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Analysis of Lithic Assemblages from Virgin Branch Puebloan Sites on the Shivwits Plateau

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ANALYSIS OF LITHIC ASSEMBLAGES FROM VIRGIN BRANCH PUEBLOAN SITES ON THE SHIVWITS PLATEAU

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ABSTRACT

Flaked stone technology, as with any utilitarian technology, is studied by archaeologists for a number of reasons. Often lithics are studied to understand the activities of a prehistoric group. Everything from the final product to the waste material can, when recovered in suitable amounts, reflect the conscious decisions of its creator. Understanding this helps to embed all stages of stone tool (lithic) use into aspects of human behavior and in understanding the organization of technology.

The Virgin Branch Puebloans are the westernmost sub-branch of the Ancestral Puebloan culture of the American Southwest. While some of their expanse has been studied within their lowland regions, their upland territory, specifically the Shivwits Plateau on the Arizona Strip, has until very recently remained understudied. This thesis examined the flaked stone tools, cores, and debitage recovered from eight sites within the vicinity of Mt. Dellenbaugh on the Shivwits Plateau. Its goal is to understand past human behavior with reference to site function, raw material use, and lithic reduction strategies for the purpose of adding to the information compiled by the University of Nevada, Las Vegas' ongoing research within the region.

Results showed that at many sites a wide range of similar activities were occurring with some possibly including evidence of more specialized activities. In addition to this, with the exception of a few differences in raw material selection and some variation in the lithic debitage, most of the sites were utilizing similar reduction strategies even as distance from the raw material source increased.

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CHAPTER 1

INTRODUCTION

This thesis examines flaked stone technology, raw material stone, and debitage resulting from the use and manufacture of stone tools, as used by the Virgin Branch Puebloans (VBP) within the vicinity of Mt. Dellenbaugh in the southern portion of the Shivwits Plateau within the Grand Canyon-Parashant National Monument, Arizona. Flaked stone technology and waste material are examined by archaeologists for a number of purposes. Most often stone technology, as with other forms of technology, is examined to understand past behaviors. Altered raw material stone and debitage also aids in understanding material accessibility, availability, and how it was utilized within specific environmental contexts. This thesis explores how the Shivwits Plateau VBP utilized flaked stone with the goal of obtaining information on site function, raw material use with reference to locations to source material, and material conservation strategies.

Previous studies and analyses of flaked stone attributes both within and outside of the VBP region provided a basis by which flaked stone tools and other lithic artifacts can be used to identify site function and raw material use (Martin 2009). For this undertaking, I conducted macroscopic lithic attribute analysis on lithic artifacts collected from a series of excavations documented over the past several years from the Shivwits Plateau as part of the University of Nevada, Las Vegas Department of Anthropology’s ongoing research in the region.

A study of this type and scope has not been attempted within the region; although a similar study was conducted on sites within the vicinity of Mt. Trumbull on the neighboring Uinkaret Plateau to the east of this thesis’ study area (Figure 1.1). The flaked

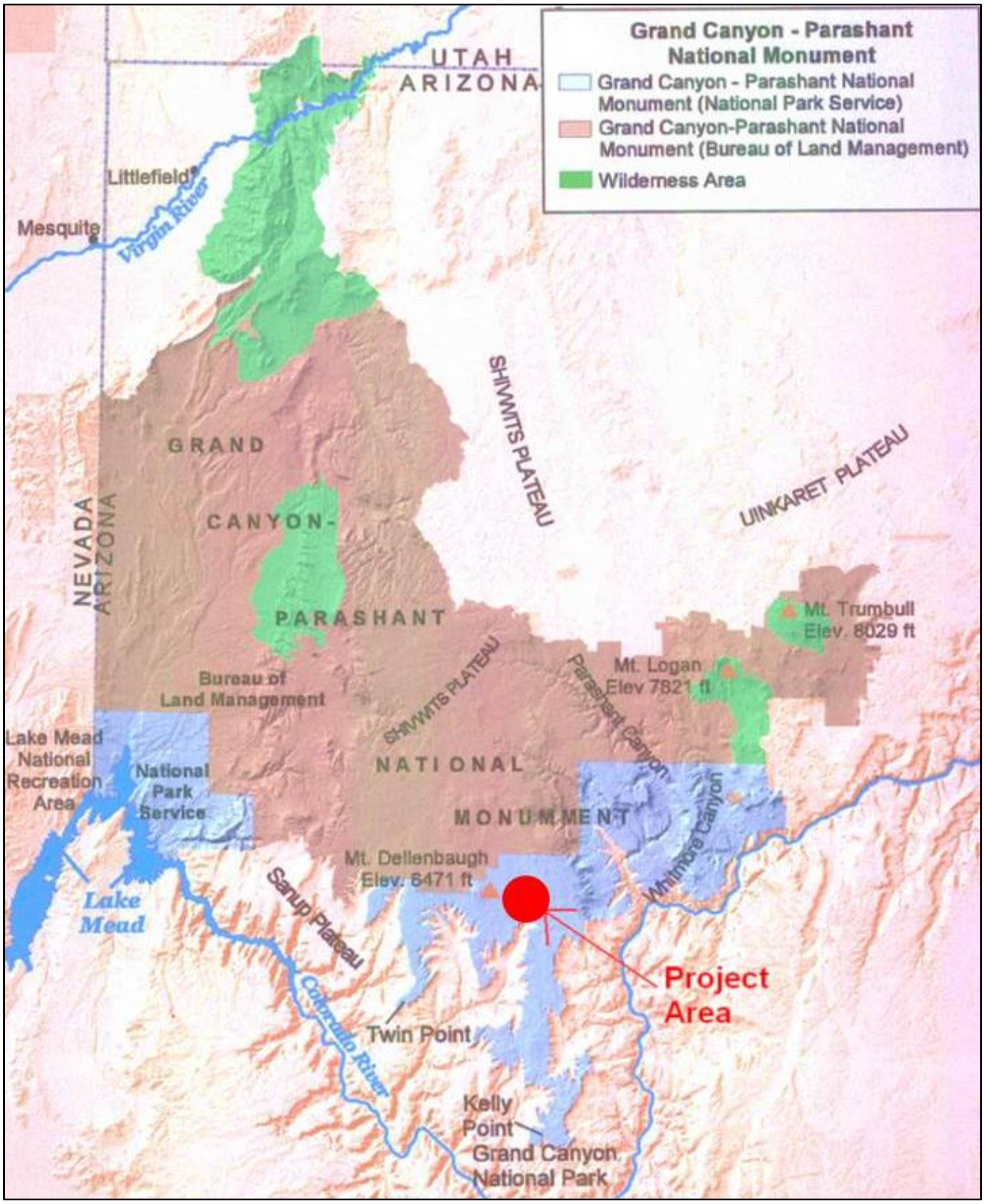


Figure 1.1. Map of the Shivwits Plateau and study area. (Adapted from Harry 2012).

stone artifacts analyzed here are from collections taken from field schools and surveys carried out over the past eight field seasons beginning in 2006. These projects were directed by Dr. Karen Harry (UNLV) as part of the Shivwits Research Project. The flaked stone collections used in this thesis were collected from eight sites, which include multi-roomed habitation sites, pueblos, and small farming hamlets dating to the middle and late Pueblo II and early Pueblo III periods. More detailed information on each of these sites as well as the work conducted by UNLV is available in the next chapter. Compared to other regions occupied by the VBP, the Shivwits Plateau is relatively understudied. With this in mind it is my hope that this research will help provide a more extensive view on how flaked stone technologies can inform about site function based on tool utilization in addition to how raw material was used with the VBP in their upland territories.

