2**	MPW	25.5	15.8	5.2	14.2	8.7	10.9	3.8	1.5
555.1	MPW	-	-	4	23.1	11.6	16.6	4.6	-
620.1	MPW	-	18.2	5.4	16.3	9	13.1	3.4	-
628.1	MPW	-	20.4	5.2	16	8.9	13	2.8	-
803.1**	CO	28	14.1	5.1	14.5	7.4	13	3.1	2.1
1146.1**	MPW	-	15.3	4.6	15	8.3	11.6	1.5	-
1775.1*	MPW	28.6	14.4	4.1	13.9	8.1	9.8	3.2	2.5
1819.1	MPW	29.3	16.7	5.6	16.2	9.1	14.3	3.5	2.6
2033.1	MPW	34.2	15.8	4.3	13	6.8	10.4	3.1	2.3
2154.1*	MPW	49.4	16.2	5.2	14.2	10.8	10.8	3.5	3.9
3451.1*	PC	31.6	16.8	5	15	8.6	12	2.6	2.5
3460.1	CO	25.4	15.1	5	15.1	7.5	12.2	3.6	2.5
3463.1*	PC	-	15.6	4.8	14.6	8.4	13.6	3.6	-
3472.1	PC	-	15.4	5.6	15.5	8.8	11.8	3.9	-
3487.1*	MPW	24.6	16.5	4.6	14.5	8.3	11.7	2.2	1.8
3526.1*	MPW	-	20.9	4.7	15.7	9.8	14.5	4.8	-
3707.1*	MPW	-	19.6	5.2	16.5	8.5	13.4	3.5	-
3707.2*	PC	-	18.9	5.4	14.5	6.9	12.8	2.9	-
3707.3*	PC	-	17.4	5.4	16.2	8.8	14	3.6	-
3791.1	MPW	45	20.8	4.1	21	10.7	14.5	5.1	3.8
3844.1	CD	-	15.8	4.2	12.7	7.4	12.2	5.7	-
3908.1	CO	23.5	12.5	4.6	12.5	6.2	10.5	1.9	1.2
3958.1*	PC	49.1	16.6	4.4	17	10.6	13.6	4.2	4.5
3959.1*	PC	26.5	15.2	4.2	14.9	9.3	11.2	2.3	1.5
4007.1*	MPW	26.6	16	5.2	16.2	8.6	13.3	4	2
4021.1*	MPW	30.5	17.7	4.8	18	12.3	14.1	3.7	3.1
4124.1	MPW	-	14.2	3.8	12.6	7	12.1	3.8	-
4318.1	MPW	22.2	14.5	4.7	12.9	8.9	11	4.3	1.3
6413.1	MPW	-	19	5.3	19.1	10.7	14.3	2.2	-
Mean		**31.3**	**16.6**	**4.8**	**15.5**	**8.8**	**12.6**	**3.5**	**2.4**

*Outside of debitage sample.
**These three points were recovered from Strata VII and VIII.

The NCS points are tightly dated between 9020+/-70 and 7970+/-80 rcybp—placing them temporally in the initial 1000 years of the Early Archaic time period. This makes these points roughly four millennia older than the Elko-eared and Gatecliff split stem points recovered from Gatecliff Shelter (Thomas 1981:13). Taken together, I classify these points from the Early Archaic component at NCS as Pinto points rather than Elko-eared points primarily based upon their age. Regardless of where they are placed in a morphological typology, what matters for this research are their age and how they were hafted. These characteristics are distinctly different from the large stemmed projectile points in the Paleoarchaic component at NCS.

Untyped Points

Five projectile points that were too fragmentary or unfinished to type were recovered from the Paleoarchaic and Early Archaic components. The first Paleoarchaic point is a fragment made from Paradise chert which exhibits edge-grinding on the base of the stem (Figure 3.2c). The second is a large side-notched point with a convex base (this point was probably unfinished) made out of Morrison petrified wood recovered from Stratum IV in the Paleoarchaic component (Figure 3.2d). The third is a large stemmed obsidian point that appears to have been broken during manufacture and is not in its finished form (Figure 3.2f). The other two untyped points were recovered from the Early Archaic component and are made out of Morrison petrified wood (Figure 3.1a-b). One is corner-notched, the other is side-notched, and both exhibit convex bases.

Jimmy Allen/Frederick Point

One stemmed point exhibiting a basal indent and edge grinding was recovered from the lowest level (Substratum Va) of the Early Archaic component (Figure 3.1g). I classified this specimen as a Jimmy Allen/Frederick point because it is morphologically reminiscent of those illustrated in Pitblado (2003:111). This point appears to be a late Paleoindian lanceolate point that has been reworked into a drill. The reworking is clearly evident since the point was heavily patinated, and the reworked edges exposed the underlying texture and color. Stem width measures 20.6 mm, basal indent is 4.2 mm, and the tip is missing.

Scottsbluff Point

One stemmed point classified as Scottsbluff (Pitblado 2003:82) was recovered from the Paleoarchaic component in Substratum IVf (Figure 3.2b). This is another Late Paleoindian projectile point that is heavily reworked and was possibly found and brought to the site by NCS Paleoarchaic occupants. The stem is edge-ground and has a slightly concave base. Stem width measures 18.4 mm, stem length is 12.5 mm, and basal indent is 1.3 mm.

North Creek Stemmed Points

All ten North Creek Stemmed points were recovered from the lower levels of the Paleoarchaic component dating between ~10,000-9,500 rcybp (Figure 3.2e,g-o). These points exhibit edge-grinding on stems that are parallel-sided, slightly expanding, or contracting. Stem bases range from slightly convex to prominently convex. Complete or nearly complete specimens have distinct tangs with one generally being more prominent than the other. These points are morphologically dissimilar enough from the Great Basin Stemmed points (although they are somewhat reminiscent of Silver Lake points [Justice 2002]) that I placed them into their own descriptive morphological category. Measurements for the North Creek Stemmed points are recorded in Table 3.7. Recognizing that the sample size is small, I evaluated the North Creek Stemmed mean measurements against the mean measurements of eight Silver Lake points from Justice (2002:89,422) and found that the Silver Lake points are overall shorter, thicker, and not as wide as North Creek Stemmed points (Table 3.8). Silver Lake point stems are also longer and wider than the stems of North Creek Stemmed points. Finally, Silver Lake points tend to weigh more than North Creek Stemmed points.

Table 3.7. North Creek Stemmed Projectile Points Measurements

Catalog No.	Material	Measurements in millimeters Max. Length	Max. Width	Max. Thick	stem width	stem length	neck width	Weight (g)
6376.1	GSR	60	34.4	9.1	22.6	16.4	22.6	10.1
6059.1	MPW	43.8	27.5	5.7	19	14.3	17.9	6
6377.1*	MPW	48.4	27.9	5.9	16.6	12.2	15.4	6.3
6194.1	PC	43.2	30.8	7.4	18.3	11.3	16.8	7.7
5912.1	BJ	-	-	5.4	14.4	14.8	14.4	-
2972.1	MPW	-	25	5.7	15.7	14.9	15.7	-
6011.1*	MPW	-	27.4	5.9	21.9	13.4	20.2	-
6453.1	PC	-	-	-	12.3	-	12.3	-
6412.1	OB	-	-	7.5	20.2	17.9	20.2	-
6259.1	PC	-	-	6.3	18.5	18.7	18.5	-
Mean		**48.9**	**28.8**	**6.5**	**18.0**	**14.9**	**17.4**	**7.5**

*Outside of debitage sample

Table 3.8 Silver Lake Points (Justice 2002:89, 422)

Spec. No.	Measurements in mm Max. Length	Max. Width	Max. Thick	stem width	stem length	neck width	Weight (g)
12.14	49.2	21.5	7.7	16	17.4	14.8	6.8
12.15	46	39.2	11	24	17.1	31.3	16
12.16	-	26.9	8.4	18.2	16.4	17.5	-
12.17	41.3	29.5	9.4	24	18.7	22.9	8.5
12.18	-	37	8.4	21.9	27.4	20.9	-
12.19	41.2	23.5	7.4	21.5	-	17.6	7.5
12.20	-	22.1	6	15.7	14.1	16.1	-
12.21	48.5	23.4	7.9	16.7	21	14.8	8.8
Mean	**45.2**	**27.9**	**8.3**	**19.8**	**18.9**	**19.5**	**9.5**

Bifaces

Biface stages followed Andrefsky 2005 and a definition for each biface stage is outlined in Chapter Two. As mentioned previously, Stage One bifaces are flake blanks and were not identified during the analysis because they lack modification and could potentially be any flake large enough to work into a biface.[16] Stages 2-3 are considered early stage bifaces, and stages 4-5 are late stage bifaces. The Early Archaic component has a total of 32 bifaces with the majority in the Stage 5 category (Table 3.9, Figure 3.3). The Paleoarchaic component has 36 bifaces and is different in that it has an inverse relationship to the Early Archaic component and very few Stage 5 bifaces (Figure 3.4).

Table 3.9. Biface Stages by Component

	Component				
	Early Archaic		**Paleoarchaic**		**Total**
	n	**%**	**n**	**%**	
Stage 1 (Flake blank)	-	-	-	-	0
Stage 2 (Edged biface)	8	25.0%	8	22.2%	16
Stage 3 (Thinned biface)	6	18.8%	12	33.3%	18
Stage 4 (Preform)	2	6.3%	14	38.9%	16
Stage 5 (Finished biface)	16	50.0%	2	5.6%	18
Total	32	100.0%	36	100.0%	68

Figure 3.3. Select Early Archaic bifaces. Stage 2 (a-e), Stage 3 (f-g), Stage 4 (h), Stage 5 (i-t).

[16] Nodules or cores that were intended to be worked into a biface would also fit into this category.

Figure 3.4. Select Paleoarchaic bifaces. Stage 2 (a-f), Stage 3 (g-j), Stage 4 (k-v), Stage 5 (w).

Hafted Bifaces (Knives)

Two hafted bifaces (knives) were recovered from the Paleoarchaic and Early Archaic components (Figure 3.5). The Paleoarchaic specimen has been typed as a Cody knife and resembles one of the Cody knives from the Larsen Cache in southwestern Wyoming (Ingbar and Frison 1987:462, Figure A6.1c) and one from the Martin Site in Utah Valley (Janetski 2001:20 Figure 4a). It is made out of a dark Paradise chert and was recovered from a Paleoarchaic intensive use-surface (Substratum IIIe) dating between ~9,700-9,500 rcybp.

Figure 3.5. Hafted bifaces (knives). Early Archaic knife (a) (Catalog No.2004.8.3674.1); Paleoarchaic Cody knife (b) (Catalog No. 2004.8.5469.1).

The Cody knife weighs 24.5 grams and measures 78.6 mm long by 43.3 mm wide by 8.1 mm thick. The stem of this point is edge-ground and is morphologically similar to the stems of the North Creek Stemmed points. It even has a distinct tang (the other tang is broken) similar to the North Creek Stemmed points, but this is where the similarity ends. One lateral edge of the blade is convex and reminiscent to the sloping blade edge of the Cody Knives found on the plains (see Bradley and Frison 1987 for examples of these). This edge also exhibits use-wear in the form of an abraded/dulled edge with small and uniform unifacial step-fractured flake scars. This suggests that the blade edge was used to scrape a hard material (Andrefsky 2005). The other blade edge is straight, roughly serrated, and exhibits use-wear in the form of an abraded/dulled edge. The use-wear in conjunction with the serrated edge suggests that the blade edge was used to cut rather than to scrape.

The Early Archaic knife is made out of fine-grained quartzite, has a blunt tip, and exhibits polish wear on its lateral blade edges. It measures 89.7 mm long, 47.1 mm wide, 10.2 mm thick, and weighs 47.8 grams.

Unifaces

Unifaces were present in the Early Archaic component (n=7), but abundant (n=50) in the Paleoarchaic component (Table 3.10, Figure 3.6). Proportionally, the Paleoarchaic (23.8 percent) has many more unifaces than the Early Archaic (5.2 percent) when evaluated against the entire tool assemblage (see Table 3.2). Most of these unifaces exhibit use-wear and were probably used to scrape hides and other materials. The Early Archaic component is represented by four high angle (>45 degrees) unifaces, only one low angle (<45 degrees) uniface, and two both angle (exhibiting angles greater than and less than 45 degrees) unifaces. High angle unifaces (n=33) dominate the Paleoarchaic assemblage, but low angle (n=5) and both angle (n=12) are present as well. Apparently, high angle unifaces were preferred during the Paleoarchaic time period—perhaps for their utility in scraping hides without cutting through the skin.[17]

Figure 3.6. Selected unifaces. Early Archaic (a-b); Paleoarchaic (c-p).

Table 3.10. Uniface Angles by Component

	Component				
	Early Archaic		**Paleoarchaic**		
	n	**%**	**n**	**%**	**Total**
High Angle Uniface	4	57.1%	33	66.0%	37
Low Angle Uniface	1	14.3%	5	10.0%	6
Both Angle Uniface	2	28.6%	12	24.0%	14
Total	7	100.0%	50	100.0%	57

[17] It is interesting to note that 46 percent (n=23) of the Paleoarchaic unifaces were recovered from an intensive use-surface (Substratum IIIe).

Utilized/Modified Flakes

Utilized flakes are expedient tools and are described in Chapter 2. Generally, they are flakes that were used in various cutting or scraping tasks without any time investment put into their manufacture (Andrefsky 2005). They were simply removed from a core and used. Modified flakes are lumped into this category as well since they exhibit only minimal modification with little time investment. The Early Archaic component contained 42 (31.1 percent of the component tool assemblage) utilized/modified flakes while the Paleoarchaic component contained 77 (36.7 percent of the component tool assemblage) (see Table 3.2). Proportionally, the components are not very different, and it is important to note that they represent the bulk of the stone tools in both components.

Drills

Only four drills were identified in the sample assemblage and these all are confined to the Early Archaic component. (Figure 3.7i-l) One drill (Figure 3.7j; Catalog No. 2004.8.4248.1) was reworked on a Late Paleoindian point (Jimmy Allen/Frederick point [Pitblado 2003]) recovered from Substratum Va—the division between the Early Archaic and Paleoarchaic components. Thus, the point probably was found and reworked by an Early Archaic person.

Gravers

A total of eight gravers were identified in the Early Archaic and Paleoarchaic components; six from the Early Archaic and two from the Paleoarchaic components (Figure 3.7). Two of the Early Archaic gravers (Figure 3.7a-b) are modified on flakes while the remaining four are modified on projectile points and a biface. One

Paleoarchaic graver is modified on a biface thinning flake and exhibits four tips (Figure 7.7g). The other Paleoarchaic graver is on the tip of a North Creek Stemmed point.

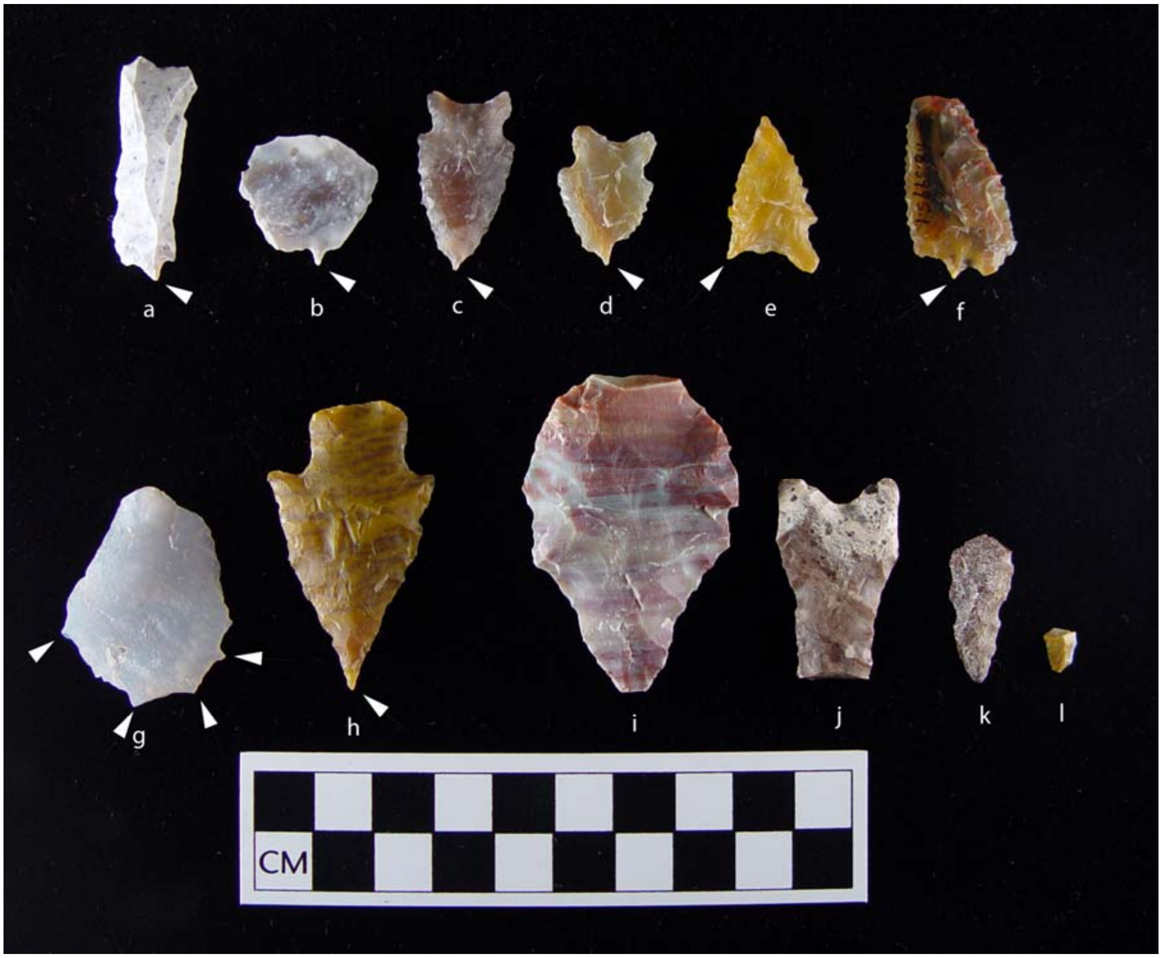

Figure 3.7. Gravers and drills. Early Archaic gravers (a-f); Paleoarchaic gravers (g-h); Early Archaic drills (i-l). White arrows point to the graver tips.

Notched Flakes

Eight notched flakes were recovered from the lower levels of the Paleoarchaic component (Table 3.11; Figure 3.8). All eight were manufactured from obsidian and were recovered from the same substrata (IIb,d,e,f) as the North Creek Stemmed projectile points and green speckled rhyolite. Seven of the eight notched flakes exhibit opposable notching on the proximal end while the eighth is notched on the distal end of the flake. One specimen (Figure 3.8h) appears to be more formalized than the others. It is possible that these notched flakes were utilized as spokeshaves. Similar notched flakes were recovered from Smith Creek Cave on the Nevada/Utah border to the west (Bryan 1979:208-210). The Smith Creek Cave specimens were called "nosed" flakes and were recovered from the Mount Moriah Occupation Zone that dated between ~11,000-9,000 rcybp. Measurements for the Smith Creek Cave specimens have yet to be obtained before a proper comparison can be made to the NCS specimens.

Figure 3.8. Paleoarchaic notched flakes. Note the opposable notching.

Table 3.11. Notched Flake Measurements

Catalog No.	Measurement in mm								Weight (g)
	Length	Width	Thick	notch dia. 1	notch depth 1	notch dia. 2	notch depth 2		
3561.1	42	28.4	4.3	15.5	2.7	12.9	2.9		4.1
5840.1*	24.4	17.8	5.7	5.4	0.6	5.5	1.5		1.6
6037.1	21.9	15.7	2.9	5.7	2.1	5.4	1.7		0.8
6062.1	23.4	12.7	2.3	4	1.1	5.4	1.9		0.3
6408.1	25.6	23	3.2	5.9	1.5	6.7	2		1
6408.2	23.6	18.9	3.7	5	1.4	5.6	1.2		0.6
6409.1	21.5	16.4	1	6.9	2	8.2	1.7		0.6
6410.1	18.1	13.4	3.5	4.4	1.3	4.9	0.9		0.5
Mean	**25.1**	**18.3**	**3.3**	**6.6**	**1.6**	**6.8**	**1.7**		**1.2**

*Outside of debitage sample

Cores

Morrison petrified wood (n=10), Paradise chert (n=5), and one Boulder jasper cores were recovered from both components (Table 3.12; Figure 3.9) All five of the Early Archaic cores were multidirectional cores with an average weight of 41.5 grams, while nine of the Paleoarchaic cores were multidirectional and two were unidirectional with an average weight of 116.6 grams. Although cores are similarly represented in both components (see Table 3.2), they are very different in size as the Paleoarchaic cores are much larger than the Early Archaic cores.

Table 3.12. Core Type by Component

	Component		
	Early Archaic	**Paleoarchaic**	**Total**
Unidirectional			
Morrison petrified wood	-	1	1
Paradise chert	-	1	1
Multidirectional			
Boulder jasper	-	1	1
Morrison petrified wood	3	6	9
Paradise chert	2	2	4
Total	**5**	**11**	**16**
Average weight/core (grams)	41.5	116.6	

Hammerstones

A total of six hammerstones was recovered from the Early Archaic component, and ten from the Paleoarchaic (Table 3.13; Figure 3.10). The six Early Archaic hammerstones averaged 426.6 grams in weight and are quartzite, volcanic welded tuff, and a fine-grained volcanic. Although the Paleoarchaic hammerstones have an average weight of 543.5 grams, two of the quartzite hammerstones (Figure 3.10c,d; Catalog Nos. 2004.8.2932.1 & 2004.8.3524.1) are very small, and weigh 25.1 and 14.5 grams respectively. Paleoarchaic material types are quartzite, volcanic welded tuff, and a conglomerate.