Research Questions, Data Requirements, and Data Expectations

1.) **What do the tool assemblages at these sites reveal about site function?**

This question examines what the tool assemblages at these sites reveal about site function. This question was posed specifically to examine similarities and differences in site function with an emphasis on the tool assemblage data.

Data requirements:

To understand site function, general tool types as well as the percentages of a number of different attributes, within and between the sites under examination were compiled and compared with one another. Similar ratios of flake tools/cobble tools, for example, helps provide an overview of general site activities, thus indicating similarities or differences in site function (see Appendix A and B for Tool Types and Tool/Cobble Tool definitions). The edge shape of the tools and cobble tools, when applicable, were also obtained as edge shape may be factor indicating different types of processing activities that the tools were used for. Edge angle was recorded as edge angle is often associated with the functional assessments of the artifacts. For instance, acute angles are effective for cutting, as opposed to steeper edge angles which are more suited for scraping (Andrefsky 2005: 160 – 161). Examining whether retouch was unifacial or bifacial can help identify the functions of stone tools. Recording the number of retouched edges was also imperative for identifying tool types in terms of edge modification to suit a particular task by creating a specific working edge.

Data expectations:

If the inhabitants of different sites were involved in the same general sets of activities, we would expect the sites to yield similar types of tools, evidenced by similar ratios of tool types, edge shape, edge angle, and number of retouch edges. Alternatively, if the inhabitants of each site were involved in different tasks, we would expect there to be differences in the tool collections.

2.) **Did the inhabitants of settlements in close proximity to the Kaibab Formation utilize different lithic reduction strategies than those whose settlements were more distant?**

This question sought to examine what reduction strategies in material conservation were occurring at these sites with reference to their proximity to the Kaibab Formation (see Table 2.1), where it is believed a majority of raw material stone, especially cryptocrystallines, were acquired.

Data requirement:

To examine lithic reduction strategies, the ratios of all classes of chipped stone, and their attributes, were compared between sites. To inform on material conservation, tool/cobble tool types were cross-referenced with both raw material and texture and then compared between sites. Raw material type and texture are direct indicators of availability and access to finer quality resources to produce tools. Identifying the nature of formal tools by their presence with other tools as well as their attributes, such as raw material and texture, was also required as formal tools are associated with conservation. As expedient tools generally have more cortex than formal tools, in addition to less utilization along their edges, the amount of cortex on tools helped to identify tools as expedient or formal, as tools with a greater percentage of cortex are more often associated with expedient technology (DeMaio 2013). The size and weight of tools may also indicate how efficiently raw material was used, especially when compared with those of cores and complete flakes (Henry 1989).

The cores and debitage assemblages were also examined for this question. Core type ratios were identified and compared between sites to understand how raw material was utilized. For example, a greater proportion of multidirectional cores could indicate that higher-quality material was scarce (Andrefsky 2005: 158). Comparing cores and debitage made with finer quality material (raw material and textures) between sites can help to identify access to material stone, especially for debitage as this can then be cross-referenced with stage of production.

Comparisons of reduction strategies were examined primarily through the core and debitage assemblages. The presence of few cores with larger proportions of later stage debitage could indicate that tool maintenance was taking place at the site and that pre-worked material was brought on site. Additionally, the size of cores as well as their cortex revealed how extensively cores were used at these sites. Comparing debitage type ratios between sites can inform on the stages of production occurring at each, as can the presence or absence of platform lipping, as such lipping results from the use of soft hammer percussion, which generally occurs in the late stages of tool production. The number of dorsal scares, amount of cortex, and size of complete flakes would indicate stage of production as well. A greater number of such scars, combined with very little cortex, and small flakes site indicates that the flake was removed during later stages of production (Bradbury and Carr 1999).

Data Expectation:

If greater efforts were made to conserve of high-quality raw materials at the sites located a greater distance from the Kaibab Formation, then it is expected that, compared to sites located nearer to the formation, those sites will exhibit a higher proportion of flakes exhibiting platform preparation, and a higher frequency of small, heavily reduced cores exhibiting fine textures and a high material quality. Additionally a high frequency of tools made from high quality material, may indicate that tools were brought in to the site pre-made or as flake blanks, which would also be evident by the appearance of high quality material in the debitage at the site. It is also expected that sites closer to the Kaibab Formation will have a greater occurrence of expedient tool technology than formal tools due to greater access to raw material. Finally, if proximity to the Kaibab

Formation is not a factor influencing the chipped stone assemblage, then it is expected that no difference in flake reduction strategies will be observed at any of the sites.

CHAPTER 2

BACKGROUND

Virgin Branch Puebloan Territory

The VBP were a prehistoric group who practiced a mixed subsistence strategy of hunting/gathering and cultivation and are considered the westernmost sub-branch of the Ancestral Puebloan culture of the American Southwest. They occupied a territory which included three distinct regions that make up the current Three Corners area of the United States. The first of these regions, the Southern Nevada lowlands, in which the Moapa Valley is located, includes sites located along the Virgin and Muddy Rivers, and features a dry hot environment in which rainfall is limited to 10cm a year (Lyneis 1995). The second region, the St. George Basin located in southern Utah, marks a region of intermediate elevation between the Virgin Lowlands and the plateaus at an elevation of about 750 – 1250 meters above sea level (Lyneis 1995). Rainfall is greater than in the Virgin lowlands at 22 cm a year, which in addition to multiple springs and drainages support rich stands of riparian vegetation (Lyneis 1995: 203).

The third region, the Colorado Plateau, which extends from southern Utah to northwest Arizona, the Arizona Strip, features the highest elevations occupied by the VBP. At its highest elevations, the plateaus support ponderosa pine, in addition to pinyon and juniper, with patched areas of grassland (Lyneis 1995). The drainage valleys of the plateaus support Great Basin Desertscrub, mostly in the form of sage brush. This region encompasses both the Uinkaret to the east and the Shivwits Plateau to the west (Figure 1), the latter of which is the focus of this research.