Figure 3.9 Select cores. Early Archaic (a-d), Paleoarchaic (e-l).

Table 3.13. Hammerstone Material by Component

	Component		
	Early Archaic	**Paleoarchaic**	**Total**
Quartzite	4	7	11
Volcanic Welded Tuff	1	2	3
Fine-grained Volcanic	1	-	1
Conglomerate	-	1	1
Total	**6**	**10**	**16**
Average weight/stone (grams)	426.6	543.5	

Figure 3.10 Select hammerstones. Early Archaic (a-b,g); Paleoarchaic (c-f,h-j).

Debitage

Sampled debitage from the Early Archaic (n=3537) and Paleoarchaic (n=8425) components totaled 11,962 specimens (Table 3.14). Although the Paleoarchaic component debitage count is more than double the Early Archaic component count, when the counts are divided by the volume excavated, the difference is reduced although it still remains significant. Table 3.15 presents the data from the sample columns, but not the use-surfaces outside of the sample columns. Here, there are 301 flakes (40.5 percent) per cubic meter in the Early Archaic component and 442 flakes (59.5 percent) per cubic meter in the Paleoarchaic component.

Flake Type

Flake type categories are mutually exclusive, and all types were present in both components (Table 3.16). In the Early Archaic component, internal flakes dominate (60 percent), followed by flake fragments (25.4 percent) and angular shatter (7.7 percent). Other flake types include biface thinning flakes (2 percent), primary decortication flakes (0.7 percent), secondary decortication flakes (2.1 percent), primary decortication shatter (2 percent), and potlids (0.1 percent). Likewise, in the Paleoarchaic component, internal flakes dominate (58.5 percent) followed by flake fragments (30.5 percent) and angular shatter (6.4 percent). The remaining categories each consist of less than 2 percent of the component assemblage.

Striking Platforms

Not all debitage specimens contain striking platforms (i.e. flake fragments, angular shatter, primary decortication shatter, and potlids), and even on those that do contain striking platforms, many of the platforms are too small to classify. Thus, Table 3.17 only contains the counts of classifiable striking platforms by component. Striking platform categories in this table are mutually exclusive. The Early Archaic component striking platforms are dominated by simple (70.4 percent), and then followed by complex (18 percent), prepared (9.3 percent), and cortical (2.4 percent). The Paleoarchaic component follows a similar pattern with simple platforms dominating (68.2 percent), followed by complex (27.1 percent), prepared (4.1 percent), and cortical 0.6 percent).

Table 3.14. North Creek Shelter Debitage Provenience

Provenience	macro without cortex				macro with cortex			micro without cortex				micro with cortex			Other	Total
	Internal Flake	Biface Thinning Flake	Flake Fragment	Angular Shatter	Primary Flake	Secondary Flake	Primary Shatter	Internal Flake	Biface Thinning Flake	Flake Fragment	Angular Shatter	Primary Flake	Secondary Flake	Primary Shatter		
Stratum V	142	42	32	32	10	42	35	1981	30	867	241	14	32	34	3	3537
Stratum IV	95	19	45	12	2	10	6	1409	6	738	91	3	17	24	1	2478
Stratum III	144	33	49	57	3	26	19	1723	49	913	255	6	18	42	1	3338
Stratum II	120	34	52	12	1	9	6	1427	21	765	105	1	20	13	1	2587
Stratum I	2	-	-	1	-	1	-	9	-	7	2	-	-	-	-	22
Total	503	128	178	114	16	88	66	6549	106	3290	694	24	87	113	6	11962

Table 3.15. Sample Columns Debitage Count/Volume

	Components		
	Early Archaic	**Paleoarchaic**	**Total**
Sample Columns Debitage Count	3290	6499	9789
Sample Columns Volume (cubic meters)	10.94	14.72	25.66
Count/Volume	301	442	742
Percent	40.5%	59.5%	100.0%

Table 3.16. Flake Type by Component

	Component				
	Early Archaic		**Paleoarchaic**		
	n	**%**	**n**	**%**	**Total**
Internal flake	2123	60.0%	4929	58.5%	7052
Flake fragment	899	25.4%	2569	30.5%	3468
Angular shatter	273	7.7%	535	6.4%	808
Biface thinning flake	72	2.0%	162	1.9%	234
Primary decortication flake	24	0.7%	16	0.2%	40
Secondary decortication flake	74	2.1%	101	1.2%	175
Primary decortication shatter	69	2.0%	110	1.3%	179
Potlid	3	0.1%	3	0.0%	6
Total	3537	100.0%	8425	100.0%	11962

Table 3.17. Striking Platform by Component

	Component				
	Early Archaic		**Paleoarchaic**		
	n	**%**	**n**	**%**	**Total**
Simple	986	70.4%	1571	68.2%	2557
Complex	252	18.0%	624	27.1%	876
Prepared	130	9.3%	95	4.1%	225
Cortical	33	2.4%	13	0.6%	46
Total	1401	100.0%	2303	100.0%	3704

Lips

As described in Chapter 2, lips are prominent ridges found just below a striking platform and are associated with soft-hammer percussion or pressure flaking. Three hundred fifty-nine (10.1 percent of the component assemblage) flakes with lips were identified in the Early Archaic component, while 547 (6.5 percent of the component assemblage) lipped flakes were noted in the Paleoarchaic component. Therefore, it appears that Early Archaic peoples more often used soft-hammer percussion or pressure flaking than Paleoarchaic peoples (Andrefsky 2005; Odell 2003).

Cortex

Specimens containing cortex in the sample debitage assemblage comprise less than 5 percent (Table 3.18). In the Early Archaic, 2 percent of the component assemblage consists of primary shatter cortex, 2.1 percent of secondary flake cortex, and 0.7 percent of primary flake cortex. The Paleoarchaic assemblage has less cortex overall with primary shatter cortex at 1.3 percent, secondary flake cortex at 1.2 percent, and primary flake cortex at a mere 0.2 percent.

Table 3.18. Cortex by Component

	Component				
	Early Archaic		**Paleoarchaic**		
	n	**%**	**n**	**%**	**Total**
0%	3370	95.3%	8198	97.3%	11568
Primary shatter cortex	69	2.0%	110	1.3%	179
Secondary flake cortex (1-50%)	74	2.1%	101	1.2%	175
Primary flake cortex (51-100%)	24	0.7%	16	0.2%	40
Total	3537	100.0%	8425	100.0%	11962

Flake Size

Flake size is calculated by dividing the debitage weight by the debitage count in a single category. In Table 3.19, debitage is separated not only by component, but by macro (flakes that did not fit through a ½ inch screen) and micro (flakes that did fit through a ½ inch screen) flake categories. In the Early Archaic component, macro flakes averaged 3.28 grams per flake, and micro flakes averaged 0.13 grams per flake. Similarly, Paleoarchaic macro flakes average 3.32 grams per flake, and micro flakes average 0.12 grams per flake. Overall, there is not much of a difference between components in flake size.

Table 3.19. Flake Size (Wt/Ct) by Component

	Component				
	Early Archaic		**Paleoarchaic**		**Total**
Weight (grams)	**weight**	**%**	**weight**	**%**	
Macro (>1/2")	1100.3	73.5%	2519.1	73.5%	3619.4
Micro (<1/2")	396.4	26.5%	906.2	26.5%	1302.6
Total	1496.7	100.0%	3425.3	100.0%	4922
Count	**n**		**n**		
Macro (>1/2")	335	9.5%	758	9.0%	1093
Micro (<1/2")	3202	90.5%	7667	91.0%	10869
Total	3537	100.0%	8425	100.0%	11962
Mean Flake Size (Weight/Count)					
Macro (>1/2")	3.28		3.32		3.31
Micro (<1/2")	0.13		0.12		0.12
Total Mean (grams/flake)	**0.42**		**0.41**		**0.41**

Material Type

There are nine debitage material types specified in Table 3.20. Morrison petrified wood (52.1 percent) clearly dominates the sample assemblage—more than likely because a major source of the toolstone is located within eight kilometers (five miles) to the east of NCS. Paradise chert (28.3 percent) follows Morrison petrified wood in quantity. This toolstone source is located on the southern portion of the Kaiparowits Plateau roughly 56 kilometers (35 miles) to the south. At the source, Paradise chert is abundant and can be found in hand-sized, high-quality nodules (Geib 2001:175-178). Unidentified cryptocrystalline silicate (8.8 percent) is the next largest category and consists of debitage specimens that could not be positively identified as one of the other categories. Most of these specimens likely are Morrison petrified wood, Paradise chert, or Boulder jasper. Sources of Boulder jasper are found on the lower slopes of Boulder Mountain about 24 kilometers (15 miles) to the northeast of NCS (Geib 2001:185-186). In its raw form, Boulder jasper can be found in fairly large nodules; however it is very tough and hard to knap (Ibid.)—which may account for its relative lower percentage in the assemblage—yet its knapability can be vastly improved through heat treatment.

Table 3.20. Material Type by Component

	Component					
	Early Archaic		**Paleoarchaic**			
	n	**%**	**n**	**%**	**Total**	**% Total**
Morrison petrified wood	1792	50.7%	4442	52.7%	6234	52.1%
Paradise chert	943	26.7%	2442	29.0%	3385	28.3%
Unidentified cryptocrystalline silicate	474	13.4%	575	6.8%	1049	8.8%
Boulder jasper	156	4.4%	224	2.7%	380	3.2%
Obsidian	19	0.5%	657	7.8%	676	5.7%
Quartzite	102	2.9%	18	0.2%	120	1.0%
Green speckled rhyolite	-	-	55	0.7%	55	0.5%
Siltstone	42	1.2%	8	0.1%	50	0.4%
Other	9	0.3%	4	0.0%	13	0.1%
Total	3537	100.0%	8425	100.0%	11962	100.0%

(X^2=667.204; df=8; $p<0.000$) (V^2=0.056)

Obsidian (5.7 percent) sources are variable with the nearest source 115 kilometers (71 miles) to the west. Quartzite (1 percent) likely comes from local sources located on site. The green speckled rhyolite (0.5 percent) is fine-grained and its source is unknown; however, it is possible that it comes from volcanic flows near one of the obsidian sources to the west. It is important to note that this toolstone was only found in the lower levels of the Paleoarchaic component in the same substratum as the North Creek Stemmed points (one of which is made from the green speckled rhyolite) and notched obsidian flakes.[18] Siltstone (0.4 percent) also likely comes from local sources located on site. Other (0.1 percent) stone material consists of unknown material and quartz with unknown (possibly local) sources.

[18] A trace element analysis of four green speckled rhyolite samples demonstrated that these specimens do not match up with any known obsidian source.

Broken down by component, the Early Archaic assemblage consists of Morrison petrified wood (50.7 percent), Paradise chert (26.7 percent), unidentified cryptocrystalline silicate (13.4 percent), Boulder jasper (4.4 percent), obsidian (0.5 percent), quartzite (2.9 percent), siltstone (1.2 percent), and other (0.3 percent). The Paleoarchaic component contains Morrison petrified wood (52.7 percent), Paradise chert (29 percent), unidentified cryptocrystalline silicate (6.8 percent), Boulder jasper (2.7 percent), obsidian (7.8 percent), quartzite (0.2 percent), a green speckled rhyolite (0.7 percent), siltstone (0.1 percent), and other (<0.1 percent). Differences in material type between components are significant (X_2=667.204; df=8; p=0.000), with important differences in obsidian, green speckled rhyolite, quartzite, and siltstone proportions.

When material type is evaluated by weight, then some differences between components becomes apparent (Table 3.21). The Paleoarchaic component has a higher proportion (63.3 percent) of Morrison petrified wood than the Early Archaic component (28.4p percent). Another area of difference that is not apparent in counts, is the high proportion (32.1 percent) of quartzite in the Early Archaic component over the mere 2.3 percent of quartzite in the Paleoarchaic component.

Table 3.21. Material Type by Weight

	Component					
	Early Archaic		**Paleoarchaic**			
	weight (g)	**%**	**weight (g)**	**%**	**Total**	**% Total**
Morrison petrified wood	425.8	28.4%	2166.6	63.3%	2592.4	52.7%
Paradise chert	413.2	27.6%	961	28.1%	1374.2	27.9%
Unidentified CCS	106.9	7.1%	55.4	1.6%	162.3	3.3%
Boulder jasper	41.1	2.7%	67.7	2.0%	108.8	2.2%
Obsidian	1.3	0.1%	55.2	1.6%	56.5	1.1%
Quartzite	480	32.1%	80	2.3%	560	11.4%
Green speckled rhyolite	-	-	33.9	1.0%	33.9	0.7%
Siltstone	20.9	1.4%	1.8	0.1%	22.7	0.5%
Other	7.5	0.5%	3.7	0.1%	11.2	0.2%
Total (grams)	1496.7	100.0%	3425.3	100.0%	4922	100.0%

Obsidian Sources

A total of 54 obsidian samples were sourced; 19 from the Early Archaic component and 35 from the Paleoarchaic component (Table 3.22). Wild Horse Canyon and Pumice Hole Mine sources were lumped together as the Mineral Mountains source due to their close proximity to each other. For the Early Archaic component, the Mineral Mountains and Black Mountain[19] sources are equally represented with eight each. Obsidian from the Black Rock and Panaca Summit sources represent one and two specimens respectively. The Paleoarchaic proportions are different as the component is comprised of 27 Mineral Mountains obsidian specimens, three Black Mountain specimens, one Black Rock specimen, and four Panaca Summit specimens. The difference is most prominent between the Mineral Mountains and Black Mountain sources. As obsidian source percentages are considered, it must be recognized that the small sample size could affect the results.

Table 3.22. Obsidian Source by Component

		Component				
		Early Archaic		Paleoarchaic		
Source	**Distance from site**	**n**	**%**	**n**	**%**	**Total**
Mineral Mountains	126km/78miles	8	42.1%	27	77.1%	35
Black Mountain	115km/71miles	8	42.1%	3	8.6%	11
Black Rock	163km/101miles	1	5.3%	1	2.9%	2
Panaca Summit	202km/126miles	2	10.5%	4	11.4%	6
Total		19	100.0%	35	100.0%	54

When sourced obsidian samples are evaluated by weight, the proportions between components remains similar to the proportions based on count with one exception—

[19] The Black Mountain obsidian source was first identified in 2005 and is located approximately 62 kilometers (38.5 miles) to the south of the Mineral Mountains source (Hughes 2005).

Panaca Summit obsidian proportions (Table 3.23). In this case, the Early Archaic component has a much higher proportion (36.4%) of Panaca Summit obsidian than the Paleoarchaic component (9.1%).

Table 3.23. Obsidian Source by Weight

		Component				
		Early Archaic		**Paleoarchaic**		
Source	**Distance from site**	**weight (g)**	**%**	**weight (g)**	**%**	**Total (g)**
Mineral Mountains	126km/78miles	2.1	38.2%	29.8	82.1%	31.9
Black Mountain	115km/71miles	1.3	23.6%	3	8.3%	4.3
Black Rock	163km/101miles	0.1	1.8%	0.2	0.6%	0.3
Panaca Summit	202km/126miles	2	36.4%	3.3	9.1%	5.3
Total Weight (g)		5.5	100.0%	36.3	100.0%	41.8

Chapter Summary

In both the Paleoarchaic and Early Archaic components at NCS, there were abundant chipped stone tools and debitage pieces. Overall, the Paleoarchaic component contained more chipped stone artifacts than the Early Archaic component even when standardized by volume excavated. Major differences in chipped stone tools between the two components are notable in projectile points, bifaces, unifaces, cores, hammerstones, and notched flakes.

The Early Archaic component has a higher proportion of projectile points as well as the distinct morphological change to notched points from the Paleoarchaic stemmed points. The Early Archaic component has higher proportions of finished bifaces than the Paleoarchaic component, but lower proportions of unifaces. Early Archaic cores and hammerstones tend to weigh less than Paleoarchaic cores and hammerstones, and notched flakes (or spokeshaves) are only found in the Paleoarchaic component.

The debitage assemblage for both components is essentially the same for flake types, striking platform types, flake size, and flake cortex. Differences between components are primarily isolated to material type. Weight proportions indicate that the Paleoarchaic component contained much more Morrison petrified wood and much less quartzite than the Early Archaic component. Weight and counts point to a significant difference is highly localized toolstones (quartzite and siltstone) and non-local toolstones (green-speckled rhyolite and obsidian) between components. The Early Archaic component has much higher proportions of the highly localized toolstone and much less non-local toolstone than the Paleoarchaic component.

Obsidian sources are also different by time period. Weight and count of sourced obsidian specimens indicate that the Mineral Mountains sources were utilized more during the Paleoarchaic time period, while the Black Mountain and Panaca Summit sources were utilized more during the Early Archaic time period.

In summary, there are definite differences between the Early Archaic and Paleoarchaic components at NCS which is primarily evident in the chipped stone tools. Having identified the areas of apparent similarities and differences between components, the next chapter will discuss those areas of the chipped stone assemblage that may reflect residential mobility.

Chapter 4-Discussion

Residential Mobility

Previous research (Beck and Jones 1997; Goebel 2007) has characterized Paleoarchaic and Early Archaic groups as residentially mobile foragers after Lewis Binford's (1977, 1979, 1980) studies of modern day foragers. In addition, Great Basin researchers have found that the Paleoarchaic foragers exhibited a higher level of residential mobility than the Early Archaic foragers (Beck & Jones 1997; Beck et al. 2002; Goebel 2007). Specifically looking at Ted Goebel's (2007) work at Bonneville Estates Rockshelter, the difference in residential mobility is readily apparent in the chipped stone assemblage. These differences having been demonstrated for the Great Basin, I will attempt to do the same at North Creek Shelter on the Colorado Plateau.

First, I am assuming that both the Paleoarchaic and Early Archaic peoples at NCS were residentially mobile foragers. Second, I assume that the site was a residential camp—one that was strategically selected in order for the family group to take advantage of the available resources in the general area—for both time periods (Binford 1977, 1979, 1980). Third, I am assuming that both peoples practiced high degrees of residential mobility—i.e. groups stayed at NCS for short periods of time focusing on a variety of local resources before moving on to other resource rich areas—when compared with younger Archaic groups. Finally, based upon the research conducted at BER and in the Great Basin in general, I expect to find that the NCS Paleoarchaic peoples were even more residentially mobile than the Early Archaic peoples.

In order to test the relative degree of residential mobility between components, I will primarily follow Goebel's (2007) model from BER, which includes examining length of stay, catchment area, tool kit formality, and tool provisioning. If the NCS Paleoarchaic people were more residentially mobile than the Early Archaic peoples, then I expect to find that they stayed at the site for shorter lengths of time, utilized larger and more diverse catchment areas, used a more formalized tool kit, and did more tool resharpening as part of their provisioning.

Length of Stay

To test how long Paleoarchaic and Early Archaic groups were staying at NCS, I will examine the tool richness, raw material diversity, and formal/informal tool ratios for each component. Richness is defined as the number of tool categories in a component. Diversity (H') combines richness and equitability within each category to describe the degree to which the categories are equally abundant and is calculated using the Shannon-Weaver function (Reitz and Wing 1999:105).[20] Equitability/evenness (V') is the degree to which the categories are equally abundant independent of richness.[21] Using these definitions, if the Paleoarchaic occupants stayed at the shelter for shorter lengths of time, then I expect to see a lower richness of tools, a higher diversity among toolstone, and a higher ratio of formal/informal tools in the Paleoarchaic component over the Early Archaic component (Andrefsky 2005; Goebel 2007; Odell 2003; Whittaker 1994).

Tool Richness

Tool richness is the count of tool type categories per component. The NCS chipped stone tool assemblage demonstrates no difference in richness between components (the specialized Early Archaic drills are offset by the specialized

[20] The higher the H' value, the less diverse the assemblage is. The lower the H' value, the more diverse the assemblage is.
[21] The closer the V' value is to one, the more even or equitable the assemblage is. The closer V' is to zero, the less even or equitable the assemblage is.

Paleoarchaic notched flake tools) (Table 4.1). Thus, the tool richness does not suggest that one group of people stayed at NCS longer than the other.

At BER, the Pre-Archaic component is richer in tool categories (n=9) than the Early Archaic component (n=6) (Table 4.2) as the Early Archaic component is lacking combination tools, gravers, and denticulates.[22] This suggests that the Pre-Archaic peoples at BER required additional tool types to perform additional activities, for which an increased length of stay would be inferred (Andrefsky 2005). Evaluated in this manner, we get the opposite result than expected; however, this difference is based upon a total of four tools: one combination tool, two gravers, and one denticulate. The small numbers of these tools allows the possibility that the differences could be the result of some other factor than length of stay, which makes this conclusion very tentative.

Table 4.1 NCS Tool Category Richness by Component[23]

	Components	
	Early Archaic	Paleoarchaic
Projectile point	x	x
Biface	x	x
Hafted biface (knife)	x	x
Uniface	x	x
Utilized/modified flake	x	x
Drill	x	-
Core	x	x
Hammerstone	x	x
Graver	x	x
Notched flake	-	x
Component Richness	**9**	**9**

[22] Goebel (2007) includes groundstone in the tool category which would increase the Early Archaic tool richness to seven. This still would not change the conclusion that the Pre-Archaic peoples stayed at the site for longer periods of time.

[23] Although not included in this test, formal groundstone is only present in the Early Archaic component. If this tool category was included, then it would indicate that the Paleoarchaic tools are not as rich; however, the difference of one category is small and probably insignificant.

Raw Material Diversity

Diversity of toolstone is telling between components.[24] Local toolstones (Morrison petrified wood, Paradise chert, and Boulder jasper) dominate the assemblages (see Table 3.20),

Table 4.2 BER Tool Category Richness by Component

	Components	
	Early Archaic	Pre-Archaic
Projectile points	x	x
Biface	x	x
Combination tool	-	x
End/Side Scrapers	x	x
Retouched Flake	x	x
Core	x	x
Unworked Cobble	x	x
Graver	-	x
Denticulate	-	x
Component Richness	**6**	**9**

and there does not appear to be much difference between components for these toolstone types based only on count (Early Archaic H'=0.562; Paleoarchaic H'=0.545).[25] When toolstone weight is factored in, then it becomes apparent that the Paleoarchaic peoples incorporated much more Morrison petrified wood than the Early Archaic people (Figure 4.1). Calculated by toolstone weight, it becomes apparent that the Paleoarchaic component (H'=0.443) is more diverse and less equitable than the Early Archaic component (H'=0.637).[26]

Clear differences between components are also evident in the proportions of highly localized (quartzite & siltstone) and non-local (obsidian and green speckled

[24] Equitability is factored in the Shannon-Weaver function of diversity; however, it can be measured independent of richness by dividing H' by richness, resulting in V'. Here, the closer V' is to one, the more even or equitable the assemblage is.
[25] Early Archaic V'=0.623; Paleoarchaic V'=0.571.
[26] Early Archaic V'=0.706; Paleoarchaic V'=0.464.

rhyolite) toolstones (X^2=627.486; df=1; p<0.000)[27] (V^2=0.697)[28] (Figure 4.2). The Paleoarchaic component contains higher proportions of non-local toolstone than the Early Archaic, while the Early Archaic component has higher proportions of highly localized toolstone.

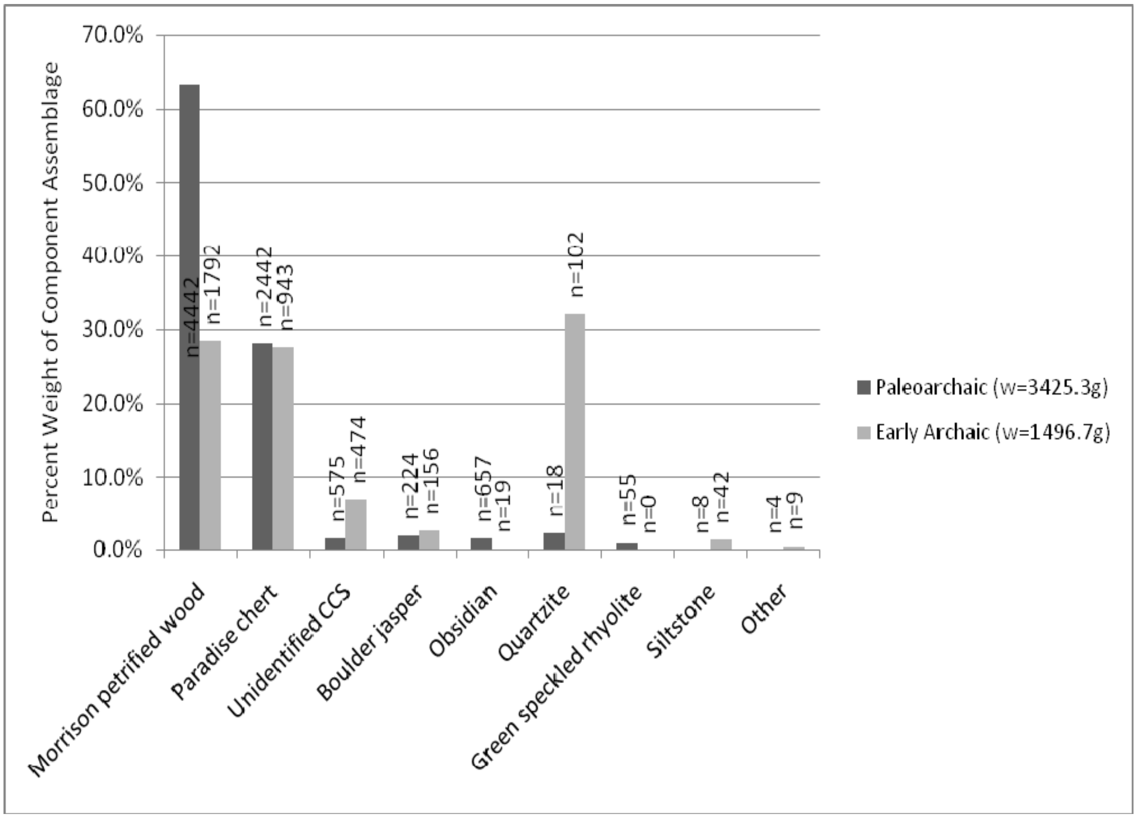

Figure 4.1. NCS toolstone weight by component. Note the magnified differences in Morrison petrified wood and quartzite between components.

[27] The chi-squared test measures the significance of the data between time periods. The differences between components are significant at α=0.05. If the P value is higher than the alpha value, then the data are insignificant and the differences between components may be the result of sampling error.
[28] Cramers V-squared tests the strength of association between components. The closer the value is to one, the stronger the association between components. Again the significance level is set at α=0.05.

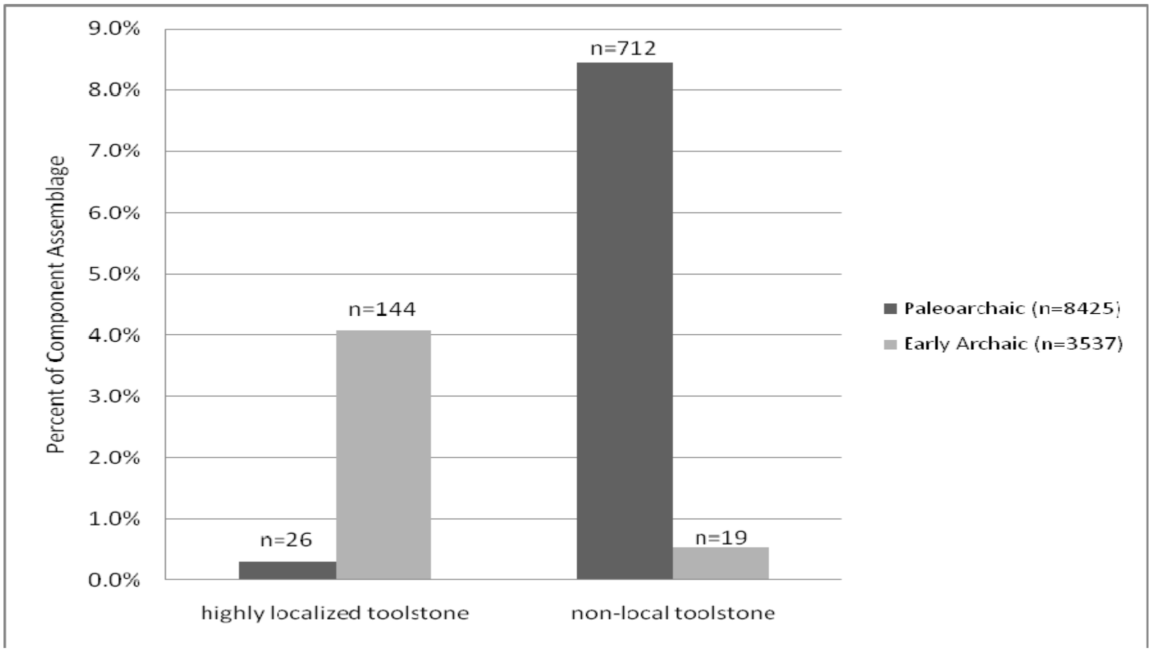

Figure 4.2. NCS highly localized toolstone (quartzite and siltstone) versus non-local toolstone (obsidian and green speckled rhyolite) by component. (X^2=627.486; df=1; p<0.000) (V^2=0.697)

These demonstrate that the Paleoarchaic raw material assemblage is more diverse than the Early Archaic assemblage and that Paleoarchaic peoples had a stronger preference for non-local toolstone than the Early Archaic people at NCS. Therefore, these data would suggest that Paleoarchaic peoples stayed at the site for shorter lengths of time than the Early Archaic peoples.

Toolstone material at BER (Goebel 2007) is only slightly variable as well (Figure 4.3). The Pre-Archaic component is barely more diverse (H'=0.468) than the Early Archaic component (H'=0.497).[29] Although the proportions are statistically significant (X^2=141.234; df=4; p<0.000), the strength of association is weak (V^2=0.034). Therefore, differences in toolstone material between components are not too dissimilar; however, there appears to be a very slight increase in diversity and slightly higher proportions of

[29] Early Archaic V'=0.711; Pre-Archaic V'=0.670

non-local toolstone (obsidian and fine-grained volcanic) in the BER Pre-Archaic component.

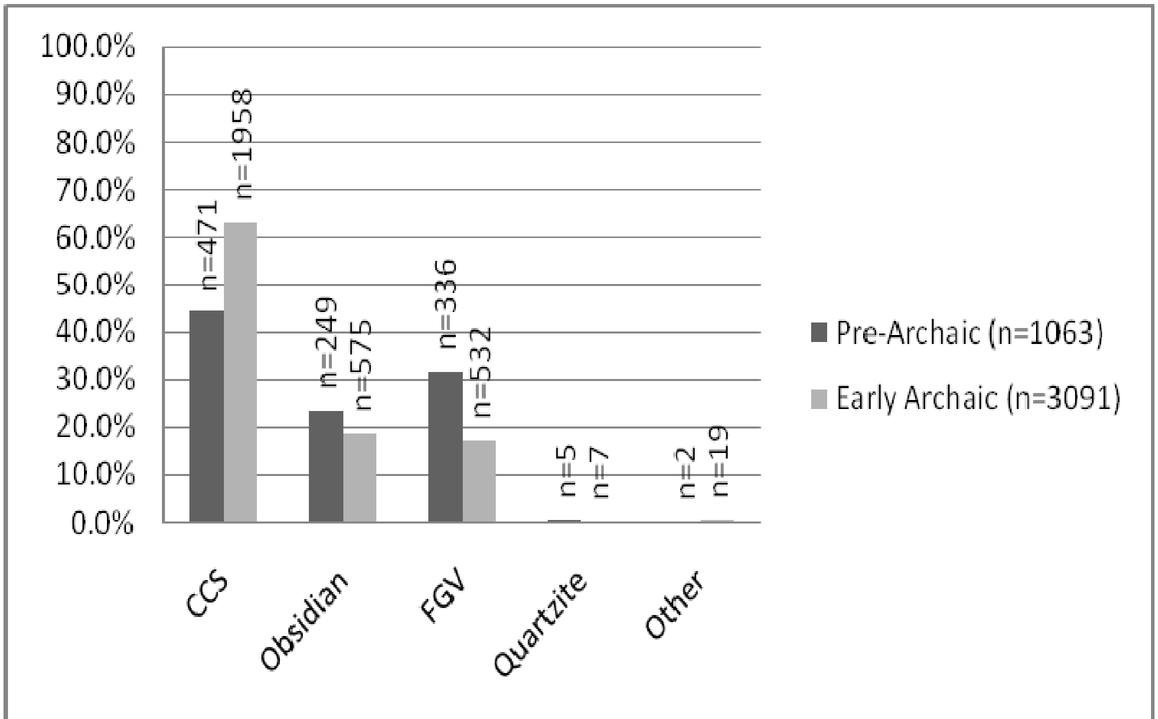

Figure 4.3. BER toolstone material by component (Goebel 2007). (X^2=141.234; df=4; p<0.000) (V^2=0.034).

Formal/Informal Tools

Formal tools are those artifacts that required greater time investment in their manufacture than informal tools (Andrefsky 2005). Two formal/informal tests will be conducted, one looking at formal to informal cores, and the other looking at formal to informal tools by component.

For the first test, formal cores consist of Stage 2 & 3 bifaces, while informal cores consist of unidirectional and multidirectional cores (Andrefsky 2005). When the formal to informal core ratio is examined by component, then it appears that the Early Archaic component has a slightly higher ratio (1.8:1) of formal to informal cores over the

Paleoarchaic component (1.4:1) (Table 4.3); however, the difference is very slight and statistically insignificant (X^2=0.096; df=1; p=0.757) (V^2=0.003).

Table 4.3. NCS Formal/Informal Core Ratio by Component

	Component	
	Early Archaic	**Paleoarchaic**
Formal Cores (Stage 2 & 3 bifaces)	7	11
Informal Cores	4	8
Formal/Informal Core Ratio	1.8:1	1.4:1

Similarly, an evaluation of the formal to informal tools suggests that there is no difference in toolkit formality between the two components (X^2=0.009; df=1; p=0.924) (V^2<0.000) (Table 4.4). For this calculation, formal tools consisted of projectile points, Stage 3-5 bifaces, hafted biface, unifaces, drills, gravers, and notched flakes. Informal tools were Stage 2 bifaces, utilized/modified flakes, cores, and hammerstones.

Table 4.4. NCS Formal/Informal Tool Ratio by Component

	Component	
	Early Archaic	**Paleoarchaic**
Formal Tools	41	75
Informal Tools	51	91
Formal/Informal Tool Ratio	0.8:1	0.8:1

These two tests reveal that formal/informal core and tool ratios do not appear to be different between components; therefore, these data do not suggest than one group of people stayed at NCS for longer/shorter lengths of time than another.

Evaluating the BER tool kit formality in the same manner, differences between components is readily apparent (Tables 4.5 and 4.6). Although the formal/informal core ratios indicate that that the Early Archaic toolkit at BER is much more formal (V^2=0.298) than the Pre-Archaic toolkit, this is likely the result of the small sample size in the Pre-Archaic component. In this case, looking at formal to informal cores might not be appropriate for evaluating tool kit formality at BER. An evaluation of formal to informal tools suggests that the Pre-archaic tool kit is more formal than the Early Archaic toolkit, but again this may be affected by sample size (X^2=2.060; df=1; p=0.151) and the difference is statistically slight (V^2=0.015). Nonetheless, it appears that the BER Pre-Archaic toolkit is a bit more formal than the BER Early Archaic toolkit.

Table 4.5. BER Formal/Informal Core Ratio by Component

	Component	
	Early Archaic	**Pre-Archaic**
Formal Cores (Stage 2 & 3 bifaces)	35	2
Informal Cores	2	3
Formal/Informal Core Ratio	17.5:1	0.07:1

Table 4.6. BER Formal/Informal Tool Ratio by Component

	Component	
	Early Archaic	**Pre-Archaic**
Formal Tools	45	19
Informal Tools	59	14
Formal/Informal Tool Ratio	0.8:1	1.4:1

Summary

Based upon evaluations of tool richness, raw material diversity, and formal/informal tools, only raw material diversity demonstrated a significant difference between components at NCS. Yet, based upon raw material diversity, it appears that Paleoarchaic people stayed at NCS for shorter lengths of time than Early Archaic peoples.

Although tool richness suggests that the Pre-Archaic peoples stayed longer at BER, toolstone diversity and tool kit formality suggest otherwise. As previously discussed, the tool richness could result from other factors than length of stay. Therefore, the BER Pre-Archaic occupants probably did stay for shorter lengths of time at the shelter than the Early Archaic occupants, and the difference between the two time periods appears to be stronger than seen at NCS.

Catchment

Testing catchment for both time periods will include looking at size and diversity in the toolstone types and sources (Jones et al. 2003). Catchment size (implied through the richness and location of toolstone sources) roughly measures the size of area that groups of people utilized and/or traversed in order to obtain their necessary resources. Diversity implies differential preferences and movement in the catchment area. If NCS Paleoarchaic groups utilized larger catchment areas than Early Archaic groups, then I expect to find unique non-local toolstone with sources located further away from the site in the Paleoarchaic component. Closely related, if the Paleoarchaic lithic conveyance zones are more diverse than Early Archaic zones, then I expect to see higher proportions of non-local to local toolstone in the Paleoarchaic component.

Size

Examining the toolstone material from both components demonstrates that all types of sourced toolstone are represented in both components (Table 4.7; see also Figure 4.4).[30] Toolstone sources being a rough measure of catchment area (Beck and Jones 1997, Jones et al. 2003), it appears that both the Paleoarchaic and Early Archaic occupants of NCS utilized catchment areas of the same size (Bodily 2008).

This is different from what was evident in the sourced obsidian at BER (Goebel 2007). The BER Pre-Archaic component had obsidian specimens from Malad, but none

[30] Because the exact source of the green speckled rhyolite is unknown, it is not considered in calculating catchment area.

from the Mineral Mountains (Wild Horse Canyon), while the reverse is true for the Early Archaic component (Goebel 2007:177, Figure 9.5). At BER, the sourced specimens reveal that the Pre-Archaic catchment area is indeed larger than the Early Archaic catchment zone.

Table 4.7. NCS Sourced Toolstone by Component

Source	Distance from site	Component: Early Archaic	Component: Paleoarchaic
Non-local Toolstone			
Panaca Summit obsidian	202km/126mi	x	x
Black Rock obsidian	163km/101mi	x	x
Mineral Mountains obsidian	126km/78mi	x	x
Black Mountain obsidian	115km/71mi	x	x
Local Toolstone			
Paradise chert	56km/35mi	x	x
Boulder jasper	24km/15mi	x	x
Morrison petrified wood	8km/5mi	x	x
Richness		**6**	**6**

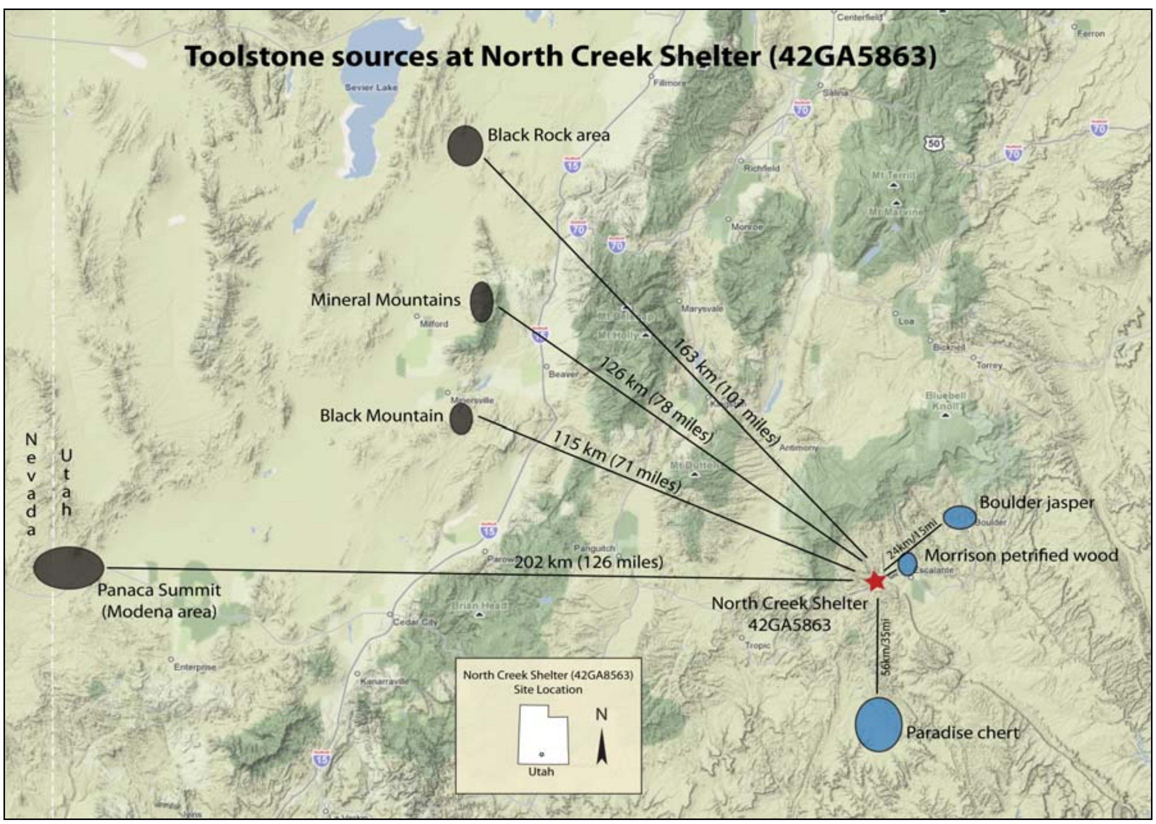

Figure 4.4 NCS toolstone source locations. Non-local obsidian sources are in shaded in black.