Climate and Geology

The Shivwits Plateau is semi-arid, with summer temperatures exceeding 100 ° F, and winter temperatures below freezing during the evening and above freezing in the afternoon (MacWilliams et al. 2006). Annual precipitation ranges from 23 cm to 33 cm with most precipitation falling in the winter (Lyneis 1995). A second rainy season occurs in the summer rains, with rains falling as a result of monsoon fed storms from Mexico (MacWilliams et al. 2006). While no large permanent sources of water are found within this area, the area is known to have perennial/ intermittent springs (Karen Harry, personal communication, 2014).

The elevation of the plateau ranges from 1,500 – 2,100 meters above sea level. The terrain upon the plateau is generally flat with some hills, but can become slightly uneven as a result of differences in subsurface stratigraphy, two of which are of noteworthy mention to the formation of the southern end of the plateau. The first of these two, the Kaibab Formation, is a fossiliferous limestone stratum that was deposited during the Permian period. Kaibab limestone would have been of particular importance to prehistoric peoples, as the limestone contains both tabular slabs, useful in dwelling construction, and tabular chert and chert nodules that acted as a valuable and abundant resource for stone tool production (MacWilliams et al. 2006).

Above the Kaibab Formation lies a volcanic strata of Pliocene and Miocene age basalt and andesite-basalt flows resulting from the prehistoric volcanism is the area (Wenrich et al. 1996). This geological activity gave rise to the formation of Mt. Dellenbaugh, an extinct basalt cinder cone, which rises approximately 247 meters (900 feet) above the surrounding landscape (MacWilliams et al. 2006; Wenrich et al. 1996).

These flows add to the uneven topography of the southern end of the plateau through their erosion into large vesicular basalt boulders and rocks in addition to mineral-rich basaltic soils. These natural elements acted as valuable resources for settlement development in that vesicular basalt rocks were also used in dwelling construction. Additionally, Glendee Ane Osborne's (2008) research has indicated that the frequency of sites on this volcanic stratum appears to increase during the Pueblo I and II periods. The stratum supports "semi-permeable clay-rich soils with a shallow water table" which would have provided adequate land for dry farming practices conducted by the VBP (Lyneis 1995).

Virgin Branch Puebloan Prehistory

According to Margaret Lyneis, occupation of the Virgin Branch territory in general began before A.D. 1 and lasted approximately until A.D. 1200 (1995: 201). However, as it applies to the chronology of the territory as a whole, most archaeologists use a generalized version of the Pecos Classification with dates taken from the neighboring Kayenta Region to the east (Lyneis 1995: 208). The phases and their corresponding dates as they apply to the VBP territory are as follows; Basketmaker II (BM II) B.C. 1200 – A.D 500, Basketmaker III (BM III) A.D. 500 – 750, Pueblo I (PI) A.D. 750 – 900, Pueblo II (PII) A.D. 900 – 1150, and Early Pueblo III (PIII) A.D. 1150 – 1200/1225 (Anderson 2011; Lyneis 1995; Allison 2000). This chronological sequence for the VBP is based on changes in attributes seen in ceramic assemblages (Lyneis 1995: 208-209). These changes in ceramics have been linked to the neighboring Kayenta region. For example, BM II Virgin Branch sites were by definition aceramic, which changed during BM III period which is marked by the emergence of gray ware pottery (Lyneis 1995). However, Lyneis has stressed that chronometric controls for the region "remain under development" (Lyneis 1992: 32).

While radiocarbon dates are available for the sites on the Shivwits Plateau they often lack tight precision. As a result, the chronology of the Shivwits Plateau and the VBP territory in general, is still in need of more detailed study. However, the presence of indented corrugated ceramics in establishing a site's temporal period has proven useful in the VBP region. Lyneis (1995) notes that in the region these ceramics first appear at about A.D. 1050, and from then "increase in frequency until abandonment at around A.D. 1200 or 1250." (209) Thus, the proportion of corrugated ceramics to other ceramics helps to provide a general date of site occupation.

During the BM II period, occupation in the region is characterized by the presence of pit houses with minimal floor features and by slab lined circular storage cists. The period is marked by maize and squash dry farming (Jensen 2002). This period is defined as aceramic, with diagnostic artifacts found in the form of sandals, coiled baskets, fiber and hide bags, dart fore shafts, atlatls, snares, nets, and human/animal hair cordage (Lyneis 1995).

The BM III period is marked by a greater dependence on horticulture, and the introduction of the bow and arrow (Jensen 2002: 12). Pit houses and circular slab lined storage cists continued as the norm into this period of occupation. Additionally, the period is associated with the introduction and widespread use of pottery. Diagnostic ceramic types include sand tempered plain and painted (Lino style) gray wares (Martin 2009: 28). Moapa gray ware ceramics, believed to have been produced near Mt. Trumbull on the Uinkaret Plateau, also appear in the Moapa Valley during this time. The presence of this ceramic type indicates possible extensive occupation in the upland region and established trade networks between the two VBP regions.

In terms of settlement and subsistence, the Pueblo I period is similar to the preceding BM III period, with the exception that there exists a greater variation in site layouts and the appearance of above-ground room blocks (Martin 2009: 29). In addition, globular based, flaring rim jars became more popular at this time. The frequency of olivine-tempered, Moapa gray wares moving between the upland and lowland regions began to increase as well.

The Pueblo II period marks the greatest expanse of the VBP, with trade between the upland and lowland territories reaching its height (Lyneis 1995). In the uplands, sites begin to appear more frequently in areas containing deep soil suitable for farming, thus indicating an increase in population as well as an increased reliance on agriculture (Osborne 2008; Jensen 2002). More habitation rooms in the form of subterranean, semi-subterranean, and surface rooms are found in both continuous and separate room blocks, with clusters of connecting storage rooms forming a slight arc, or "C" arrangement (Martin 2009: 30). Corrugated pottery appears at about A.D. 1050 this region, and increases in frequency after that time.

The Early Pueblo III period represents the last period of occupation before abandonment; the timing of abandonment, as well as specific reasons for abandonment, is still debated (Jensen 2002; Lyneis 1996). This period is generally associated with increased aggregation within a few sites followed by a decline in populations throughout the VBP territory, although the plateaus still show evidence of continued use and occupation (Lyneis 1996). In addition, Kayenta pottery and designs styles, both in black-on-white and red wares, increase in frequency at upland sites both on the Shivwits and Uinkaret Plateaus indicating greater contact with the east.

It is also worthy to note that in spite of increases in population during the Pueblo II period and increased site aggregation during the early Pueblo III, the Virgin Branch Puebloans appear to have not constructed kivas. These structures are often attributed to increases in settlement size and population in other parts of the Puebloan Southwest (Lyneis 1996: 21). The lack of kivas is often considered a defining characteristic of Virgin Branch Puebloans. This, as well as varying utilization of cultivated and collected wild resources has raised debate on Virgin Branch distinction from other prehistoric Puebloan groups in the Southwest region, and to what degree they are related to groups in the neighboring Great Basin region such as Fremont culture.