Diversity

Diversity of toolstone within both components has been previously discussed, and reflects differential movement within the catchment area (Figure 4.1, also see Table 3.20). As pointed out before, a area of significant difference is found in the non-local toolstone. There is a higher proportion of non-local toolstones (obsidian and green speckled rhyolite) in the Paleoarchaic component than the Early Archaic component (see Figure 4.2). This suggests that Paleoarchaic peoples visited these non-local toolstone sources to the west more frequently or obtained more per visit than the Early Archaic peoples (Andrefsky 2005; Whittaker 1997). In addition, there is variability between components in the relative frequency of obsidian from different sources (X^2=9.202; df=2; p=0.010) (V^2= 0.173)[31] (Figure 4.5, also see Table 3.23). Here, the major differences are found in the proportions between the Mineral Mountains, Black Mountain, and Panaca Summit sources by component; however this may be exaggerated by the small sample size. This may reflect toolstone preference and/or differential movement in the catchment area, but in either case it suggests Paleoarchaic people utilized and moved within their catchment area differently than Early Archaic people.

Proportions of obsidian sources at BER (Goebel 2007) reveal prominent differences between time periods (Figure 4.6). Apparently, Pre-Archaic BER occupants utilized obsidian from Browns Bench located in Idaho much more than the Early Archaic occupants. Also, Early Archaic occupants incorporated much more obsidian form the

[31] Chi-squared and Cramers V^2 tests were run on count not weight. In order to make the chi-squared test valid, the Black Rock source was not included in this test since it produced an expected count of less than one.

local Ferguson Wash source than the Pre-Archaic peoples. These reveal that the Pre-Archaic peoples at BER focused more on non-local obsidian sources.

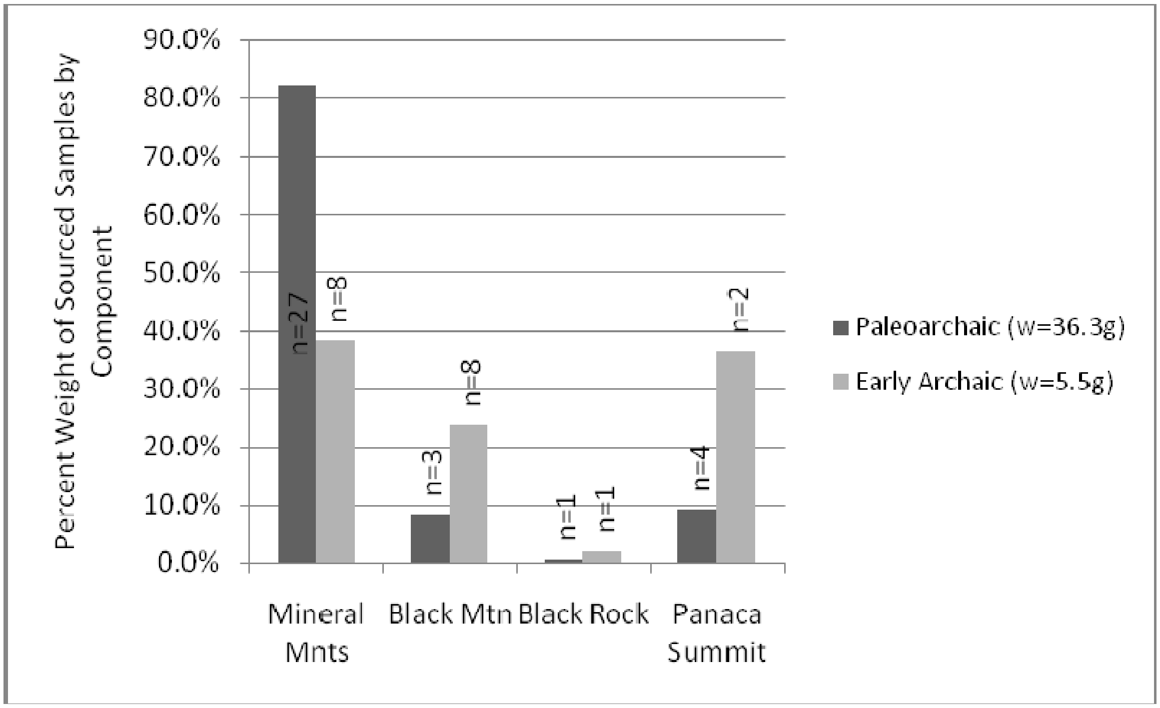

Figure 4.5. NCS obsidian source proportions by weight. Note the large differences between the Mineral Mountains, Black Mountain, and Panaca Summit sources by time period.

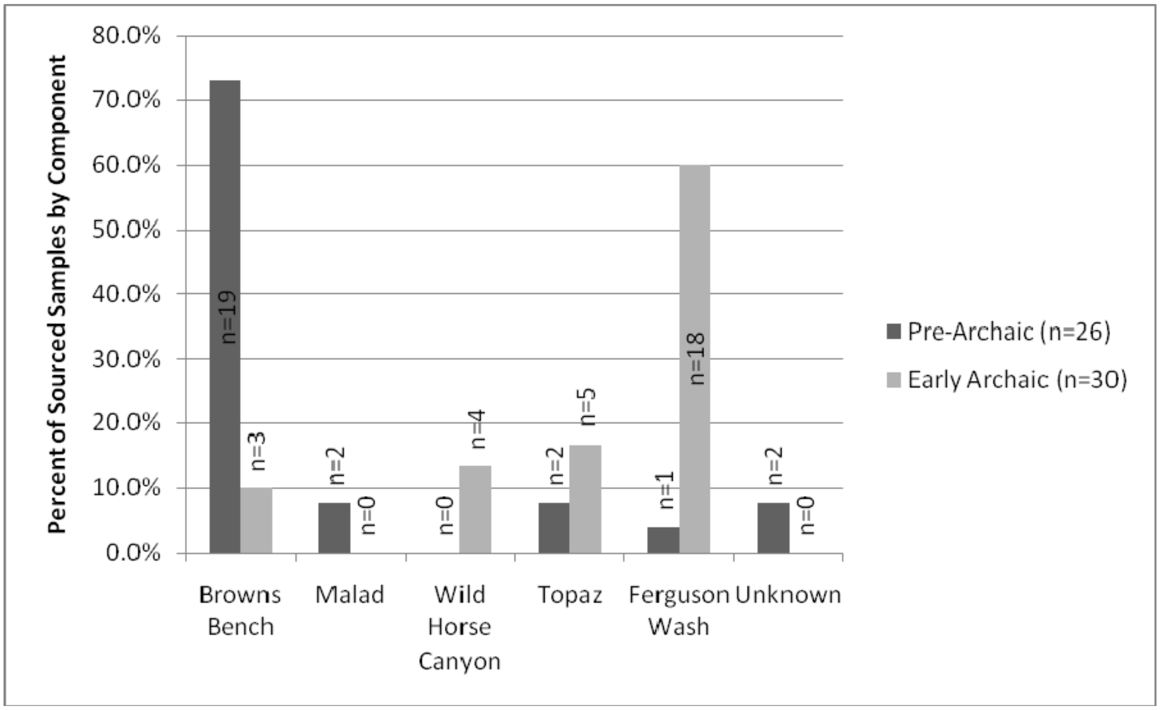

Figure 4.6. BER sourced obsidian proportions based on counts. Note the prominent difference by time period in the Browns Bench and Ferguson Wash sources.

Summary

As far as can be determined, catchment size is the same for both time periods at NCS—which does not support differences in residential mobility between NCS Paleoarchaic and Early Archaic groups. Yet, the toolstone in the Paleoarchaic component is more diverse, which suggests a more diverse catchment area implying a higher level of residential mobility for the time period. Similarly, the non-local toolstone variability indicates that Paleoarchaic groups moved around in their catchment area more frequently than Early Archaic groups—again implying a higher level of residential mobility.

Differences in catchment area for Paleoarchaic and Early Archaic peoples at NCS are not as great as the differences between the Pre-Archaic and Early Archaic time periods at BER. The BER data indicate that the Pre-Archaic lithic conveyance zone is much larger and more diverse than the Early Archaic lithic conveyance zone. If this really does imply differences in residential mobility, then the Pre-Archaic occupants of BER were notably more residentially mobile than the Early Archaic occupants.

Tool kits

Tool kit formality is based upon the relationship between formal to informal tools. Previous discussion revealed that there does not appear to be any difference in tool kit formality between the Paleoarchaic and Early Archaic peoples at NCS (see Tables 4.3 and 4.4). Thus, tool kit formality does not imply any difference in levels of residential mobility between the Paleoarchaic and Early Archaic groups that occupied the shelter. This is different from what is evident at BER as its Pre-Archaic tool kit tended to be more formal (i.e. more finished tools) than its Early Archaic tool kit (see Tables 4.5 and 4.6).

Provisioning

For this discussion, provisioning will focus on how Paleoarchaic and Early Archaic groups provisioned themselves with tools at NCS—through producing new tools on site, and/or resharpening already existing ones. Clearly both activities would have occurred at NCS during both time periods, but if the Paleoarchaic peoples were more residentially mobile, then there should be evidence for a higher frequency of tool rejuvenation in the Paleoarchaic component, and a higher frequency of tool manufacturing in the Early Archaic component. Evidence for tool manufacture and rejuvenation should be apparent in biface stages, toolstone material, flake types, striking platforms, biface thinning flakes, flake size, and cortex (Andrefsky 2005).

Proximity to toolstone sources and the quality of the toolstone affects site function and toolstone proportions (Andrefsky 2005:158). In the case of NCS, there are multiple high quality toolstone sources in close proximity (Morrison petrified wood, Boulder jasper, and Paradise chert). These would have presented an ideal opportunity for manufacturing new tools on site for both Paleoarchaic and Early Archaic groups. Therefore, it is expected to see a preponderance of evidence for tool manufacture from these toolstones in both components.

Biface Stages

Biface stages reflect tool production rather than tool rejuventation; therefore, if Paleoarchaic groups focused less on tool production than Early Archaic groups at NCS, then there should be higher proportions of early stage bifaces in the Early Archaic component. Bifaces recovered from the Paleoarchaic and Early Archaic components at NCS reveal that biface production occurred during both time periods. Yet, there are some apparent differences in biface stages (Figure 4.7). In the Paleoarchaic time period, bifaces were manufactured in increasing proportions from Stage 2 to Stage 4, and then there is a large drop off in Stage 5 bifaces. A possible explanation for this pattern may be that the Paleoarchaic people at NCS were manufacturing bifaces to Stage 5, but then they carted off the finished Stage 5 bifaces to their next stop in their seasonal round. The Early Archaic time period reveals an inverse relationship as bifaces were manufactured in decreasing proportions from Stage 2 to Stage 4, and then there is a large increase in Stage 5 bifaces. It is important to note that almost all of the Stage 5 bifaces are biface tips (possible projectile point tips). Accounting for the high proportion of Stage 5 biface tips may be as simple as these tips having been lost in a hunted animal which was then subsequently brought back to the site to be butchered. Considering this as a possible explanation for the high proportion of finished bifaces in the Early Archaic component, the data suggest that the Early Archaic peoples were also manufacturing early stage bifaces out of local toolstone on site. However, Early Archaic peoples were not manufacturing them to the final stages, rather they were transporting them to some other site for the final working. Considered together, it appears that NCS Paleoarchaic occupants were producing more bifacial tools on site than the Early Archaic occupants. This is the opposite than what was expected, but the pattern is significant (X^2=21.729; df=3; p<0.000)[32] and strong (V^2=0.319).

Biface production at BER reveals a different relationship between time periods (Figure 4.8). The BER Pre-Archaic sample size is small and makes looking at biface proportions tentative.[33] The BER Early Archaic occupants produced many Stage 2 bifaces, yet it appears that they were manufactured to their final forms elsewhere. The difference between NCS and BER Stage 5 bifaces may be explained by the possibility that butchering occured directly outside of the rockshelter and was therefore not recovered in the excavation sample. In sum, the data suggest that the BER Early Archaic occupants produced bifaces to a much higher degree than the Pre-Archaic occupants.

[32] The Chi-squared test was calculated without Stage 1 bifaces.
[33] The Chi-squared test is not valid on this data since there are four cells with expected counts less than one and nine cells with expected counts less than five. This means that the pattern—specifically in the Pre-Archaic component—is likely the result of sampling error.

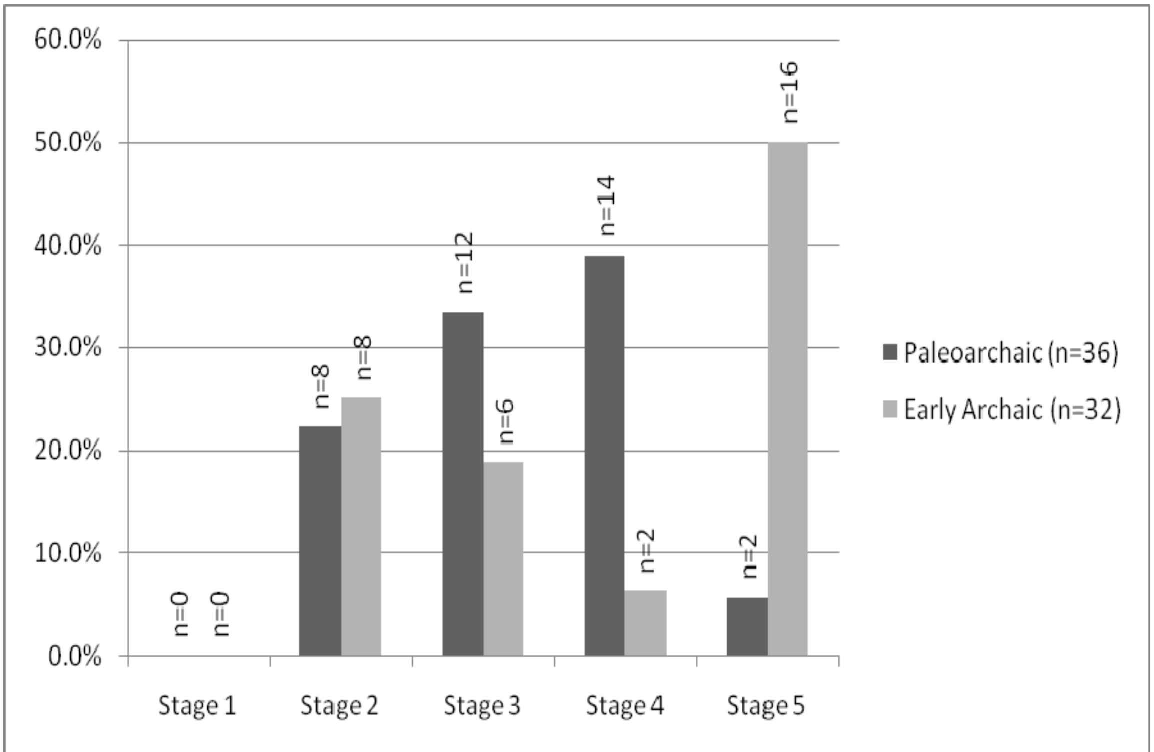

Figure 4.7. NCS biface stages by component. (X^2=21.729; df=3; p<0.000) (V^2=0.319)

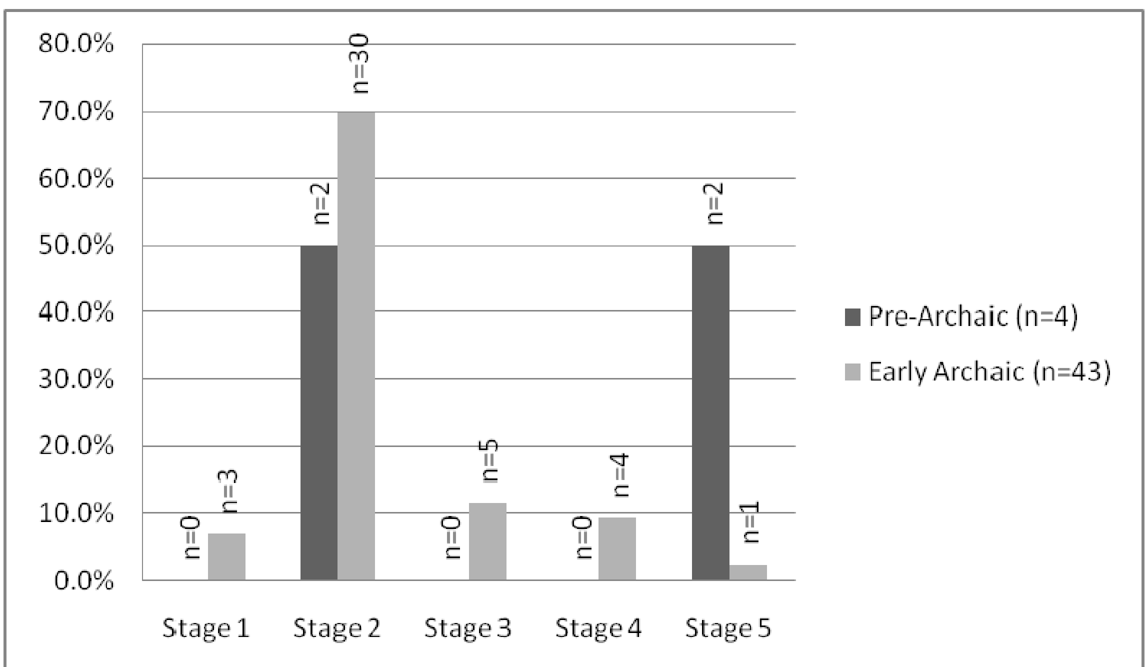

Figure 4.8. BER biface stages by component. (V^2=0.305)

Toolstone material

Due to the proximity of NCS to the high quality toolstone sources (Geib et al. 2001), it is expected that these toolstones will dominate the assemblage for both components—which is clearly the case as Morrison petrified wood, Paradise chert, and Boulder jasper constitutes over 80 percent of the assemblage for both time periods (Figure 4.9).[34] This suggests that the primary activity was tool manufacture of local toolstone during both occupational periods at NCS.

Highly localized toolstone of inferior quality (quartzite and siltstone) and non-local toolstone (obsidian and green speckled rhyolite) should provide evidence for differences in tool manufacture and rejuvenation by component. If the Paleoarchaic peoples focused more on tool rejuvenation than Early Archaic groups, then there should be a higher proportion of non-local toolstone in the Paleoarchaic component.

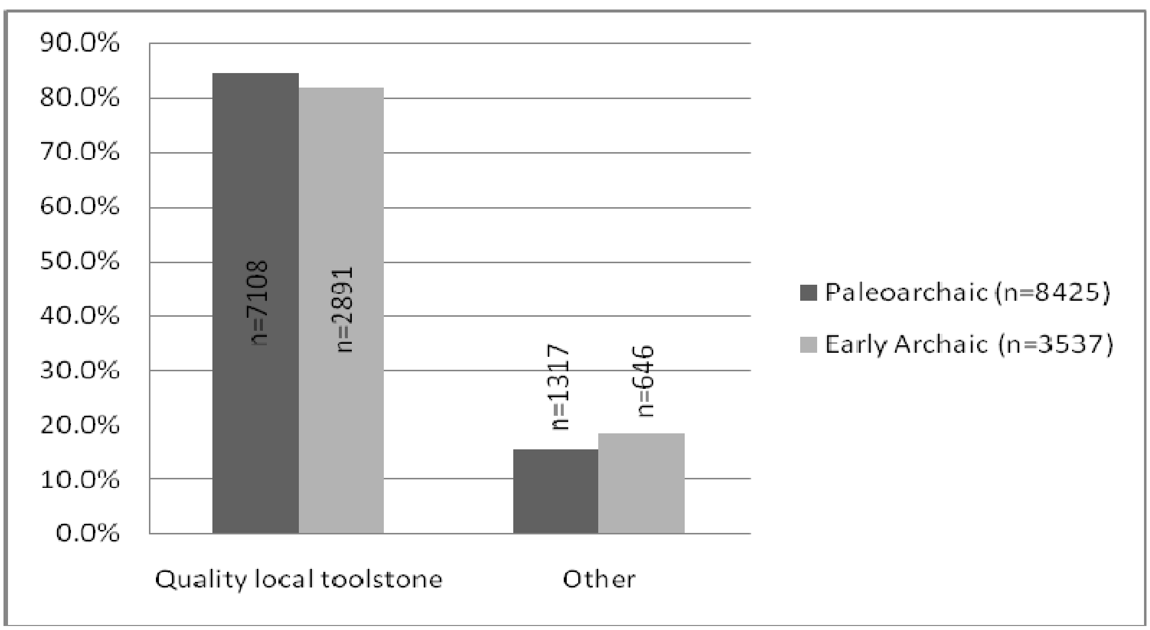

Figure 4.9 NCS quality local toolstone (Morrison petrified wood, Boulder jasper, and Paradise chert) versus other by component. (X^2=12.581; df=1; p<0.000) (V^2=0.001)

[34] See Andrefsky 2005 and Odell 2002 for a discussion on the effects of toolstone proximity and quality.

Likewise, if Early Archaic peoples focused more on tool production out of toolstone found in close proximity to the site, then there should be a corresponding increase of highly localized toolstone in the Early Archaic component over the Paleoarchaic component. As is evident (see Figure 4.2), the expected differences are indeed reflected in the toolstone assemblage, and they are significant (X^2=627.486; df=1; p<0.000) and strong (V^2=0.697) enough to suggest that the Paleoarchaic peoples did focus more on tool rejuvenation than the Early Archaic occupants. Conversely, the data suggests that the Early Archaic occupants focused on tool production more than the Paleoarchaic groups.