Previous Research on the Shivwits Plateau

Until recently, research on the Shivwits Plateau was limited primarily to a series of surveys of the area that took place as early as the 1870's and later into the 1950's and 1970's by both explorers and professional archaeologists (Teague and McClellan 1978). These surveys indicate that the Shivwits Plateau has abundant cultural resources indicating extensive past use of the region, with "the most extensive use periods of occupation occurring in the Late Archaic and Pueblo II periods" (MacWilliams et al. 2006: 19). However, as a result of these surveys, most archaeological interpretations were based primarily on surface remains and scatters.

It was not until the start of the millennia that more extensive surveys and archaeological excavations were conducted in the region, such as the Shivwits Plateau Survey 2001 (MacWilliams et al. 2006). This survey was part of a project to inventory and assess the quality of cultural resources in the Grand Canyon Parashant National Monument, which became protected land in January 11, 2000 as a result of President William Clinton's Proclamation 7265. Archaeological excavation on the Shivwits Plateau began in 2006 with separate projects conducted by Brigham Young University (BYU) in the central portion of the plateau, and by UNLV in the southern portion of the plateau (Allison 2010). UNLV’s excavations have focused primarily on the area surrounding Mt. Dellenbaugh (Harry 2010). The lithic assemblage data under examination in this research were recovered from sites excavated by UNLV’s ongoing research in the area.

Previous Lithic Studies in the Virgin Branch Region

In spite of more recent excavations in the Virgin Branch region, the area still remains understudied, and the same holds true for the lithic assemblages within the region for which there have been only a few in depth studies (Allen 1999: 1). To date, no study on lithic assemblages has been performed for the Shivwits Plateau. However, of noteworthy mention are three studies performed by separate authors in the lowland, intermediate, and upland territories.

Vikki Allen (1999) was the first to perform a cross comparison of Virgin Branch lithic assemblages from multiple sites within lowland territory with the Moapa Valley. She focused on lithic assemblages at three sites occupied at separate intervals during the Pueblo II period; Bovine Bluff (early Pueblo II), Main Ridge (middle Pueblo II), and

Adam 2 (late Pueblo II). Allen's study examined four main topics: 1.) temporal trends in tool use, 2.) the source(s) of obsidian recovered at the sites, 3,) whether projectile points were produced on site, and 4.) whether activity areas could be discerned within the sites. Her examination of lithic technologies at these sites showed signs that Virgin Branch Puebloans began to increase sedentism within the lowlands during the Pueblo II period. This is evidenced by changes in lithic technology and raw material use from more formal, curated, fine quality technology to some more expedient tools composed of various raw material stone. This, in turn reflected the processing of agricultural products which indicated that an increased reliance on cultigens has occurred (Allen 1999: 112).

Dalley and McFadden's (1988) research conducted at the Little Man 1, 2, 3, and 4 sites along the Virgin River in Washington County in southwestern Utah (St. George Basin) also helped to contribute to our current understanding of lithic technology in the Virgin Branch region during the late Pueblo I and early Pueblo II periods. Dalley and McFadden's research in the region supported the notion that the Virgin Branch Puebloans occupied sites in the region year round and were heavily dependent on agriculture. His examination of the lithic assemblages at these sites indicates that a wide range of tool production and core reduction activities were occurring at each site, with a greater presence of lithic remains found principally within pit houses (1988: 256). His conclusion that the Virgin Branch occupied their sites year round and became increasingly sedentary was supported by lithic inventories from the site which were composed primarily of utilized flakes, although the diversity of the tool assemblages was affected by site size and occupation time.

Within the upland territory there have been multiple studies which have focused primarily on the area surrounding Mt. Trumbull on the Uinkaret Plateau. Cheryl Martin's (2009) research examined lithics recovered from six sites around Mt. Trumbull. Martin studied tool, core, and debitage assemblages to provide a broad interpretation of production and reduction activities occurring around Mt. Trumbull, and found that earlier stage flake production and cortex removal occurred at another location. Martin also studied the quality of the raw material stone used in stone tool production at each of these sites. She concluded that although fine-grained cryptocrystalline materials were available, many tools were created from more coarse- grained materials (2009:143). Additionally, she reported that obsidian was traded to the region from sources in north-central Arizona, south of the Grand Canyon, and in southwestern Utah. The obsidian used by the Virgin Branch Puebloans at Mt. Trumbull does not appear to have been heavily curated as it occurred most frequently as utilized flakes (2009: 143). Her research proved invaluable for this study, as her research area closely aligns with that of this research.

Theoretical Background

A theoretical framework must be structured to explain how the past lifeways and behaviors of the Shivwits Plateau VBP can be understood by examining the lithic assemblages from these sites. The nature in which flaked stone artifacts are obtained, manufactured, used, and eventually discarded is dependent on a number of factors, both cultural and non-cultural, that are in no way separate from one another. It is for this reason that the proposed research will examine the lithic assemblages from the organization of technology (technological organization) approach as described by Nelson (1991) and later expanded and employed by Carr and Bradbury (2006).

The organization of technology approach is rooted in Lewis Binford's (1979) ethnographic studies of the Numamuit and in early processual approaches to understanding artifact life-history. Binford's original intention was to understand tool assemblage variability and its relationship to the situational conditions that influence the procurement of raw material and the design, manufacture, and disposal of tools. Specifically, he sought to use this data to interpret subsistence-settlement systems and site function. His approach influenced Kelly (1988) who defined "organization" as;

> "the spatial and temporal juxtaposition of the manufacture of different tools within a cultural system, their use, reuse, and discard, and their relation not only to tool function and raw-material type and distribution, but also to behavioral variables which mediate the spatial and temporal relations among activity, manufacturing, and raw-material loci" (717).

Kelly saw the technological organization approach as a means of explaining how technological changes are reflected in large-scale behavior among prehistoric groups. The approach was further elucidated by Margaret Nelson (1991) who defined it as "the study of the selection and integration of strategies for making, using, transporting, and discarding tools and the materials needed for their manufacture and maintenance" (Nelson 1991: 57). Nelson's contribution to our current understanding of the approach is due in part to a diagram she created to explain the various tiers of influence that environmental, social, and economic factors have on technological strategies, and how they interplay. Technological organization is responsive to conditions of the environment. These conditions are then reflected in demographics, which are then reflected in economic and social strategies which, in turn, are reflected in technological strategies of artifact design and activity use. Design and activity are then reflected in artifact form and distribution (Carr and Bradbury 2006).