Flake Types

Although not mutually exclusive, tool production generally generates different types of flakes (macro internal flakes, macro internal flake fragments, macro biface thinning flakes, angular shatter, primary and secondary flakes, and primary shatter) than tool rejuvenation (micro internal flakes, micro internal flake fragments, and micro biface thinning flakes) (Andrefsky 2005; Goebel 2007). If Paleoarchaic people were more focused on tool rejuvenation than the Early Archaic peoples, then there should be a higher proportion of debitage reflecting tool rejuvenation in the Paleoarchaic component than the Early Archaic component. Similarly, if the Early Archaic groups were more focused on tool manufacture than the Paleoarchaic occupants, then there should be a higher percentage of tool manufacturing debitage in the Early Archaic component than the Paleoarchaic. Component debitage proportions do suggest that this is the case in both instances; however the differences in proportions are small (V^2=0.001) but statistically significant (X^2=13.089; df=2; p=0.001) (Figure 4.10). Although the differences are very slight, it appears that the NCS Paleoarchaic people may have focused more on tool rejuvenation than Early Archaic peoples. Likewise, the Early Archaic occupants at the shelter may have focused more on tool manufacture than Paleoarchaic occupants. Never-the-less, this argument is weak.

Striking Platforms

Striking platforms are dependable for distinguishing between tool rejuvenating and manufacturing activities. Complex and prepared striking platforms usually result from retouching chipped stone tools, while simple and cortical platforms are associated with primary reduction activities such as tool production (Andrefsky 2005; Goebel 2007).

NCS flake striking platforms indicate the Paleoarchaic and Early Archaic peoples resharpened their tools, but that tool manufacturing activities dominated (X^2=6.519; df=1; p=0.011) (Figure 4.11). This is not unexpected due to the proximity of high quality toolstone sources as mentioned above.

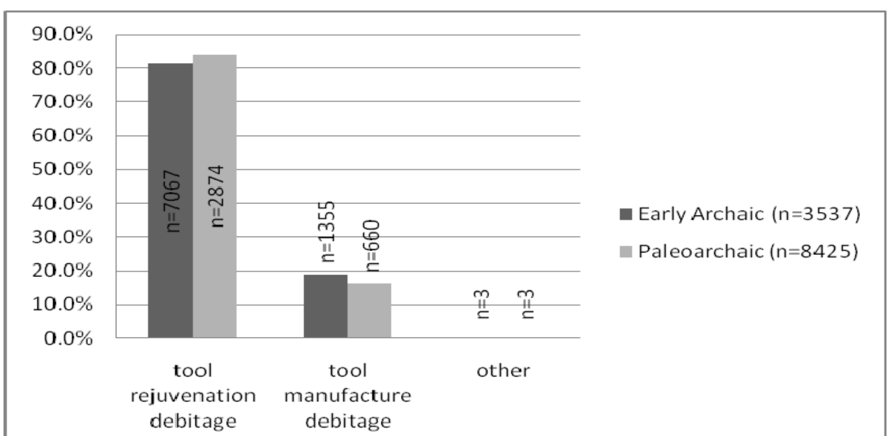

Figure 4.10. NCS tool rejuvenation flakes (micro internal flakes, micro internal flake fragments, and micro biface thinning flakes) versus tool manufacture flakes (macro internal flakes, macro internal flake fragments, macro biface thinning flakes, angular shatter, primary and secondary flakes, and primary shatter) by component.[35] (X^2=13.089; df=2; p=0.001) (V^2=0.001)

[35] Flake types indicate that tool rejuvenation and manufacturing activities occurred in the shelter for both time periods, but that tool rejuvenating dominated. The domination of tool rejuvenation flake types can be explained by the fact that tool manufacturing can also produce these flakes types.

What is of interest is these data suggest that the Paleoarchaic people did focus more on tool rejuvenation than Early Archaic peoples. It also shows that the Early Archaic occupants focused more on tool manufacture than the previous Paleoarchaic occupants. Again, these differences are proportionally slight (V^2=0.002), therefore this argument is weak.

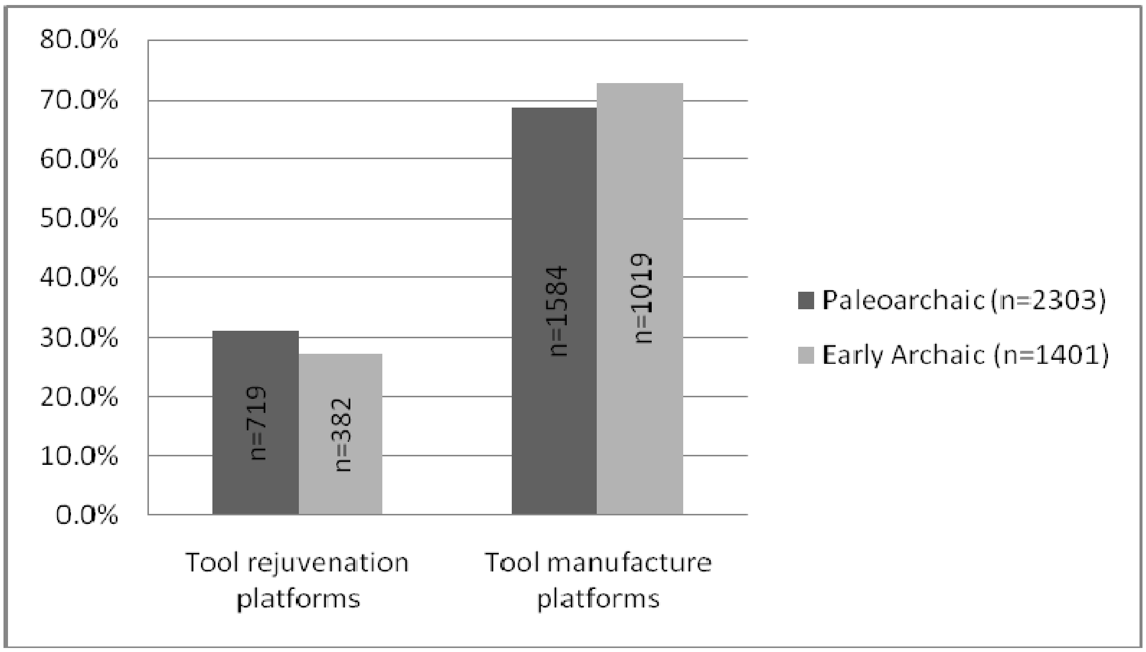

Figure 4.11. NCS tool rejuvenation striking platforms (complex and prepared) versus tool manufacture platforms (simple, cortical) by component. (X^2=6.519; df=1; p=0.011) (V^2=0.002)

Biface Thinning Flakes

Large biface thinning flakes result from tool production, but small biface thinning flakes may sometimes result from tool rejuvenation (Andrefsky 2005). The large biface thinning flakes reveal that tool production activities occurred in slightly higher proportions during the Early Archaic time period. Small biface thinning flakes suggest that the NCS Paleoarchaic occupants may have been slightly more focused on tool rejuvenation than the Early Archaic occupants; however, the relationship is likely skewed by the mixing of activities (Figure 4.12). A chi-squared test indicated that these differences may be the result of sampling error (X^2=0.554; df=1; p=0.457). Either way, the differences between component proportions are very small (V^2=0.002). Therefore, since this test is statistically insignificant and weak, it does not suggest differences in activities between components.

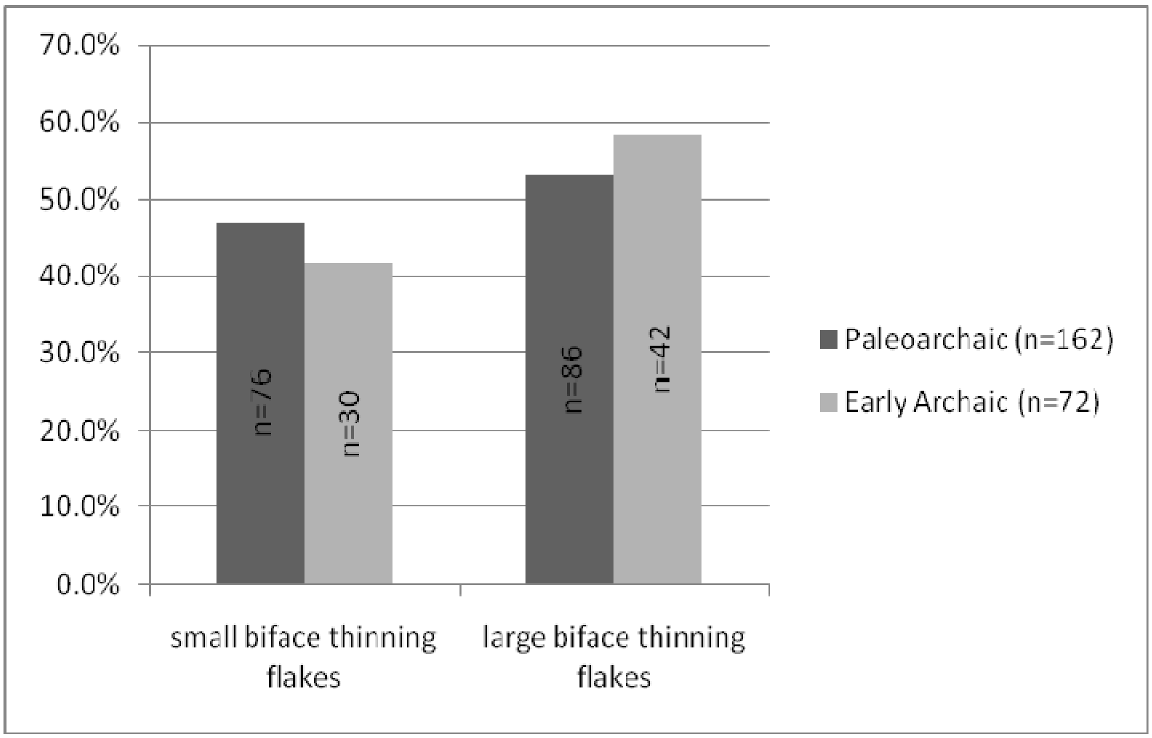

Figure 4.12. NCS small (less than ½") and large (greater than ½") biface thinning flakes by component. Note that proportional differences are very slight (less than 6 percent). (X^2=0.554; df=1; p=0.457) (V^2=0.002)

Flake Size

Generally, tool rejuvenation produces small flakes while tool production produces both large and small flakes (Andrefsky 2005). As a result, it is more reliable to use the large flake size category for differentiating between tool rejuvenation and production—the small flake size category will likely be inflated since it can result from both activities.

As expected, the small flake category (less than ½”) dominates the assemblage for both components (Figure 4.13). Normally, this would suggest that tool rejuvenation was the primary focus at the site; however, as explained above, this argument cannot be reliably made on flake size alone.

Not only does this test turn out to be statistically insignificant (X^2=0.675; df=1; p=0.411), but it is also weak (V^2<0.000). Apparently, there is no difference in flake size between time periods in either the large flake category (larger than ½”) or the small flake category.

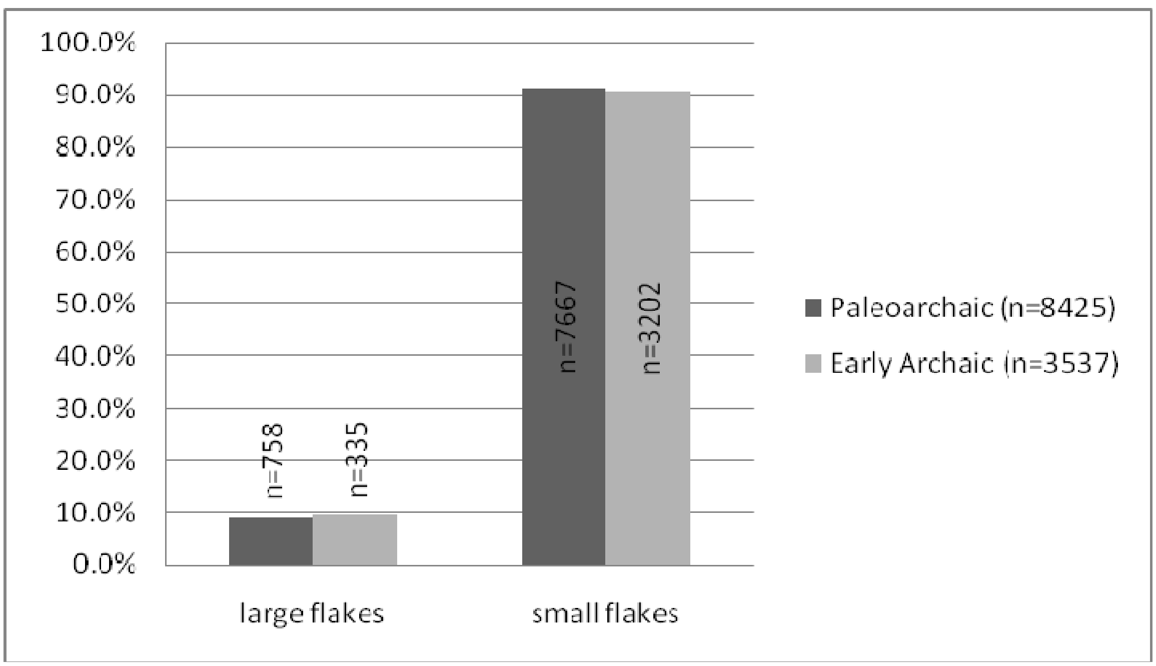

Figure 4.13. NCS large flakes (greater than ½”) and small flakes (less than ½”) by component. Note that there is virtually no difference in size in either category (X^2=0.675; df=1; p=0.411) (V^2<0.000)

Cortex

Cortex is primarily linked to tool manufacture rather than tool rejuvenation (Andrefsky 2005; Goebel 2007). An evaluation of the cortex reveals that there are slightly higher proportions of cortex in the Early Archaic component for all of the cortical flake categories (X^2=39.365; df=3; p<0.000), but that the difference is less than one percent (V^2=0.003) (Figure 4.14). Therefore, this test does not lend strong support for differentitation of activities between components; however, the small difference does suggest that there may have been a slightly higher focus on tool production during the Early Archaic occupation than the Paleoarchaic occupation in the shelter.

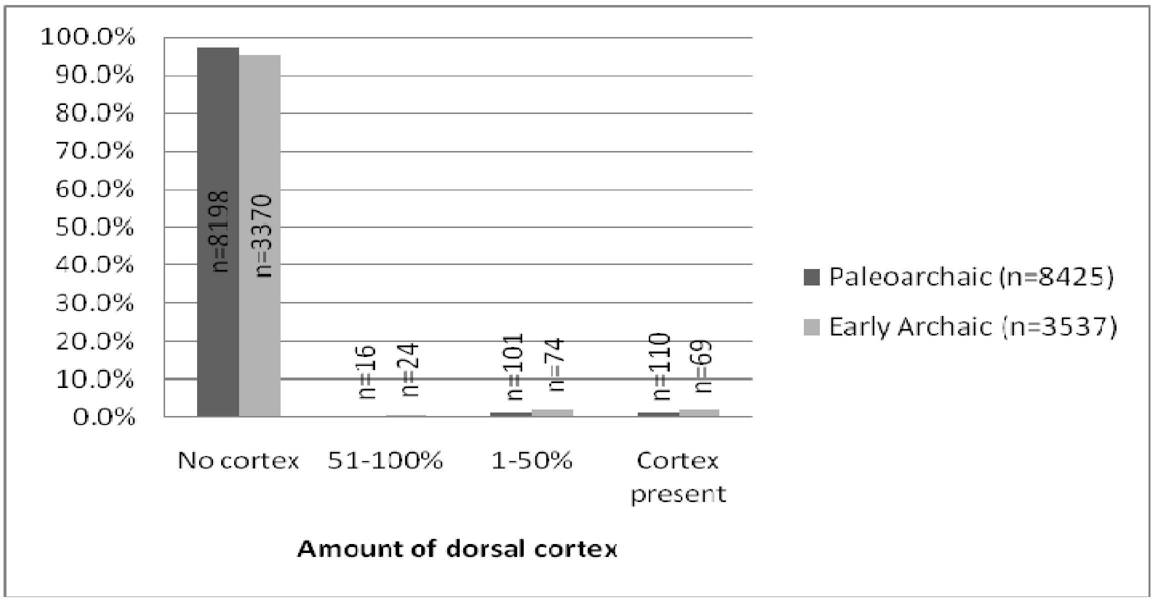

Figure 4.14. NCS cortex proportions by component. Note that the proportional differences are very slight (less than one percent). (X^2=39.365; df=3; p<0.000) (V^2=0.003)

Summary

Clearly, refurbishing and production activities occurred in the shelter during both time periods, and tool manufacturing was the primary activity for both groups of people. Biface production suggests that the Paleoarchaic occupants of NCS focused more on tool production, yet this was the only test that indicated that this was the case. Out of all the debitage tests, only toolstone material presented a strong argument for tool rejuventation occuring more often in the Paleoarchaic component and tool production occuring more frequently in the Early Archaic component. The tests of flake type and platform type were both weak, but both suggest a similar pattern. Biface thinning flakes, flake size, and cortex revealed no difference in activites between components. In sum, it appears that these data support a slight difference between components for tool rejuvenating—NCS Paleoarchaic peoples focused on tool rejuventation more than the Early Archaic peoples. Tool production is more complicated and the distinction is not as clear cut as tool rejuvenation because of the biface production data. In this case, the argument could go either way. Taken together, these results imply that the NCS Paleoarchaic occupants were only slightly more residentially mobile than the Early Archaic occupants.

At BER, differences in the biface stages and debitage reflect differences between components, but similar to NCS, they are generally not strong differences (see Goebel 2007:179-181). Biface production is not very telling for the BER Pre-Archaic component, but it does indicate that biface production occurred more in the Early Archaic component. Although chi-squared tests indicate that the differences between components are real for flake types, platform types, size, and cortex, the differences are proportionally slight. There is virtually no difference between components in cortex (V^2=0.002) and flake size. Similarly, statistical tests indicate that there is not much of a difference in flake type (V^2=0.026) and platform type (V^2=0.012), but the differences are proportionally greater than is evident at NCS. Thus, the BER debitage implies that the Pre-Archaic peoples did focus more on tool rejuventation at the shelter than the Early Archaic occupants, and conversly that the Early Archaic peoples did focus more on tool production than the Pre-Archaic occupants in the shelter.

Chapter Summary

The NCS Paleoarchaic and Early Archaic component chipped stone assemblages are so similar in the categories considered, that it was difficult to distinguish differences in length of stay, catchment, tool kit formality, and provisioning—unlike what was seen at Bonneville Estates Rockshelter (Goebel 2007). Any differences that did exist were very slight. The strongest piece of evidence for differences between components rests in catchment diversity—specifically in the proportions of highly localized toolstone and non-local toolstone. In this case, the Paleoarchaic occupants utilized much more non-local toolstone than the Early Archaic groups, which suggests that they moved more frequently and visited the non-local toolstone sites more often within the catchment area. Considering all of the chipped stone evidence, it does appear that the Paleoarchaic groups that used NCS were slightly more residentially mobile than the following Early Archaic peoples.

The chipped stone data from BER reveals a stronger difference between the Pre-Archaic and Early Archaic components when compared to NCS. Significant differences are evident in BER catchment zones and non-local to local obsidian source proportions. These data suggest that the BER Pre-Archaic occupants were indeed more residentially mobile than the Early Archaic groups.

Chapter 5- Synthesis and Conclusions

North Creek Shelter is a unique site because it contains a Paleoarchaic component—the only one of its kind that has been investigated on the Colorado Plateau. The Early Archaic component at NCS is similar to other Early Archaic sites located on the Colorado Plateau, in the Great Basin, and in the general region overall; however, the Paleoarchaic component represents one of only a few sites dating to this time period in the region. The site is also significant for its well-controlled excavation, fine-grained stratigraphy (where non-cultural episodes of deposition sealed in cultural stratigraphic layers), and quantity and quality of non-perishable artifacts. Although extinct megafauna and classic Paleoindian Clovis and Folsom points were not discovered here, North Creek Shelter is a rare and important site.[36]

Containing Paleoarchaic and Early Archaic components, NCS provided an ideal opportunity to study and compare the chipped stone assemblage by component to infer residential mobility. As indicated in Chapter Four, I found that there is not much of a difference between components in regards to residential mobility; yet, however slight, these data suggest that the Paleoarchaic occupants of the shelter were slightly more residentially mobile than the subsequent Early Archaic occupants. This tends to fit the general pattern found elsewhere in the greater region, although other studies indicate that differences between the two time periods reflect greater differences in levels of residential mobility.

Bonneville Estates Rockshelter, also containing Pre-Archaic and Early Archaic components, has recently been the subject of such a study (Goebel 2007). Goebel's

[36] Two projectile points from the site were typed as Late Paleoindian points, but these were likely picked up and reused by later peoples.

(2007) work—after which I modeled this research—reveals significant differences in the chipped stone assemblage infering differences in residential mobility between components. Although both of our studies reveal that Paleoarchaic peoples were more residentially mobile than Early Archaic peoples, the NCS data did not reveal differences as great as those at BER.

I believe that the difference between the two studies is best explained by the different ages of the NCS and BER Early Archaic components. At BER, the Early Archaic component is represented by a time span of ~7,400-6,000 rcybp—the younger and terminal end of the Early Archaic time period. At NCS, the Early Archaic component ranges from ~9,000-7,500 rcybp—the initial 1000 years of the Early Archaic time period. Not only do these two components represent opposite ends of the Early Archaic time period, there is a gap of about 600 years between the two components. Even if change happened gradually, differences in residential mobility could be reflected between the initial 1000 years and the terminal 1000 years of the 3,000 year long Early Archaic period.[37] It is my opinion that this time disparity accounts for the differences in study results between NCS and BER.

Although not directly addressed in this research, site function appears to be similar for both Paleoarchaic and Early Archaic components at NCS. Tool production was a principal activity that occurred on site during both time periods. Both Paleoarchaic and Early Archaic peoples took advantage of the proximity of quality toolstone sources and manufactured new tools to replace broken or worn ones. Raw material was primarily brought to the site as raw nodules, or in lightly decorticated form, and then reduced into

[37] Phil Geib (1996) noted a significant difference between the initial 1000 years and the rest of the Early Archaic time period on the Colorado Plateau.

the finished product (this seemed to have occurred more frequently during the Early Archaic time period). Resulting flakes from the reduction process were clearly used for a variety of tasks as is evident from the high proportions of utilized/modified flakes in the assemblage. Tool resharpening also occurred in the shelter—as worn tools were rejuvenated. In addition to replenishing tool kits, the presence of broken and complete projectile points in both components indicates that hunting occurred in the immediate area—which is also supported by the large quantity of faunal remains recovered from the site (Newbold 2009). Butchering and processing of these animals is also evident by butchering marks on bones and by the presence of utilized/modified flakes (likely used in the butchering process) and steep-edged unifacial scrapers (probably used in scraping hides). Although there was a drastic reduction in unifacial scrapers in the Early Archaic component—suggesting that hide processing was more prominent during the Paleoarchaic time period—these scrapers were still present in both components. Apparently, this site was a residential camp where various natural resources were collected, tools were replenished, and animals were butchered during both time periods.

If there are only slight differences in residential mobility and apparent site function between Paleoarchaic and Early Archaic groups at NCS, then what justifies differentiating the two time periods? David Madsen (2007) states that it comes down to a single factor—the appearance of groundstone in the Great Basin around 8,500 rcybp. The presence of groundstone in the Early Archaic but not the Paleoarchaic component at BER is clearly demonstrated, and at NCS, this is a primary distinguishing factor as well. Formal groundstone—and its implications for small seed processing and broadening diet breadths—first appears at about 9,000 rcybp in the lowest level (Substratum Va) of the

Early Archaic component at NCS (Janetski et al. 2008). Another primary distinguishing factor between components at NCS is the distinct change from large stemmed projectile points to smaller notched Pinto points (again the Pinto points first appearing in the lowest level of the Early Archaic component at around 9,000 rcybp). Therefore, although the two components at NCS reflect similar levels of residential mobility, they are clearly different in certain aspects of material culture.

In conclusion, I demonstrated that NCS Paleoarchaic peoples practiced a slightly higher level of residential mobility than the NCS Early Archaic peoples. I also pointed out that the two time periods were more similar than different in this regard, and the data did not reflect the drastic differences in residential mobility identified elsewhere in the Great Basin. Although NCS Paleoarchaic peoples were only slightly more residentially mobile than the Early Archaic occupants, there are distinct differences in style of points and some tools utilized by these groups which justifies distinguishing between the two time periods at NCS.

Appendix A: Abbreviated Paleoarchaic and Early Archaic Tool Database

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
75	V	109	100	2.20	PC	20.3	20.1	1.7	1.3	Elko projectile point
143	IV	109	100	3.14	PC	18.2	25.4	5.6	2	Untyped Large Stemmed point
411	V*	109	101	1.95	MPW	36.1	27.9	59	6.6	Stage 4 Biface
476.1	V	110	100	2.21	PC	53.8	28	16.8	25.4	Uniface
476.4	V	110	100	2.21	BJ	26.6	43.5	5.9	8	Utilized flake
536	V	110	100	1.85	BJ	25.3	11	3.8	0.8	drill/awl
555	V	110	100	2.31	MPW	11.8	23.1	4	0.7	Pinto projectile point
558	V	110	100	2.31	MPW	16.4	41.8	9.8	6.2	Modified flake
597	V	110	100	2.65	DC	25.4	17.4	4.9	1.8	Stage 5 Biface
610	V	110	100	2.55	CC	12.6	9.5	3.1	0.3	Stage 5 Biface
619.11	V	110	100	2.55	MPW	27	12.8	5.6	1.6	Stage 5 Biface
620	V	110	100	2.56	MPW	36.1	18.2	5.4	3.8	Pinto projectile point
628	V	110	100	2.84	MPW	25.9	20.4	5.2	2.2	Pinto projectile point
736.30	IV	109	100	3.28	MPW	43.2	14.7	16.8	14.6	Core
746.1	IV	110	100	3.54	MPW	82.3	68.5	36.7	231	Uniface
746.2	IV	110	100	3.54	MPW	71.6	56	23.4	107.6	Utilized flake
1557	V	108	100	1.80	CD	32.1	16.8	5.9	3.3	Rocker side-notched point
1721	V	112	99	1.71	CO	30.3	17.5	7	3	Rocker side-notched point
1772.2	V	108	100	1.96	MPW	18.1	26.1	6.9	2.4	Utilized flake
1775	V*	108	101	1.96	MPW	28.6	14.4	4.1	2.5	Pinto projectile point
1784	V*	108	101	2.07	MPW	16.2	12.3	2.9	0.5	Stage 5 Biface
1809.2	V	108	100	2.09	MPW	19.1	33.1	11.7	6.2	Modified flake
1819	V	108	100	2.19	MPW	29.3	16.7	5.6	2.6	Pinto projectile point
1849	V	108	100	2.09	PC	16.6	13	2.7	0.5	Stage 5 Biface
1849.2	V	108	100	2.09	PC	10.5	10.4	4.3	0.4	Stage 5 Biface
1859	V	108	100	2.19	MPW	17.6	22.1	7.3	2.7	Stage 2 Biface

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
1860.4	V	108	100	2.19	PC	13.2	31.4	9	4.2	Utilized flake
1860.10	V	108	100	2.19	CO	11.4	23.9	3.2	0.8	Utilized flake
1860.22	V	108	100	2.19	MPW	16.2	12.3	3.1	0.9	Utilized flake
1970	V	108	100	2.29	OT	114.4	93.2	71.7	1162.3	Hammerstone
1976.3	V	108	100	2.24	MPW	32.6	17.4	4.7	2.2	Utilized flake
1977	V	108	100	2.24	QC	121.7	128.5	33.3	605.3	Utilized flake
2033	V**	108	101	2.36	MPW	34.2	15.8	4.3	2.3	Pinto projectile point
2049	V	108	100	2.41	PC	27.7	20.3	9.7	3.5	Utilized flake
2154	V*	109	101	2.90	MPW	49.4	16.2	5.2	3.9	Pinto projectile point
2180	V	109	98	1.62	PC	13.8	9.6	4.3	0.5	Stage 3 Biface
2180	V	109	98	1.62	PC	37.7	26.9	11.9	13.3	Utilized flake
2180.10	V	109	98	1.62	MPW	21.6	10.5	4.4	0.9	Modified flake
2213	V*	109	101	2.80	MPW	21.7	37.3	8.9	7.7	Stage 2 Biface
2251	V**	109	101	2.97	PC	40.5	28.3	23.1	23.7	Core
2266.2	V	109	98	1.79	PC	44.4	43.1	12.7	22	Uniface
2266.4	V	109	98	1.79	OB	21.8	17.7	6.4	2	Utilized flake
2296	V*	109	101	2.70	PC	27.9	12.4	6.2	1.3	Stage 3 Biface
2334.5	V	109	98	1.89	PC	29.2	44.2	15.4	18.6	Core
2334.7	V	109	98	1.89	MPW	32.2	31.1	6.4	4.8	Utilized flake
2339	IV	110	100	3.55	MPW	74.4	46.1	25.5	63.5	Uniface
2353	IV	110	100	3.61	MPW	49.2	57.1	29.2	53.7	Core
2392	III	109	100	3.70	BJ	45.4	34.7	9	2.1	Stage 4 Biface
2472	III	109	100	3.79	OT	123.8	84.3	55.6	878.1	Hammerstone
2533	IV	108	100	3.25	MPW	49	38.3	9.9	18.3	Stage 4 Biface
2591	V	109	98	1.96	OB	26.3	16.3	3	1	Utilized flake
2909	III	110	100	4.01	MPW	50.9	47.6	15.1	32.3	Uniface
2910	V	110	99	2.59	PC	53.2	38	8.8	12.6	Utilized flake
2931	III	110	100	4.01	QC	33.6	31.2	18.4	25.1	Hammerstone

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
2935.4	V	110	99	2.50	PC	15.6	11.3	4	0.6	Stage 4 Biface
2941.2	V	110	99	2.60	CR	20.2	18.4	6.4	1.9	Utilized flake
2972	II	110	100	4.08	MPW	25.8	25	5.7	3.5	North Creek Stemmed point
2980	V**	112	98	2.27	QC	80.4	66.4	28.9	164.4	Utilized flake
2981	V**	112	98	2.23	QC	64.8	57.5	30.9	103.1	Uniface
2981	V**	112	98	2.23	QC	64.8	57.5	30.9	103.1	Hammerstone
2982	V	111	99	2.22	MPW	37.2	35	5.1	4.5	Utilized flake
3077	V	108	100	2.07	MPW	59.6	32.3	7.1	8.1	Modified flake
3096	V	108	100	1.86	MPW	13.9	10.5	2.7	0.3	Stage 5 Biface
3295	IV	108	100	3.25	QU	56.2	64.8	12.1	41.1	Utilized flake
3296	IV	108	100	3.20	BJ	81	75.7	14.5	93.5	Uniface
3325.1	V*	113	98	2.05	QC	104.1	89	53.6	591.1	Hammerstone
3325.2	V*	113	98	2.05	QC	85.7	70.3	57.4	478.8	Hammerstone
3348	V*	113	98	1.97	MPW	41.3	51.1	11.7	30.4	Modified flake
3394	V*	112	98	2.24	MPW	56.2	58.3	43.7	137.7	Core
3395	V*	112	98	2.24	MPW	7.8	14.5	3.7	0.4	Untyped corner-notched point
3398	V*	112	98	2.14	PC	41.3	23.2	5.6	4.4	Elko projectile point
3417	V**	112	98	2.23	OT	51.4	50	21.5	79.1	Hammerstone
3451	V*	110	98	2.39	PC	31.6	16.8	5	2.5	Pinto projectile point
3451	V*	110	98	2.39	PC	31.6	16.8	5	2.5	Graver
3453	V*	110	98	2.70	QC	87.3	41	31.9	145.2	Hammerstone
3454	V*	110	98	2.42	MPW	42.6	25.8	9.6	11	Stage 3 Biface
3460	V**	110	98	2.38	CO	25.4	15.1	5	2.5	Pinto projectile point
3463	V*	110	98	2.37	PC	29.7	15.6	4.8	2.5	Pinto projectile point
3465	V	110	99	2.40	MPW	29.9	33.2	11.2	10.2	Core
3471.1	V	109	99	2.42	CO	43	43.8	11.1	12.7	Uniface
3471.2	V	109	99	2.42	PC	25.2	15.6	2.9	1.2	Utilized flake
3472	V	109	99	2.42	PC	25.8	15.4	5.6	2.1	Pinto projectile point

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
3487	V*	110	98	2.30	MPW	24.6	16.5	4.6	1.8	Pinto projectile point
3487	V*	110	98	2.30	MPW	24.6	16.5	4.6	1.8	Graver
3499	V	110	99	2.31	PC	36.8	26.8	4.3	3.6	Utilized flake
3514	II	108	100	4.29	PC	49.2	49.2	20.5	58	Uniface
3515.1	V*	113	98	2.35	PC	49.6	29.8	9.3	13.6	Stage 3 Biface
3515.2	V*	113	98	2.35	MPW	38.5	29.2	8.8	10.5	Stage 2 Biface
3520A	V	110	99	2.50	MPW	47	31.5	16.8	17	Core
3524	II	110	100	4.27	QC	24.1	23.5	18.7	14.5	Hammerstone
3526	V*	113	98	2.35	MPW	27.3	20.9	4.7	3.1	Pinto projectile point
3539	V	109	99	2.30	MPW	11.4	9.9	3.7	0.4	Stage 5 Biface
3541	V	109	99	2.21	MPW	6.9	5.7	2.3	0.1	drill/awl
3541.3	V	109	99	2.21	MPW	7.9	19.4	3.9	0.5	Stage 5 Biface
3561.1	II	110	100	4.15	OB	42	28.4	4.3	4.1	Notched Flake
3561.2	II	110	100	4.15	PC	39.5	45.4	7.5	13.9	Stage 4 Biface
3616	V*	111	98	2.49	MPW	46.7	23.9	9	7.2	Stage 3 Biface
3642	V	109	99	2.51	MPW	14.5	12.2	4	0.3	Stage 5 Biface
3674	V*	112	98	2.38	QU	89.7	47.1	10.2	47.8	Hafted biface
3689	V*	113	98	2.40	PC	42.6	16.7	4	3.9	Stage 5 Biface
3695	V*	113	98	2.39	QC	90.5	64.2	31.5	176.7	Utilized flake
3707.1	V*	112	98	2.50	MPW	29.5	19.6	5.2	3.6	Pinto projectile point
3707.2	V*	112	98	2.50	PC	37.2	18.9	5.4	3.6	Pinto projectile point
3707.3	V*	112	98	2.50	PC	23.5	17.4	5.4	2.4	Pinto projectile point
3726	V	110	99	2.59	QC	63.2	83	20.8	118.9	Utilized flake
3768	V*	111	98	2.57	PC	30.4	16.4	4.5	2.8	Stage 5 Biface
3791	V	109	98	2.43	MPW	45	20.8	4.1	3.8	Pinto projectile point
3823	V	110	99	2.67	QC	85	95.7	18.5	145.1	Utilized flake
3844	V	111	99	2.70	CD	33.9	15.8	4.2	2.5	Pinto projectile point
3908	V	112	99	2.69	CO	23.5	12.5	4.6	1.2	Pinto projectile point

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
3919.2	V	113	99	2.53	QC	26.7	42.6	4.4	5.1	Utilized flake
3955	V*	112	98	2.68	MPW	34	19	6	3.9	Graver
3958	V*	112	98	2.68	PC	49.1	16.6	4.4	4.5	Pinto projectile point
3959	V*	112	98	2.68	PC	26.5	15.2	4.2	1.5	Pinto projectile point
3968	V*	112	98	2.68	MPW	53.3	36	8	14.4	drill/awl
4007	V*	111	98	2.76	MPW	26.6	16	5.2	2	Pinto projectile point
4007	V*	111	98	2.76	MPW	26.6	16	5.2	2	Graver
4021	V*	111	98	2.78	MPW	30.5	17.7	4.8	3.1	Pinto projectile point
4090	I	108	100	4.80	MPW	21.2	19.4	2	0.1	Utilized flake
4124	V**	110	98	2.90	MPW	27.3	14.2	3.8	2.7	Pinto projectile point
4248	V**	110	98	2.94	CD	33.6	20.5	4.2	3.8	Jimmy Allen/Frederick point
4248	V**	110	98	2.94	CD	33.6	20.5	4.2	3.8	drill/awl
4297	V	110	99	2.99	MPW	27	17.9	4.4	1.6	Stage 2 Biface
4317	V	114	98/99	2.62	OT	55.3	25.5	8.4	10.5	Stage 5 Biface
4318	V	114	98/99	2.62	MPW	22.2	14.5	4.7	1.3	Pinto projectile point
4377	II	108	100	4.24	PC	51.1	25.3	16.3	14.5	Utilized flake
4392	IV	109	100	3.14	MPW	5.2	11.7	4.3	0.3	Stage 4 Biface
4399	V	110	99	2.59	QC	65.1	94.4	20.2	137.9	Utilized flake
4403	V	109	99	2.45	PC	58.4	34.6	18.7	34.3	Modified flake
4403.2	V	109	99	2.45	QC	78.5	57.1	11.4	54.3	Utilized flake
4409	V	109	99	2.49	QC	60.9	72.1	16.2	81	Utilized flake
4410A	V*	113	98	2.20	QC	111.6	67.1	19	168	Utilized flake
4412	V	112	99	2.69	PC	40.8	13.7	3.7	2	Graver
4413	V*	112	98	2.14	MPW	10.3	18.3	3.1	0.8	Untyped side-notched point
4420	V	112	99	2.70	QC	62.7	77.3	15.9	85.1	Utilized flake
4421	V**	110	98	3.02	MPW	8.2	11.2	3.3	0.1	Stage 5 Biface
4422	V*	111	98	2.69	MPW	17.1	15.5	3.7	0.8	Stage 5 Biface
4424	V	109	98	2.33	MPW	50.5	38.6	7.9	18.7	Modified flake

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
4425	V	112	99	2.58	PC	22.3	22.2	4.1	1.8	Graver
4426	V*	114	98	2.62	BJ	33.3	23	10.7	8.6	Uniface
4427	V	110	99	2.96	MPW	36.4	31.8	9.4	9	Stage 2 Biface
4602	V*	114	98	2.65	MPW	57.2	38.6	19.3	27.3	Stage 2 Biface
4629	IV*	111	98	3.00	MPW	43.4	30.2	10.6	13.5	Uniface
4704	IV*	114	98	2.78	MPW	56.9	27.3	8.2	8	Utilized flake
4740	IV*	112	98	3.13	QC	100.6	90.5	52	652	Hammerstone
4822	IV	112	99	3.15	MPW	70.3	28.4	12.7	21.1	Stage 2 Biface
4896	IV*	114	98	3.15	MPW	31.7	32.9	8.2	7.5	Stage 3 Biface
4942	IV*	111	98	3.28	PC	44.2	30.5	6.8	11.4	Modified flake
4963	IV**	109	99	3.19	OB	29.9	27.4	3.3	2.4	Utilized flake
5004	IV*	109	98	3.23	PC	82.2	63.6	33.4	167.7	Uniface
5007	IV**	110	99	3.25	PC	59.3	35.6	15.4	26.2	Stage 3 Biface
5025	IV*	110	98	3.30	CO	30.5	20.4	6.4	4.5	Scottsbluff projectile point
5057	IV**	110	99	3.30	BJ	69.4	78.1	19.9	135.7	Stage 2 Biface
5076	IV	110	100	3.38	MPW	60.2	49.8	17.8	52.4	Core
5092	IV*	111	98	3.35	OB	35.9	29.8	6.7	5	Untyped Large Stemmed point
5093	IV	113	99	3.25	MPW	39.1	33	8.4	12.9	Stage 3 Biface
5126	IV*	113	98	3.30	BJ	30.8	30.9	8.5	9.3	Stage 3 Biface
5134	IV*	111	98	3.38	PC	61	47.1	18.4	43	Stage 2 Biface
5140	IV*	110	98	3.40	BJ	37.7	25.8	5.6	4.7	Stage 4 Biface
5146	IV*	110	98	3.38	PC	53.7	50.3	29.4	68.2	Modified flake
5155	IV*	111	98	3.45	QC	127.6	101.2	57.5	1048.9	Hammerstone
5192	IV	114	99	3.30	MPW	27.6	20.3	6.5	3.6	Stage 4 Biface
5198	IV*	112	98	3.46	MPW	47.9	48.9	11.7	31.2	Stage 2 Biface
5202	IV*	112	98	3.42	MPW	63.2	45.3	12.3	34.2	Modified flake
5287	IV**	110	99	3.53	QC	96	84.2	43.8	457.1	Hammerstone
5297	IV	112	99	3.67	PC	88	94.2	32.9	218.5	Utilized flake

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
5300	IV	112	99	3.67	PC	37.9	34.2	9	10.5	Stage 4 Biface
5304	IV*	111	98	3.50	BJ	40.1	39.9	8.8	16.6	Stage 3 Biface
5310	IV*	111	98	3.56	PC	42.7	34	9.7	17	Stage 3 Biface
5317	IV*	111	98	3.60	MPW	28	31.7	7.8	7.9	Untyped Large side-notched point
5343	IV*	114	98	3.47	MPW	89.8	78.7	26.8	199.8	Core
5399	III**	109	99	3.65	MPW	64	46	12.1	40.9	Utilized flake
5464	III**	114	98	3.64	PC	43.3	48.4	9.9	18.8	Stage 3 Biface
5469	III	114	99	3.67	PC	78.6	43.4	8.1	24.5	Cody Knife
5532	III*	112	98	3.83	MPW	20.4	26.9	6	3.1	Stage 3 Biface
5533	III*	111	98	3.79	PC	42.8	26.9	5.9	7.2	Utilized flake
5536	III**	110	98	3.72	PC	67.6	40.9	20.8	58.5	Uniface
5544	III*	111	98	3.79	MPW	72.6	38.5	17.9	51.6	Modified flake
5545	III*	111	98	3.77	PC	60.1	41	10.7	26.8	Uniface
5546	III*	112	98	3.74	MPW	67.9	91.7	21.4	168	Uniface
5560	III	112	99	3.83	PC	39.4	38.3	5.9	6.2	Utilized flake
5562	III	112	99	3.83	MPW	66.6	36.5	13.4	29.3	Stage 2 Biface
5564	III	112	99	3.81	MPW	40.5	47.4	12.5	31.9	Uniface
5566	III	113	99	3.72	PC	53.8	52.3	16.2	35.7	Utilized flake
5567	III	112	99	3.78	PC	38.4	40.3	7.6	9.3	Utilized flake
5568	III	111	99	3.76	MPW	44.9	56.3	21.5	67	Modified flake
5569	III	112	99	3.81	PC	73.7	38.3	15.2	48.5	Uniface
5570	III	112	99	3.82	OT	118.1	80.3	64.3	850.5	Hammerstone
5572	III**	111	98	3.76	OT	121.2	88.4	64.7	963.9	Hammerstone
5575	III	112	99	3.78	MPW	56.9	37.3	10.5	11.7	Utilized flake
5578	III	112	99	3.83	MPW	74.7	50	16	93.1	Uniface
5581	III	111	99	3.74	MPW	65.8	35.1	29	51.1	Uniface
5582	III	112	99	3.81	OT	43.2	59.1	21.3	48.8	Modified flake
5583	III**	112	98	3.79	PC	51	34.6	6.6	8.5	Utilized flake