Carr and Bradbury (2006) further expand this model in a few very important ways. First, they suggest that this model be used not just for a specific part of a lithic assemblage, as Nelson had originally done for formal tools, but for entire lithic assemblages. Second, they defined activities (see Figure 3) as those that pertain to artifact life history. Moreover, activities must be considered minimally and explicitly when employing this model. For example, tool form and distribution cannot be solely accounted for by examining tool attributes. Raw material stone size and quality of different materials must be examined as these factors will affect both artifact distribution and form, and thus activities, especially if the raw materials used are of different qualities and if they are local or non-local in origin (Carr and Bradbury 2006: 312). Thus, an examination of raw material and debitage aids in understanding the constraints of the local environment. Additionally, artifact form is highly responsive to activities of use and reuse, which when examined can aid in determining site function and the degree of material conservation. It should be noted that the inclusion of "demographics" was also an addition by Car and Bradbury (2006) that deserves some elucidation. Environmental constraints play an influential role in both population size, density, and in cultural change which, either directly or indirectly, affect technology. By including demographics within the model, Carr and Bradbury emphasize its importance, but do not imply that the "number of, for example hafted biface or flake counts, is a direct indicator of population size" (Carr et al. 2012: 7). Rather, they acknowledge that through many interplaying factors, demographics impact the formation of technology.

This approach is best understood as both a hierarchy of influence beginning with environment and ending with artifact form and distribution and as a continuum that can

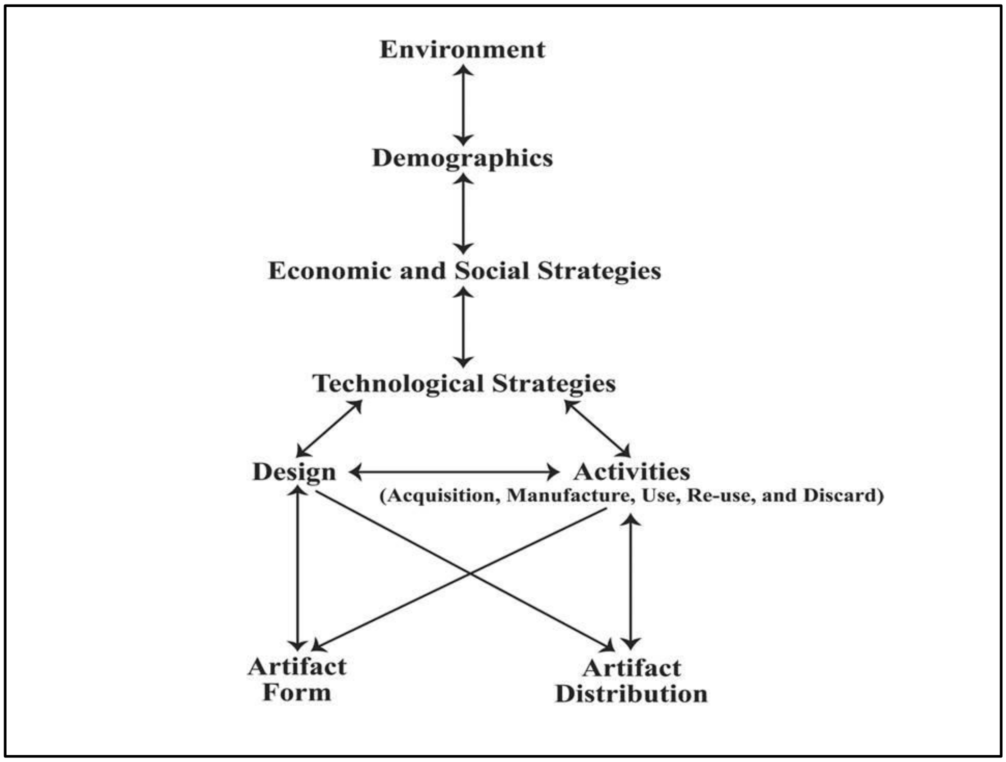


Figure 2.1. Diagram of Carr and Bradbury's (2006) expanded Organization of Technology approach (adapted from Nelson 2006)

start either at the bottom with artifact form and distribution (reflecting design and activities) or at the top with environmental factors. As it pertains to this notion, "hierarchy" may not be the best term, as the use of the term suggests that varying levels of importance are assigned to certain tiers. Nelson even stressed that "no one level of analysis is inherently superior to or more informative than any other" (Nelson 1991: 58). Rather, understanding past behaviors would involve all of these levels. Ultimately, the goal is to arrive at conclusions that help to explain economic and or social strategies for a group. Thus, when I say "hierarchy," I do not mean to assign levels of importance to each tier, but instead wish to convey the level of influence one tier has on another tier and its role in the system as a whole.

In spite of its usefulness for this and previous lithic analysis studies, the approach has been criticized by some. Torrence (1994:123) criticized the approach for its utilization by archaeologists who are often unengaged in theory building at the highest level, but otherwise accept certain aspects of the approach without question. Although Torrence acknowledges the fine work that has been achieved using this approach, she stresses that more work must be done to develop it further. Bradbury et al (2008) agree with Torrence (1994) to the extent that certain concepts embedded in the model need clarification and refining, especially with regards to social strategies and their influence on technological strategies (238). Cobb's (2000) main criticism was not with the approach itself; rather, it was with its lack of holistic application. Cobb has argued that lithic analysis must be linked with other forms of material culture to arrive at a broader understanding of the past and the role lithic technology within the society.

Admittedly, the focus of this study is not to intentionally develop the theoretical perspective of this approach, and this research can be placed within Torrence's criticism. However, I agree with Bradbury et al (2008) that the approach must continue to be applied in "particularistic ways so that concepts are operationalized, its utility measures against the archaeological record, and it is linked to theory" (237). In terms of Cobb's criticism, the implications of other cultural remains with reference to the lithic assemblages did not escape my notice. As a result, this study accounts for this by taking into consideration site features, faunal (when applicable), and botanical remains in addition to other technology recovered from each site (specifically ground stone artifacts).

This project examined the lithic assemblages by, in a manner, starting at both ends of the model. The environment of the Shivwits Plateau has been discussed. What remains to be examined are technological strategies as it is understood via design and activities which in turn are influenced by artifact form and distribution, which can be understood through lithic analysis. The ultimate goal of this study is to see what these materials can reveal about site function and raw material use of the Shivwits Plateau VBP, which can be elucidated by examining those factors that influence activities.

Background to the Study

Site Function and Tool Use

Determining site function is important in that it helps the researcher to understand the behaviors and activities of a social group within a given geographic area. For the purposes of this study, site function is ascertained primarily through the examination of flaked stone tools which result from conscious decisions made during all stages of their production. Examining flaked stone tools, and ascertaining the ratios of different tool types recovered from a site, help the researcher understand the technological organization of a group and makes it possible to understand the activities that occurred at the site; that is, how the site was being used. Additionally, the context in which these tools were found in relation to site features, botanical/faunal remains, and other forms of technology – specifically ground stone tools and ceramics when applicable – must also be considered if site function is to be determined. These other components help to provide a holistic view of the site so that it can be determined what role the tool assemblages play in site function.

Raw Material Quality, Access, and Availability

All of the sites examined in this thesis, the most common lithic materials are cryptocrystalline silicates, usually chert, which exhibit varying degrees of quality. This trend was also observed by Martin (2009) in her work conducted on lithics in the neighboring Uinkaret Plateau near Mt. Trumbull. While cryptocrystallines make up a vast majority of the lithic assemblages at some of these sites – in nearly all cases cryptocrystallines (chert and chalcedony) comprised 96 % to 99 % of the recovered sample (Harry 2010 & 2012) – other raw materials were utilized as well. These included chalcedony, rhyolite, fine grained basalts, sandstone, and obsidian; however, they tend to comprise less than 4 % of the samples from each site. With two exceptions, all of these other materials were available locally on the Shivwits Plateau. These exceptions include sandstone which would have to be procured below the rim, and obsidian which may have been traded into the area from sources in Utah, Arizona, and Nevada (Martin 2009).

The reliance on chert at these locations is logical given the proximity of these sites to exposed layers of Kaibab limestone which contain embedded nodules of chert. Although research at specific quarrying sites has not been conducted in the region, at least ten chert acquisition sites were identified during the 2001 Shivwits Plateau Survey (MacWilliams et al. 2006). Some of these sites would have been within reasonable walking distance to the area surrounding Mt. Dellenbaugh, at distances approximately 12-14 kilometers away (Wenrich et al. 1996). While the distances to these sites could be considered accessible walking (Leonard et al. 1989), it does not take gradient or elevation into account. Additionally, workable raw material could be obtained closer to the sites, as the Kaibab Formation has outcroppings within less than 7 kilometers of these locations (see Table 1.1). Regardless of acquisition location, cryptocrystalline material would have had to have been transported from the Kaibab limestone outcropping to the sites, all which are located on the basalt substrate.

While there is an abundance of accessible raw material in the region, especially cryptocrystallines, the quality of the material is often poor in that it contains other sedimentary rock and mineral inclusions which make it difficult to produce clean flake terminations when they are knapped (Aaron Woods and Timothy J. Ferguson, personal communication, 2013). While higher quality material is not necessary to make usable stone tools, it is likely that high quality material will be conserved and re-used, especially if its availability is low compared to other materials that are locally available (Beck and Jones 1990). Andrefsky (1994) and Parry and Kelly (1987) have argued that when inhabitants of a region have greater access to low quality material stone, they tend to manufacture tool stone into expedient tool designs for short term use.

Understanding how upland VBP organized their technology to produce tools suitable for performing everyday tasks, with reference to material conservation, is important to understanding their lifestyle patterns and choices. For example, if suitable, knap-able raw material was available locally within a region, one would expect tools to have been produced when needed, rather than in anticipation of a future task, as would be the case if raw material availability or accessibility were diminished. Likewise, tool maintenance and recycling are affected in the same way, as a locally available material will be maintained less frequently and have shorter use life (Bamforth 1986). This situation would facilitate the creation of more expedient technologies. It is possible that Shivwits Plateau VBP would match this case, as the material used at these sites is locally available and occurs in great abundance, having been brought in from an off-site location in the form of nodules, but is otherwise of poor quality. Likewise, higher quality material could also have been transported from an off-site location either as a tool or even as blanks in an attempt to better conserve the material for future use. At the same time, it is assumed that high-quality material, in the form of local fine-grained cryptocrystallines and non-local obsidian, would be maintained and recycled more often, because of the rarity of these higher-quality materials. Evidence of the aforementioned strategies would be detectable in the tool, core, and debitage assemblages.

Addressing Formation Processes

Cultural formation processes that occur before deposition can affect not only the spatial distribution of an artifact, but also its appearance, which can create patterns unrelated to the past behaviors that created them (Schiffer 1995). For example, Schiffer (1995) argued that the final area of artifact deposition may be skewed by cultural practices, such as transporting waste material away from the area in which it was initially created, such as to a refuse pit or midden. As it relates to this point, some of the lithics under examination were recovered from middens. However, the lithic assemblages selected from each site were recovered from artifact scatters around and within the sites, and from excavated features and room structures (surface and subsurface). However, this does not imply that the artifacts recovered from these areas represent the final area of deposition, as natural (non-cultural) formation processes can also affect the placement and appearance of artifacts after they have been discarded.

A number of natural formation processes may have affected the lithics recovered from the sites under examination. For example, many of these sites are associated with large surface deposits, which are not only affected by the region's climate but by flora and fauna disturbances. Lithic artifacts could have easily been altered by trampling by human or local fauna (Tringham et al. 1974), or by new tree growth and floral manipulation as a result of human disturbance. What is more, the study area around Mt. Dellenbaugh, like that of the neighboring Uinkaret Plateau, is made up of eroding basalt hills which, in addition to changes in the water table on the Colorado Plateau due to winter snow melt and summer storms, could easily have displaced artifacts both on and under the surface of the sites (Martin 2009). Additionally, erosion, slope, and gravity may have an effect on the final location of the lithics recovered as well. All of the sites sit approximately 6,140 ft. above sea level and some are found on gently sloping hills. These factors combined with the erosion processes as a result of freeze-thaw, water movement, and even wind could cause the downward slope of artifacts from their original area of deposition within sites.

The point in discussing formation processes is to show how sites and their respective artifacts are affected by processes that occur before they are recovered for study. It is a forgone conclusion that a number of cultural formation processes influenced location and appearance of the lithic assemblages. What is slightly more challenging is accounting for the effects of natural formation processes upon the lithic assemblages. Some of the natural formation processes listed above were accounted for by referencing the depositional data for both the surface collections and subsurface excavation. Artifacts recovered from surface and subsurface contexts were then compared and subject to specific sampling parameters, detailed in Chapter 3. Chapter 3 reviews the sampling strategy and attributes analyses employed for this study.

CHAPTER 3

METHODOLOGY

As stated in Chapter 1, this research is based primarily on flaked stone macroscopic attribute analysis. The attributes recorded for stone tools during the course of this study were chosen as it is believed they can help understand the organization of technology and by correlation general site functions (Nelson 1991; Sliva 1997). Additional sets of attributes were recorded on cobble tools, cores, and debitage in order to understand raw material use and any discernable trends in material conservation. Thus, attribute analyses can help reveal important information regarding both the environmental and social factors that affected how stone technology was used.