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
5584	III	112	99	3.79	QU	80.6	70	43.2	342.2	Hammerstone
5595	III**	110	98	3.72	PC	61.7	26.6	5.6	10.1	Modified flake
5599	III	111	99	3.76	OB	54.4	30.2	6.1	5.5	Utilized flake
5601	III**	112	98	3.82	PC	67.7	46.9	27.6	68.1	Uniface
5608	III	112	99	3.78	PC	53.2	34.8	20.3	36.7	Uniface
5609	III**	112	98	3.85	MPW	48.5	27	10.6	13.6	Utilized flake
5612	III	111	99	3.85	BJ	47	42.8	14	21.9	Uniface
5617	III**	112	98	3.81	PC	46	46.8	9.6	27.2	Uniface
5618	III	111	99	3.81	PC	55.2	47.1	9.1	24.5	Uniface
5619	III**	111	98	3.82	PC	20.9	32.3	7	4.6	Modified flake
5621	III**	113	98	3.79	PC	53	40.6	8	13	Utilized flake
5624	III	112	99	3.82	MPW	51.5	46.4	22	51.4	Uniface
5625	III	112	99	3.81	PC	66.9	45.9	13.6	27.3	Uniface
5630	III	112	99	3.80	PC	55.1	43.2	12.3	34.1	Uniface
5631	III	112	99	3.80	PC	41.2	51.5	20	36.3	Uniface
5632	III	112	99	3.80	MPW	54	47	17.5	42.2	Uniface
5634	III	112	99	3.81	MPW	45	39	14	27	Uniface
5637	III	113	99	3.77	MPW	89.4	65.6	28.9	199	Uniface
5638	III	113	99	3.81	MPW	51.1	58.7	14	29.7	Utilized flake
5639	III	113	99	3.80	PC	68.3	42.6	8.8	26.6	Stage 4 Biface
5640	III	113	99	3.81	PC	35	33.5	9.8	8.1	Uniface
5641	III	113	99	3.81	PC	30.7	40.3	7.1	7.5	Utilized flake
5643	III	113	99	3.78	BJ	44.9	64.7	19.4	43.7	Uniface
5644	III	113	99	3.77	PC	44.1	53.4	16.6	33.9	Uniface
5653	III	112	99	3.80	MPW	75.1	35.3	13.1	30.1	Utilized flake
5660	III	113	99	3.83	OB	18.4	19.8	2.9	1	Modified flake
5840	III*	114	98	3.90	OB	24.4	17.8	5.7	1.6	Notched Flake
5885	II**	114	98	3.99	PC	31.9	23	4.3	3.6	Utilized flake

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
5891	II**	114	98	3.99	MPW	63.5	71.5	27.3	107.6	Uniface
5892	II**	113	98	4.03	MPW	55.7	46	28.2	67.3	Core
5912	II**	113	98	4.04	BJ	15.1	16.8	5.4	1.4	North Creek Stemmed point
5923	II*	110	98	4.03	MPW	32.1	76.4	27.2	76.6	Uniface
5939	II	112	99	4.05	MPW	105.9	71.1	28.5	202.3	Uniface
5951	II*	113	98	4.12	BJ	69.6	48.1	21.1	68.2	Uniface
5974	II*	111	98	4.10	QC	85.5	58	32.1	202.4	Hammerstone
5979	II*	111	98	4.09	MPW	44.9	34	6.7	8.5	Stage 5 Biface
6003	II	113	99	4.16	OB	33	13	3	1.5	Modified flake
6011	II*	113	98	4.19	MPW	47.3	27.4	5.9	8.7	North Creek Stemmed point
6022	II*	113	98	4.19	PC	59.3	44	25.7	67.8	Uniface
6037	II**	112	98	4.21	OB	21.9	15.7	2.9	0.8	Notched Flake
6044	II**	111	98	4.15	MPW	82.7	68.2	32	161.7	Uniface
6045	II**	111	98	4.14	MPW	61.2	50.1	20.1	57.4	Uniface
6057	II	112	99	4.22	MPW	26.7	16.5	3	0.8	Modified flake
6059	II	113	99	4.22	MPW	43.8	27.5	5.7	6	North Creek Stemmed point
6062	II	113	99	4.22	OB	23.4	12.7	2.3	0.3	Notched Flake
6073	II**	112	98	4.02	MPW	61.1	48.6	23.2	81.5	Uniface
6088	II*	111	98	4.21	PC	38.6	41.1	10	17.8	Stage 3 Biface
6102	II*	114	98	4.15	PC	66.7	53.7	6.4	18.4	Uniface
6105	II	114	99	4.20	PC	57.4	30.8	8.2	13.5	Stage 5 Biface
6179	II*	111	98	4.39	MPW	54.3	30.5	9.5	14.2	Stage 4 Biface
6183A	II*	113	98	4.24	MPW	82.5	59.9	29.2	87.3	Core
6194	II	113	99	4.33	PC	43.2	30.8	7.4	7.7	North Creek Stemmed point
6213	II	113	99	4.27	MPW	31.8	30.1	3.7	2.7	Utilized flake
6230	II	113	99	4.27	MPW	31.2	39.5	5.6	5.6	Utilized flake
6231	II	114	99	4.29	MPW	50.1	58.4	14.7	27.3	Utilized flake
6239	II	111	99	4.41	PC	15.4	35.6	3.4	2.6	Utilized flake

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
6252	II	112	99	4.29	PC	50.8	53.7	23.1	62.9	Uniface
6259	II**	111	98	4.32	PC	36.1	19.9	6.3	3.9	North Creek Stemmed point
6261	I	112	99	4.37	PC	95.7	64.3	39.2	176.5	Core
6265	II	112	99	4.40	MPW	50.5	26.6	7.2	9.5	Stage 4 Biface
6273	IV	115	98	3.32	MPW	35.5	43.8	10.1	17.4	Modified flake
6280	IV	115	98	3.32	MPW	39.7	43.5	12.4	15.1	Uniface
6295	III	115	98	3.50	MPW	52.1	61.7	19.8	56.8	Modified flake
6299	III	115	98	3.42	MPW	67.7	39.2	21.6	29.9	Utilized flake
6309	III**	115	99	3.43	MPW	61.9	44	15.4	34.8	Utilized flake
6310	IV**	115	99	3.47	PC	93.7	72	42.4	278	Core
6314	IV	115	98	3.32	PC	45.7	52.5	10.1	28.4	Uniface
6315	IV	115	98	3.32	MPW	54.5	41.9	14.1	24.4	Stage 2 Biface
6320	IV**	115	99	3.35	MPW	59	42.3	14.2	34.8	Stage 2 Biface
6327	III**	115	99	3.65	PC	39.3	30.2	7.6	7.7	Stage 3 Biface
6335	III*	115	99	3.63	PC	56.1	34	6.8	10.3	Stage 4 Biface
6351B	III	115	98	3.61	MPW	44.8	19.3	9.8	9.5	Utilized flake
6359	III	115	98	3.63	MPW	97.4	60.5	44.5	173.2	Core
6363	III*	115	99	4.00	PC	35.6	28.2	6.9	6.9	Uniface
6374	II*	115	99	4.18	PC	36.5	36.7	9.7	14.5	Stage 3 Biface
6376	II	115	98	4.22	GSR	60	34.4	9.1	10.1	North Creek Stemmed point
6377	II*	115	99	4.31	MPW	48.4	27.9	5.9	6.3	North Creek Stemmed point
6377	II*	115	99	4.31	MPW	48.4	27.9	5.9	6.3	Graver
6378	III*	111	98	3.84	MPW	33.9	25.4	10.4	6.8	Uniface
6408.1	II	114	99	4.25	OB	25.6	23	3.2	1	Notched Flake
6408.2	II	114	99	4.25	OB	23.6	18.9	3.7	0.6	Notched Flake
6409	II	113	99	4.25	OB	21.5	16.4	1	0.6	Notched Flake
6410	II	114	99	4.20	OB	18.1	13.4	3.5	0.5	Notched Flake
6412	II	112	99	4.40	OB	23.3	19.4	7.5	2.7	North Creek Stemmed point

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
6413	IV	115	98	3.07	MPW	10.6	19	5.3	1.1	Pinto projectile point
6414	III*	110	98	4.00	BJ	55.6	37	18.2	36.3	Core
6415	III*	111	98	3.79	PC	56.3	39.9	15.3	38.6	Uniface
6433	III**	112	98	3.90	OB	20.5	16.3	1.9	0.5	Utilized flake
6434	III	115	98	3.65	OB	18	10.4	3.8	0.5	Utilized flake
6435	II	113	99	4.17	OB	14.3	23	4	1.3	Stage 4 Biface
6437	V	109	100	2.20	PC	52.7	26.1	13.7	15.5	Stage 2 Biface
6437	V	109	100	2.20	MPW	13.3	10.7	2.3	0.2	Stage 5 Biface
6438	II	115	98	4.22	GSR	48.3	18.3	7	9.1	Utilized flake
6439	II*	114	98	4.10	GSR	23.3	21	2.8	1.5	Utilized flake
6441	III**	112	98	3.85	MPW	40.8	37.8	9.7	11.4	Utilized flake
6441	III**	112	98	3.85	MPW	63.3	54.1	7.6	23.6	Utilized flake
6442	III	113	99	3.83	MPW	56	42.7	7.8	23.4	Utilized flake
6443	III	111	99	3.81	PC	37	31.2	4	5.3	Utilized flake
6444.1	III**	111	98	3.82	PC	54.9	55.2	17.6	28.6	Utilized flake
6444.2	III**	111	98	3.82	PC	41.3	24.6	10.5	7.3	Utilized flake
6444.3	III**	111	98	3.82	PC	22.7	12.3	5.8	1	Uniface
6445	III**	113	98	3.85	PC	53.1	29.3	11.8	9.3	Utilized flake
6446	III**	110	98	3.72	PC	45.1	25.3	3.6	3.7	Utilized flake
6447	III	115	98	3.65	PC	37.1	33.1	7	5	Utilized flake
6448.1	V	109	98	2.59	QU	102	84.7	19	187.7	Utilized flake
6448.2	V	109	98	2.59	QU	35.7	63.6	14.4	41.2	Modified flake
6449.1	III	112	99	3.84	MPW	63.2	61.4	15.7	58.6	Uniface
6449.2	III	112	99	3.84	MPW	68.6	47.8	19.5	38.7	Utilized flake
6449.3	III	112	99	3.84	MPW	41.1	51.1	24.6	40.5	Uniface
6449.4	III	112	99	3.84	MPW	47.7	38.9	13.9	19	Utilized flake
6449.5	III	112	99	3.84	MPW	31.7	30.4	13.1	16.6	Modified flake
6449.6	III	112	99	3.84	PC	50.5	47.3	4.9	10.9	Utilized flake

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
6450.1	V	109	98	2.19	QU	83.5	64.5	14.3	71.3	Utilized flake
6450.2	V	109	98	2.19	PC	18.8	30.7	7.1	4.4	Utilized flake
6451	III**	112	98	3.90	PC	48.1	45	19.2	39.7	Modified flake
6452	II**	110	99	4.37	MPW	30.4	39	3.8	4.3	Utilized flake
6453	III**	112	98	3.85	PC	9.7	12.3	2.9	0.4	North Creek Stemmed point
6454.1	V	109	98	2.29	PC	14.4	7.6	5	0.3	Uniface
6454.2	V	109	98	2.29	MPW	11.7	7.2	2.3	0.1	Utilized flake
6456.1	II	114	99	4.20	PC	34.1	21.9	4.7	3.9	Modified flake
6456.2	II	114	99	4.20	MPW	46	28.6	5.8	6.6	Utilized flake
6457	II	114	99	4.32	MPW	32.2	18.9	17.2	6.9	Uniface
6458.1	II	114	99	4.10	MPW	40.6	33	6	5.4	Utilized flake
6458.2	II	114	99	4.10	PC	33	20.1	6	2.8	Utilized flake
6458.3	II	114	99	4.10	PC	17.3	12.2	2.3	0.4	Modified flake
6459	V**	110	98	2.55	MPW	33.3	21.5	8.4	3.5	Utilized flake
6461	II**	112	98	4.04	ST	43.3	44.1	7.7	9.9	Utilized flake
6462	III	111	99	3.77	PC	30.1	14.9	10	3.8	Modified flake
6463	II	111	99	4.05	MPW	22.4	13.2	4.5	1.5	Utilized flake
6464	II	113	99	4.22	PC	15.8	30.1	9	3.2	Stage 4 Biface
6466	III	114	99	4.00	MPW	32.9	22.3	3.2	2	Utilized flake
6467	III	114	99	3.70	PC	56.4	35.9	6.2	11.2	Utilized flake
6468	IV	114	99	3.00	MPW	15.1	14.4	5.4	1	Uniface
6469	V*	107	100	1.80	QU	25.9	31.4	8.2	5	Uniface
6470	V	109	98	2.33	MPW	38.3	22.1	8	3.9	Utilized flake
6471	V**	108	101	2.36	MPW	46.9	33.3	11	20.1	Stage 2 Biface
6472	II	113	99	4.32	MPW	36.3	11.4	5.4	2	Stage 4 Biface
6473	III**	112	98	3.97	PC	36.8	29.6	4.6	3.8	Graver
6474	III**	112	98	3.83	MPW	35.9	15.8	6.6	3	Utilized flake
6475	IV	113	99	3.30	MPW	18.9	11.3	4.8	1	Stage 3 Biface

Table A.1 . Abbreviated Paleoarchaic and Early Archaic Tool Database Continued

FS. No.	Stratum	North	East	Depth (mbd)	Material	Length (mm)	Width (mm)	Thick (mm)	Weight (g)	Tool Type
6476	II	112	99	4.10	MPW	54.7	26.6	7.2	8.1	Utilized flake
6477	IV	115	98	3.32	PC	73.1	57	39.9	143.1	Core
6478	IV	115	98	3.32	PC	49.5	15.2	7.8	4	Uniface
6479	IV	112	99	3.10	PC	41.9	28.3	8.7	9.5	Utilized flake
6480	II	113	99	4.33	MPW	29.7	27.3	9.5	5.6	Stage 2 Biface
6481	IV	112	99	3.07	MPW	39.8	31.8	7.5	6	Utilized flake
6482	II	113	99	4.25	MPW	17	18.1	2.1	0.7	Utilized flake
6483	V	110	100	2.65	QC	96.4	58.4	14.8	97.6	Utilized flake
6484	IV	108	100	3.24	PC	25.2	17.8	3.9	1.6	Utilized flake
6485	IV	108	100	3.52	PC	26.5	26.3	5.5	2.7	Utilized flake
6486	V	108	100	2.19	MPW	19.7	10.2	7	1	Stage 3 Biface

*Specimen recovered from a use-surface.

**Specimen outside of debitage sample.

Appendix B: Additional North Creek Shelter Pinto Projectile Point Measurements

Table B.1. Additional Pinto Measurements

Catalog No.	PSA.1°	PSA.2°	NOI.1°	NOI.2°
83.2**	117	116	117	126
555.1				
620.1	112	117	118	111
628.1	128	116	75	91
803.1**	116	112	150	136
1146.1**				
1775.1*	111	111	104	92
1819.1	120	101	134	129
2033.1	131		63	
2154.1*	118	116	116	115
3451.1*	112	112	108	91
3460.1	100	116	160	112
3463.1*	104	93	132	144
3472.1	115	115	80	100
3487.1*	111	113	110	106
3526.1*			118	121
3707.1*	114		73	
3707.2*	103		96	
3707.3*	111		125	
3791.1	123	124	98	102
3844.1	107		97	
3908.1	112	112	136	129
3958.1*	105	104	142	144
3959.1*	115	115	89	92
4007.1*	124	106	141	95
4021.1*	109	105	129	105
4124.1	94		154	
4318.1	109	120	127	110
6413.1				
Mean	**112.4**		**114.0**	

*Outside of debitage sample

** Specimens from Strata VII and VIII

APPENDIX C: Photo Keys

Table C.1. Photo Key for Figure 3.1 Early Archaic Points (p.36)

Top Row	(a) FS4413	(b) FS3395	(c) FS75	(d) FS3398	(e) FS1557	(f) FS1721	(g) FS4248	(h) FS555	(i) FS4124
	(j) FS3460	(k) FS1819							
Middle Row	(l) FS3908	(m) FS4318	(n) FS3472	(o) FS1775	(p) FS4007	(q) FS3487	(r) FS3959	(s) FS3707.3	(t) FS628
	(u) FS3463	(v) FS3451							
Bottom Row	(w) FS3844	(x) FS3526	(y) FS3707.1	(z) FS2003	(aa) FS3707.2	(bb) FS4021	(cc) FS620	(dd) FS2154	(ee) FS3958
	(ff) FS3791								

Table C.2. Photo Key for Figure 3.2 Paleoarchaic Points (p.37)

Top Row	(a) FS6413	(b) FS5025	(c) FS143	(d) FS5317	(e) FS6011	(f) FS5092	(g) FS6453	(h) FS5912
Bottom Row	(i) FS6412	(j) FS6259	(k) FS2972	(l) FS6194	(m) FS6059	(n) FS6377	(o) FS6373	

Table C.3. Photo Key for Figure 3.3 Early Archaic Bifaces (p.44)

Top Row	(a) FS4297	(b) FS1859	(c) FS4427	(d) FS6471	(e) FS6437				
Middle Row	(f) FS2180	(g) FS6486	(h) FS2935	(i) FS3541.1	(j) FS4421				
Bottom Row	(k) FS1849	(l) FS610	(m) FS3096	(n) FS6437	(o) FS6342	(p) FS3539	(q) FS1849.1	(r) FS597	(s) FS619
	(t) FS4317								

Table C.4. Photo Key for Figure 3.4 Paleoarchaic Bifaces (p.45)

Top Row	(a) FS5057	(b) FS6315	(c) FS5562	(d) FS6320	(e) FS4822	(f) FS6489			
Middle Row	(g) FS5093	(h) FS5464	(i) FS5007	(j) FS6327	(k) FS6475	(l) FS6435	(m) FS6472	(n) FS6464	(o) FS4392
Bottom Row	(p) FS5192	(q) FS6265	(r) FS3561	(s) FS5300	(t) FS2393	(u) FS2533	(v) FS5639	(w) FS6105	

Table C.5. Photo Key for Figure 3.6 Unifaces (p.48)

Top Row	(a) FS476.1	(b) FS2981	(c) FS3296	(d) FS6314			
Middle Row	(e) FS746.1	(f) FS5891	(g) FS2902	(h) FS5939	(i) FS3514		
Bottom Row	(j) FS5617	(k) FS5618	(l) FS5608	(m) FS5644	(n) FS5564	(o) FS5624	(p) FS5632

Table C.6. Photo Key for Figure 3.7 Gravers & Drills (p.50)

Top Row	(a) FS4412	(b) FS4425	(c) FS3451	(d) FS3487	(e) FS4007	(f) FS3955
Bottom Row	(g) FS6473	(h) FS6377	(i) FS3968	(j) FS4248	(k) FS536	(l) FS3541.1

Table C.7. Photo Key for Figure 3.8 Notched Flakes (p.51)

(a) FS6062	(b) FS6037	(c) FS6408.2	(d) FS5840	(e) FS6410	(f) FS6409	(g) FS6408.1	(h) FS3561

Table C.8. Photo Key for Figure 3.9 Cores (p.53)

Top Row	(a) FS3465	(b) FS3520a	(c) FS2251	(d) FS2334.5
Middle Row	(e) FS736	(f) FS2353	(g) FS5076	(h) FS5892
Bottom Row	(i) FS6477	(j) FS6359	(k) FS6261	(l) FS6310

Table C.9. Photo Key for Figure 3.10 Hammerstones (p.54)

Top Row	(a) FS2981	(b) FS3417	(c) FS3524	(d) FS2931	(e) FS5584	(f) FS5287
Bottom Row	(g) FS1970	(h) FS5572	(i) FS2472	(j) FS5570		

Appendix D: Tool & Debitage Analysis & Database Keys

Material Type key:

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LITHIC MATERIALS ANALYSIS CATEGORIES

Code	Material
OB	Obsidian
MPW	Morrison Petrified Wood. Consists of various colors (red, yellow, purple, white). Usually exhibits tree rings and breaks on a flat plane. A major source is located just north of Escalante, Utah.
PC	Paradise Chert. Usually cream colored with light colored clouds. Heat treats to a light pinkish color. Source is located on the southern end of the Kaiparowits Plateau.
BJ	Boulder Jasper. Usually ranges from yellow to red color and contains speckles. Source is scattered on the southern slopes of Boulder Mountain.
GSR	Green speckled rhyolite. Green colored rhyolite with dark speckles. Unknown source.
CC	Unknown Chert. White grading to light gray, clear or transparent material, chalcedony
CO	Unknown Chert. White grading to light gray, opaque
CR	Unknown Chert. Predominantly red to brown with some gold; translucent to opaque, jasper.
CD	Unknown Chert. Dark to nearly black, translucent to opaque
DC	Dehydrated Chert. Thermally altered to point of crazing (fine dark lines in geometric patterns), pot lidding, colors range from dull white to pinkish to dull dark
QC	Coarse grained Quartzite. Various colors
QU	Fine grained Quartzite. Various colors; may blend to chert
ST	Siltstone. Gray to black, dull finish.
OT	Other. Describe in comments
ZZ	Unknown material

Tool Analysis Key:

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LITHICS ANALYSIS KEY:
TOOLS

Site Number — Smithsonian Number
Accession Number — Museum of Peoples and Cultures accession number
FS Number — From field specimen bag

Material: See Lithic Material Analysis Categories.