The goal of this research is to come to a greater understanding of how flaked stone tool technology was organized, for the purpose of discerning site function. Additionally, it is the goal of this research to understand how the VBP on the Shivwits Plateau treated and used raw material stone within this territory.

Sampling Strategy

All lithic artifacts analyzed for this study were collected over the course of eight field seasons, which included both field schools and limited testing excavations, conducted by UNLV within the pre-established project area at eight different sites (Figures 1 and 2). Since its commencement in 2006, these investigations have recovered thousands of lithic artifacts. Before this study commenced, the lithic artifacts were subject to separate analyses conducted by me and other graduate students. The results of those analyses are stored in digital format within UNLV's Southwestern Archaeology and Ceramics Laboratory. However, this study called for the re-analysis of all types of lithic artifacts from each site in order to obtain additional, and sometimes more detailed, attribute data to answer my research questions.

Given the nature of this project's research questions in combination with the preponderance of material recovered (approximately 27,970 lithic artifacts), two sampling strategies were employed. The first sampling strategy was implemented for the tools and cores, and was designed to obtain information about the function(s) of the sites. For these artifacts, a 100 % sampling strategy was used so that all tools and cores were analyzed.

The sampling strategy employed for the lithic debitage was more complex, due to the large number of these artifacts recovered. An unbiased sample was required to avoid the selection of specific types of debitage over others (e.g. larger flakes, flakes with more cortex, flakes of a specific material or texture, or whole flakes over fragments). A sampling strategy developed by Martin (2009) was employed and modified for this study. For each site, I attempted to analyze 150 pieces of debitage recovered from surface proveniences and another 150 pieces from excavated proveniences, thus resulting in the analysis of 300 debitage artifacts from each site. In instances where less than 150 artifacts were recovered from either the surface of subsurface collections from a site, as many artifacts as possible were analyzed. If a surface or subsurface collection contained more than 150 pieces of debitage, all the pieces from the last bag examined were analyzed to avoid the selection biases mentioned above. Hence, "if the 150th piece was reached while analyzing a bag of 40 pieces, all of the pieces were included in the sample, which resulted in a sample size for that of [collection] of over 150 pieces" (Martin 2009:

54). However, to avoid selection bias and to maintain a relatively equal sample size from each site, bags that contained more than 200 pieces of debitage were excluded from the samples, unless they came from a floor context.

In addition to this, the debitage assemblages from the surface and subsurface were subjected to a few other parameters to account for selection bias as well as cultural and natural formation processes. Surface artifacts were analyzed in the order they were recovered from surface collection units until 150 pieces of debitage were obtained. Debitage gathered from general site contexts were not selected for the sample as they are not associated with specific collection units or site features. The subsurface debitage samples were obtained from feature and room contexts, avoiding midden contexts, unless the total count of subsurface debitage was less than 150. When this occurred, all subsurface artifacts were sampled. In order to more accurately associate debitage artifacts

Table 3.1. Artifacts sampled from each site.

Site Name	Tools/Cobble Tools	Cores	Debitage		**Total Artifacts Analyzed per site**
			Surface	Subsurface	
Lava Ridge Ruin *(AZ A:14:50 ASM)*	290	107	167	208	**772**
Granary House *(AZ A:14:46 ASM)*	36	11	174	156	**377**
Andrus Canyon *(AZ A:15:151 ASM)*	9	3	173	35	**220**
Corn Cob *(AZ A:15:56 ASM)*	29	3	198	107	**337**
Coyote *(AZ A:14:82 ASM)*	87	35	183	152	**457**
Site 232 *(AZ A:14:232 ASM)*	64	10	153	70	**297**
Peter's Pocket *(12-034)*	113	27	150	188	**478**
To'tsa *(AZ A:14:283 ASM)*	93	27	163	158	**441**
Artifact Grand Total	**722**	**224**	**1361**	**1074**	**3380**

with activities occurring at each site, subsurface debitage was analyzed primarily from levels encompassing floor fill contexts. If the sample size was not reached from floor fill contexts, artifacts from levels no more than 20 centimeters above the selected floor fill were also included. Levels close to the surface were not included in each sample due to greater exposure to natural formation processes that may affect lithic attributes and final location. Finally, to avoid selection bias all debitage samples were selected from proveniences that had been screened through ¼ inch wire mesh screens.

Attribute Analysis

While different analysts were responsible for processing these data in the past – I have personally analyzed three of the eight collections – all of the lithic artifacts were analyzed using the same coding system which, with the exception of additional categories to identify material type, has remained virtually unchanged since its implementation in 2006, prior to the changes made for this study.

One advantage of this project was that a portion of the lithic assemblage data required to conduct an attribute analyses for tools/cobble tools and cores was previously collected and stored in digital format. When analyzed, all tool/cobble tool and core artifacts were housed within their own bag for quick access. As the study required obtaining additional information for attributes not recorded during the initial analyses for the assemblages, the tools/cobble tools and cores were reanalyzed to obtain the needed information. This new information was then added to the preexisting databases for each site. This reanalysis also allowed me to verify if my predecessors shared similar opinions on how tools were identified. For seven of the eight sites, my identification was identical with theirs. However, the tool/cobble tool and core assemblages from the Coyote Site (AZ A: 14: 82) were not as successful, due in part to my predecessor misidentifying 12 items (expedient bifaces, and cores) as debitage. However, after this trend was discovered the contents of the entire lithic assemblage were examined in order to identify any and all missing tools and the necessary corrections were made to the database for the site.

This study also required the reanalysis of lithic debitage from each of the sites to obtain additional data. The initial analyses of the debitage were subject to a form of mass analysis; that is, debitage was screened through graduated sieves, resulting in different size grades, with artifacts sharing similar attributes - material, platform preparation, cortex, etc. – being lumped together and counted. However, these lumped groups were not placed within their own bag for future reference. Rather, they were comingled within their respective artifact bags. In combination with the need to obtain more attribute information from the debitage at each site, the information from the previous analyses of these materials was disregarded as there was no way to match the information from the initial analyses digital files to specific pieces of debitage. For this analysis, complete flakes, bifacial thinning flakes, and retouch/bifacial rejuvenation flakes (see Appendix B) were separated from the rest of the debitage in each collection bag for quick access as these flakes have a greater potential to provide more accurate data with regards to reduction activity and behavior.

To standardize methodology, this section describes all attributes recorded fort this study and provides an in depth description of each attribute as well as how it was recorded. The attribute analysis was performed using macroscopic lithic attribute analysis techniques, with the use of a 10x magnification lens when necessary. The attributes recorded for these assemblages are based on analytical methods used by Dr. Karen Harry, Dr. Barbara Roth (UNLV), Martin (2009), DeMaio (2013), and Sliva (1997). All attributes needed for this project are listed in Table 2.1 and Appendix A, with artifact type-specific definitions in Appendix B.