Uniface: Lithic specimen that exhibits flaking (sometimes includes wear) on one surface.

Type

(S) Side Flaking along one edge.
(E) End Flaking along the distal end.
(M) Multiple Flaking along more than one edge.
(O) Other Describe in comments.

Angle

(HI) Angle created by flaking is more than 45 degrees.
(LO) Angle created by flaking is less than 45 degrees.
(BO) Exhibits HI and LO flaking along two or more edges.

Biface: Lithic specimen that exhibits flaking on two surfaces. Biface stages follow Andrefsky (1998:187-193).

1 Stage One: Flake Blank
2 Stage Two: Edged Biface
3 Stage Three: Thinned Biface
4 Stage Four: Preform
5 Stage Five: Finished Biface
PP Projectile point: contains hafting element.
HA Hafted biface: contains evidence of hafting, but is too large to classify as a projectile point (i.e. knife).

Completeness: C for complete; NC for nearly complete; FD for distal fragment; FP for basal fragment; FL for lateral fragment, FM for mid section.

Projectile Point type: Use codes in IMACS handbook. Record notch and stem measurements in comments. Stem width-maximum width of stem; stem length-maximum length of stem; notch width-minimum distance between notches; basal indent-maximum height of basal indentation.

Other: Other Tools

(C) **Core**: Lithic object on which flakes have been removed. Must have three negative flake scars. Distinguish between unidirectional (flakes removed in a single direction) and multidirectional (flakes removed in multiple directions).
(H) **Hammerstone**: Object which exhibits pounding wear with no flaking.
(CH) **Core/hammerstone**: A core also used as a hammer stone.
(P) **Chopper**: Object which exhibits pounding wear along with primary or secondary flaking.
(U) **Utilized flake**: Flake that exhibits wear but no obvious modification.
(M) **Modified flake**: Flake that exhibits flaking or shaping but still retains its flake characteristics. It may have some slight wear, but the intentional modification dominates.
(DA) **Drill/Awl**: Object that is generally narrow with parallel sides and gradually comes to a point.
(G) **Graver**: Object that contains a fine modified point. Other tool tips are generally not considered as gravers.
(O) **Other**: Any other modification on a flake. Describe in comments.

Wear: Object exhibiting distinct wear along one or more edges. Wear must be uniform and regular. Wear type is recorded in comments and includes smoothed/polished (SM), stepped fractures (S), feathered flake removals (F), and crushed/abraded (C) (after Andrefsky 1998:174-175).

I. Quantity
(1) One edge
(2) Two edges
(3) Three or more edges
(O) Other, describe in comments

II. Location of wear
(S) Distal end
(P) Proximal end
(I) Side
(B) Broken edge (wear located along broken edge)
(M) Wear located in two or more of the above areas

III. Shape of wear edge
(S) Straight
(V) Concave
(X) Convex
(N) Notch
(P) Point
(M)More than one of the above

Size: Record in milimeters
Length: Maximum length.
Width: Maximum width.
Thickness: Maximum thickness.
Weight: Record in grams.

Heat Treatment : (HT) Record in comments.
Crazed: Geometric lines usually caused by overheating and rapid cooling.
Potlids: Circular flakes or negative scars without a striking platform. These usually result from overheating.
Matte vs. gloss: Matte finish is dull/non-glossy, forms on the outside of the stone, and results from heating. Gloss finish is glossy and shinny, forms under the matte finish, and results from proper heating.
Color change: Results from heating. Generally involves a reddening, but can result in a variety of colors depending upon the temperature. This usually cannot be determined unless there is a comparative raw material sample.

Tool Database Key:

FS No.: Field Specimen number from artifact bag.

Spec. No.: Specimen number on artifact following field specimen number.

N: North Grid number

E: East Grid number

1/4: Quarter section of grid (NE, NW, SE, SW). This was only recorded for some use surfaces.

F3: Tertiary Feature Number (i.e. F3 in F2 in F1)

F2: Secondary Feature Number (i.e. F2 in F1)

F1: Primary Feature Number

Opening: Opening depth in meters below datum.

Closing: Closing depth in meters below datum.

Stratum: Stratum to which FS number is assigned. If the FS number is outside of the sample columns, but part of a selected use surface, then it is followed by two asterisks.

Material: Material type key.

Uniface: Unifaces are defined as lithic specimens that exhibit flaking (sometimes including wear) on one surface (this is Andrefsky's [1998:76-79] unimarginal flake tool). If the specimen exhibits modification on more than one surface, but on different tool edges, then it is still considered as a uniface.

Type: This category records the location of the modification on a uniface.

(S) Side: Flaking on one edge of the uniface.

(E) End: Flaking along the distal end.

(M) Multiple: Flaking along more than one edge.

(O) Other: Describe in comments.

Angle: This records if the angle created by the modification is greater or less than 45 degrees.

(HI): Angle created by flaking is more than 45 degrees.

(LO): Angle created by flaking is less than 45 degrees.

(BO): Exhibits HI and LO modification along two or more edges.

Biface: Bifaces are objects that are flaked on both surfaces along the circumventing edge. Biface stages follow Andrefsky (1998:187-193).

(1) Stage One: Flake blank. This is the objective piece selected for modification into a biface. However, since it has not yet been modified, it is impossible to identify this stage in the assemblage. It potentially could be any debitage flake large enough to make a biface.

(2) Stage Two: Edge Biface. This stage is the initial edging of the objective piece. The piece is usually fairly thick and the flake removals are large, generally not crossing the midline of the biface. The bifacial removal of flakes creates a sinuous edge.

(3) Stage Three: Thinned biface. Here, flake removals are intended to thin the objective piece, thus they tend to cross the midline; however, the biface is still somewhat thick.

(4) Stage Four: Preform. This stage also contains flake scars that cross the midline, but they may now be patterned. The biface is now thin and begins to take a formal shape.

(5) Stage Five: Finished Biface. The finished biface is usually thin, has superimposed and overlapping negative flake scars, and has a formal shape. This stage lacks evidence of hafting elements (thus it is not classified as a projectile point), but broken portions may have come from a specimen that was hafted.

(PP): Projectile Point. This is a biface that contains a hafting element (Sutton & Arkush 1996) (Andrefsky [1998:76-79] lumps these with hafted bifaces). These points were hafted for propelling, thrusting, and/or piercing.

(HA): Hafted Biface. This is a biface that contains a hafting element. In this analysis, this is differentiated from a projectile point primarily based upon size and use wear. An example of this is a knife—it is significantly larger than an atlatl point and exhibits wear suggesting cutting rather than piercing.

Complete: This records if the specimen is complete or broken. If broken, it also identifies which portion of the objective piece it represents.

(C): Complete.

(NC): Nearly complete. The specimen has to be at least 90% intact to qualify for this category.

(FD): Distal fragment. This is the tip or point of the specimen.

(FP): Basal fragment. This is the hafting element or blunt base of the object.

(FL): Lateral fragment.

(FM): Mid-section.

P.P. Type: Projectile point types are coded according to the classification typology outlined in the IMACS handbook (IMACS 1982); however, they are also spelled out in a subsequent *Type* column. Additional measurements were also observed on projectile points and recorded in subsequent columns. **Other:** Other tools include those lithic objects that exhibit modification, whether it is intentional or from use. These are defined below.

(C) Core: This is an objective piece from which flakes have been removed (the flakes generally being the intended tools). Cores must exhibit at least three negative flake scars and are classified by the direction of the flake removals. Unidirectional cores have flakes removed in a single direction and multidirectional cores flakes are removed in multiple directions.

(H) Hammerstone: Hammerstones exhibit pounding or crushing wear on its surfaces, but does not contain flake scars. These usually are in cobble form and were used to strike cores or other objective lithic pieces to remove flakes. [38]

(CH) Core/Hammerstone: This is a core that has also been used as a hammerstone.

(P) Chopper: Choppers have primary or secondary negative flake scars that form an edge that also exhibits pounding wear (Whittaker 1994:5). These tools are generally modified cobbles, and the flake scars are generally large.

(U) Utilized Flake: Flakes that exhibit use-wear, but no obvious modification (Andrefsky [1998:79] classifies these as unimarginal flake tools without distinction between intentional and

[38] Although not fitting in Andrefsky's [1998:76] chipped stone classification, he does address them in pages 12-14.

use-wear modification). These generally do not have a formal shape, and the type of wear varies (wear will be addressed in a following section).

(M) Modified Flake: Flakes that exhibit flaking, but still retains its flake characteristics (Andrefsky's [1998:79] bimargial flake tools). These are differentiated from Stage 2 bifaces because they do not have a formal shape and have not been modified on all or nearly all edges. These may also contain some slight use-wear, but the intentional modification dominates.

(DA) Drill/Awl: These tools generally contain hafting elements, but differ from projectile points in their shape and probable function (Sutton & Arkush 1996:49). They are usually narrow with parallel sides which gradually come to a point. Typically, there will be use-wear on the tip and edges near the tip. It is not uncommon to find projectile points that have been modified into drills.

(G) Graver: Lithic object that contains a fine modified point—one that is small and sharp (Odell 2003:65-66). These are different from the tips of projectile points and bifaces (which tend to be more robust); however, it is possible that a biface or projectile point tip may have been modified into a graver tip. Generally, graver tips are found on flakes, but they may be found on any tool edge as well.

(O) Other: Any other type of modification on a flake. These are described in the comments.

Wear: Wear results from tool use and is generally evident on the tool edge. The wear identified in this analysis is visible to the naked eye, however identification was aided using a 8X microscope. To be culturally related, the wear must be uniform and regular. Wear type is recorded in the comments and includes *(SM) smoothed/polished, (S) stepped fractures, (F) feathered flake removals,* and *(C) crushed/abraded* (after Andrefsky 1998:174-175).

I: This is the quantity of edges that exhibit use-wear.

(1): One edge.

(2): Two edges.

(3): Three or more edges.

(O): Other. This will be described in comments.

II: This category records the location of the wear. This depends upon being able to orient the tool. The proximal edge of a formal tool is the base, hafting element, or side closest to the tool user. On informal tools, the proximal edge is the edge containing the flake striking platform. If the tool cannot be orientated, then the wear is recorded as being located on a side.

(S): Wear on the distal edge.

(P): Wear on the proximal edge.

(I): Wear on a side.

(B): Wear is located along a broken edge.

(M): Wear is located in two or more of the above areas.

III: This records the shape of the wear. The shape of the wear may follow the shape of a tool edge, or be completely independent of the original tool edge shape.

(S): Wear forms a straight or nearly straight edge.

(V): Wear forms a concave edge. This is distinguished from a notch based upon general size.

(X): Wear forms a convex edge.

(N): Wear forms a notch.

(P): Wear forms a point.

(M): Used to designate a tool that exhibits more than one of the above shapes.

Size: Size includes specimen measurements of length and weight recorded in millimeters and grams. These measurements were taken for all specimens regardless if they were broken or not.

Length: Maximum length of tool.

Width: Maximum width of tool.

Thickness: Maximum thickness of tool.

Weight: Weight of tool in grams. If the weight registered less than 0.1 grams, then the weight of 0.05 was entered.

Qty: Quantity of tools in a single category. In the case of this analysis, each tool was analyzed separately, therefore the quantity was one. If a specimen turned out to not be a tool or did not contain evidence of cultural modification, then the quantity was left blank.

Type: Verbal description of the tool types.

Comments: This is where additional observations could be recorded. Generally, this category contains a verbal description of the tool.

Heat Treated: If the tool contained evidence as having been heat treated, then it was recorded here (see Geib 2001:174-186 for a discussion of heat treatment). In order to facilitate the identification of heat treatment, a comparative heat treated collection was created and consulted for Boulder jasper, Morrison petrified wood, and Paradise chert.

Stem Width: Maximum width of stem on stemmed projectile points.

Stem Length: Maximum length of stem on stemmed projectile points.

Neck Width: Minimum distance between notches on projectile points. On stemmed points, this is the width where the stem element transitions into the blade element.

Basal Indent: Maximum height of basal indentation on projectile points.

Notch Diameter 1: Maximum diameter of first notch. This was specifically used to measure the notches on flakes.

Notch Depth 1: Maximum depth of first notch.

Notch Diameter 2: Maximum diameter of second notch.

Notch Depth 2: Maximum depth of second notch.

Source: This was recorded for those obsidian specimens that were sourced.

PSA.1: Proximal Shoulder Angle measurement of the first notch made on Pinto points after Thomas (1981).

PSA.2: Proximal Shoulder Angle measurement of the second notch made on Pinto points.

NOI.1: Notch Opening Index measurement of the first notch made on Pinto points after Thomas (1981).

NOI.2: Notch Opening Index measurement of the second notch made on Pinto points.

Debitage Analysis Key:

MUSEUM OF PEOPLES AND CULTURES
LITHICS ANALYSIS KEY:
DEBITAGE

Site Number	Smithsonian Number
Accession Number	Museum of Peoples and Cultures accession number
FS Number	From field specimen bag
Phase 1	
Material:	Sort all debitage by material (See Lithic Material Analysis Categories).
Size Sorting:	Process all debitage through ½" screen. Sort into macro (>½ ") and micro (<½ ") flakes maintaining the materials categories. Maintaining macro/micro and material type differentiation, proceed with Phase 2.
Phase 2	**Flake types**
Flakes without Cortex:	***Internal Flake*** **-** Catch-all category for variety of flake types without cortex. Record striking platform type in comments. ***Bifacial thinning flake*** **-** Usually thin, fan-shaped, curving flake with multiple dorsal negative flake scars and a multi-faceted striking platform with a lip. ***Shatter*** – Broken flake or angular waste lacking striking platform. Differentiate between flake shatter and angular shatter and record in comments. Flake shatter is a broken flake lacking a striking platform, yet the ventral and dorsal sides of the flake are still identifiable. Angular shatter is usually thick and angular, lacks a striking platform, and lacks a single identifiable ventral and dorsal side.
Flakes with Cortex:	***Primary***-flakes resulting from primary decortication with nearly all (75-100%) of the dorsal surface covered with cortex; seldom more than one negative flake scar. Cortex commonly found on striking platform. ***Secondary***-flakes resulting from secondary decortication with less than 75% of the dorsal surface covered by cortex and more than one negative flake scar. ***Primary shatter*** – Broken flake or angular waste lacking striking platform but with some cortex present. Differentiate between flake shatter and angular shatter.
Other:	Any flakes left over (i.e. potlids). Describe in Comments.
Weight:	Record in grams
Total Quantity:	Sum of all flakes in a single category.
Comments:	Observations on this assemblage or "other" flakes. Example of observation might include evidence of heat treating.
Shatter:	(FS) Flake shatter/fragment: Broken flake lacking striking platform.

(AS) Angular shatter: Lacks striking platform. No definable ventral or dorsal surface.

Heat Treatment : (HT) Record in comments.
Crazed: Geometric lines usually caused by overheating and rapid cooling.
Potlids: Circular flakes or negative scars without a striking platform. These usually result from overheating.
Matte vs. gloss: Matte finish is dull/non-glossy, forms on the outside of the stone, and results from heating. Gloss finish is glossy and shinny, forms under the matte finish, and results from proper heating.
Color change: Results from heating. Generally involves a reddening, but can result in a variety of colors depending upon the temperature. This usually cannot be determined unless there is a comparative raw material sample.

Striking Platform: (SP) Record in comments.
Complex: Multi-faceted. Struck from a biface or multidirectional core.
Simple: Single facet. Flat, smooth. Generally struck from a unidirectional core.
Prepared: Ground or abraded.
Cortical: Cortex on striking platform
Lip: Distinct line found just below the striking platform. Usually associated with soft hammer percussion or pressure flaking bending forces. Commonly found with complex striking platforms.

Debitage Database Key:

FS No.: Field Specimen number from artifact bag.

Spec. No.: Specimen number on artifact following field specimen number. In the case that there are multiple flakes in a single row, then this column was left blank.

N: North Grid number.

E: East Grid number.

1/4: Quarter section of grid (NE, NW, SE, SW). This was only recorded for some use surfaces.

F1: Tertiary Feature Number (i.e. F1 in F2 in F3)

F2: Secondary Feature Number (i.e. F2 in F3)

F3: Primary Feature Number.

Opening: Opening depth in meters below datum.

Closing: Closing depth in meters below datum.

Stratum: Stratum to which FS number is assigned. If the FS number is outside of the sample columns, but part of a selected use surface, then it is followed by two asterisks.

Weight: Weight of flakes in grams from a single row. If the weight registered less than 0.1 grams, then the weight of 0.05 was entered.

Material: Material type key.

Macro without Cortex: These debitage pieces do not contain cortex, and are differentiated as *internal flakes, biface thinning flakes,* and *shatter*.

***Internal Flakes*:** This is a catch-all category for a variety of flake types without cortex. These may be complete or broken, but they must have a striking platform to qualify for this category. Striking platform types are recorded in subsequent columns.

***Biface Thinning Flake*:** Biface thinning flakes are usually thin, fan-shaped, curved, have multiple dorsal negative flake scars, and a multi-faceted (complex) striking platform with a lip.

***Shatter*:** These specimens consist of broken flakes and angular waste that do not have striking platforms. These are differentiated as *flake shatter/flake fragment* and *angular shatter* (these are recorded in subsequent columns).

Macro with Cortex: These pieces exhibit some cortex and are separated as *primary, secondary,* and *primary shatter.*

***Primary*:** Primary flakes result from primary reduction of a nodule. Nearly all (75-100%) of the dorsal surface is covered with cortex. These flakes seldom have more than one negative flake scar, and cortex is commonly found on the striking platform.

***Secondary*:** Secondary flakes are the next flakes removed in a decortications sequence and have less than 75% of the dorsal surface covered by cortex. These generally have more than one negative flake scar on the dorsal surface.

Primary shatter**:** These pieces are broken flakes and angular waste that do not have striking platforms, but have some cortex. These are also differentiated as *flake shatter/flake fragment* and *angular shatter*.

Micro without Cortex: These categories are the same as *Macro without Cortex* with the exception of size.

Micro with Cortex: These categories are the same as *Macro with Cortex* with the exception of size.

Other: Any flakes that do not fit in any of the other categories are recorded here and described in the comments. Examples of these are pot lids (flakes that pop off of an objective piece during heat treatment).

Total Quantity: Quantity of flakes from a single row. Two or more broken flake pieces that fit together were counted as one.

Comments: Section where additional observations could be recorded. Generally, any uncertainty as to material type was indicated here by a CF. followed by the material type.

Heat Treated: Specimens that exhibited heat treatment were noted and evidence for heat treatment were identified as *crazed, pot lids, matte versus gloss finish,* and/or *color change*. (See Geib 2001:174-186 for a discussion of the effects of heat treatment on Paradise chert and Boulder jasper.)

Crazed**:** Crazing results from overheating and is portrayed as geometric lines running throughout the specimen.

Pot lids**:** Pot lids also results from overheating. These are generally ovoid in shape and pop off of an objective piece leaving a negative ovate scar.

Matte or Gloss**:** This describes the surface luster of a specimen. The outer layer of a heat treated specimen will generally take on a matte finish (one that does not evenly reflect light). When the matte layer is removed, the resulting surface appears glossy or takes on a waxy appearance. Often, both surfaces are evident on a single specimen.

Color Change**:** Often the color of a specimen will change with heat treatment. Color change is variable and is dependent upon the pre-heat treated color, and upon temperature as well. For example, Paradise chert changes from a cream to a pinkish color when heat treated properly, but changes to a dark gray or white when overheated.

Angular Shatter (AS): Angular waste debris that does not have a striking platform and lacks a definable ventral and dorsal side.

Flake Shatter (FS): Broken flake fragments that are missing their striking platforms.

Striking Platforms: These are the portion of the flake where pressure was applied to remove the flake from an objective piece. These were identified as *complex, simple, prepared,* and *cortical*. All of these striking platforms may have an accompanying *lip*, which was recorded separately. Some flakes had striking platforms that were too small to positively classify, therefore they were simply left unclassified.

Complex**:** A complex striking platform is multi-faceted. Typically, the multi-faceting is negative flake scars resulting from previous flake removals from a bifacially flaked edge. These usually come from a biface.

Simple**:** Simple striking platforms have a single facet and are also called flat or smooth platforms. These are generally struck from a unidirectional and sometimes a multi-directional core.

Prepared**:** Striking platforms that show evidence of preparation-usually in the form of abrasion—prior to flake removal.

Cortical**:** These are flakes that have cortex on the striking platform.

Lip: Lips are distinct ridges located just below the striking platform on the ventral site of a flake. These are usually associated with soft-hammer percussion or pressure flaking bending forces. They are commonly found in conjunction with complex striking platforms, but may be found with any of the striking platform categories.

Source: This was recorded for those obsidian specimens that were sourced.

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