The analysis was first broken down into three general categories: debitage, tools/cobble tools, cores. Within each general category were a series of specific artifact categories detailing the type of artifact that that was examined based on morphological attributes outlined by Karen Harry (see Appendix B) with some influence from Sliva (1997) and Andrefsky (2005). After this stage of identification, more specific attributes were recorded for each type of lithic artifact. In order to comprehend the nature of the

Table 3.2. Attributes recorded for each question.

Research Questions	Attributes Recorded
Question 1: What do the tool assemblages at these sites reveal about site function?	Tools/Cobble Tools – tool types, edge angle, edge shape, # of retouch edges, unifacial/bifacial, and condition and tool portion.
Question 2: Are the inhabitants of sites in close proximity to the Kaibab Formation utilizing different lithic reduction strategies than those further from it?	Tools/Cobble Tools – tool type, raw material, texture, cortex, heat treatment, biface stage[1], dimensions (length, width, and thickness, and weight). Core – cores types, raw material, texture, cortex, heat treatment, dimensions (length, width, and thickness, and weight). Debitage[2] – debitage type, raw material, texture, flake portion, size class, heat treatment, platform, lip presence, # of dorsal scars, cortex, dimensions (length, width, thickness, and weight).

[1] Recorded for bifaces.
[2] Number of dorsal scars, cortex, and dimensions were only recorded for complete flakes. Platform and lip presence were recorded for flakes bearing a platform.

analysis, the attributes recorded for each of the three main artifact types are organized according to the research question they, and their corresponding recorded attributes, were meant to address (Table 2.1).

Attributes Recorded for Question One

The best method for answering this question was to examine the tools and cobble tools at each site in order to ascertain site function and, from that, the general activities that were performed at these sites. While the lithic artifacts are the focus of this analysis, other forms of technology, faunal, botanical, and feature information recovered from the sites were accounted for to arrive at a more holistic view of site function as well as to understand the context of lithic technology at these sites (when applicable). This information is included in a site by site review in Chapters 5 and 6. The following section lists and defines the attributes examined for question one.

Tool/Cobble Tool Typology

Predefined types were identified based on shared morphological attributes. Artifacts listed as tools from their general category were further categorized into six specific categories: expedient utilized flakes, informally retouched flakes, scrapers, bifaces, projectile points, and drills. Cobble Tools, while technically classified under cores, were treated as tools during the analysis as they were used not for creating usable flakes for tool production, but for specific tasks. However, it is possible that some of these cobble tools may have been used as a raw material resource before being used as tools. The categories for these items included the following: hammer stones, core/hammer stones, and chopper/pecking/battering stone. Other types of cores were treated as raw material stone and subject to different attribute analysis recordings (see *core typology*). Additionally, projectile points were identified with the assistance of Dr. Barbara Roth, Dr. Karen Harry using Noel Justice (2002; 2002)

Unifacial and Bifacial Retouch

This attribute was recorded for tools and cobble tools. Unifacial retouch refers to retouch scars which extend from a given margin onto only one aspect (face) of the implement. Bifacial retouch refers to retouch scars that extend from a common margin onto both aspects of an implement (Sliva 1997: 20). This attribute was recorded as means to help differentiate between formal and expedient tool categories in an effort to understand differences in tool production and use. In this case unifacial implements (which include utilized flakes, informally retouched flakes, and scrapers) tend to be produced and used expediently, while formal tools (which include bifaces, projectile points, and drills) are bifacially retouched and tend to be used and reused continuously.

Edge Angle

Edge angle was recorded for all tool and, when applicable, cobble tool artifacts. It was recorded using a goniometer to obtain fairly objective angle measurements. Andrefsky (2005) expressed that such data is useful in making inferences as different edges angles on chipped stone artifacts are more practical at performing certain tasks. Tools with a more acute or sharp edge angle are more effective for cutting soft material, as opposed to tools with a wider edge angel which can be pulled or pushed over a surface with little chance of destroying the material being work (Andrefsky 2005: 160 – 161). This attribute was recorded for certain cobble tools as there were some cases when it could not effectively be measured. For example, in the case of a hammer stones which only has a battered surface, edge angle is only applicable if the tool also has a worked edge, which was rarely encountered during the course of the analysis.

Edge Shape

Edge shape was recorded using seven categories; convex, concave, straight, recurved,
angular, asymmetrical, and indeterminate. This attribute was recorded as an indication of the type of activity being performed at hand, as certain edge shapes are more suited for specific tasks (Keeley 1980: 111). Additionally, it could also serve as a method of discerning use and reuse, especially if the edge shapes of certain tools (especially bifaces, projectile points, and drills) are recurved or asymmetrical.

Number of Retouch Edges and Intensity of Use

The number of retouch edges refers to the number of margins where flakes were removed to create a particular angle and sharpness of edge (Martin 2009: 57). As with edge shape, the number of retouch edges can act as an indication of use and reuse patterns relating to the task that the tools was used, or how intensively a tool was used. In this case, the number of margins exhibiting retouch were counted and recorded. These numbers were utilized in a method following Martin (2009: 19 & 73), in which the number the number of retouch edges were counted on all non-bifacial tools. Tools in this sample that have only one margin of use are not considered to have been utilized used intensively.

Tool Condition and Portion

For all tools the condition and when applicable the portion of the tool was recorded. In this study, condition refers to the physical form of the tool upon its recovery from the field, recorded as Preform, Complete, Broken, or Indeterminate. The portion refers to the part of the tool that was recovered, and included the following categories: complete, proximal fragment, distal fragment, lateral fragment, medial fragment, nearly complete, and indeterminate. Different proportions of complete tools types may help indicate differences in site function; for example, high proportions of broken tools may suggest long term occupation of the site. Binford (1979) and Keeley (1982) support the idea that different portions of tools recovered from different areas may indicate differences in site activities. For instance, in his research on the Numamuit, Binford (1979) reported that broken tools would be brought back to a residence for repair or final discard (269-270). Likewise, Keeley (1982), referencing a study by Robertson (1980), also found that broken tips (distal) of projectile point tips were discarded at base camps when broken tips were removed from one's quarry (803). What this implies is that the presence of different fragments of formal tools can represent different activities being performed at each site, thus different functions. As it pertains to the terminology off this thesis, for all hafted tools the proximal end refers to the haft element, while the distal end refers to the tip (point). (See Appendix A, 14, 2 & 3).

Attributes Recorded for Question Two

Question two focuses primarily on discerning differences in reduction strategy and material conservation with reference to site distance to potential raw material sources. The corresponding analysis recorded a number of attributes which would discern differences in material use, treatments, and conservation. One of the key differences between this question and the former is the inclusion of data from debitage and cores categories in addition to tools/cobble tools. Only one attribute carried over from the first question: tool/cobble tool type. In the case of all lithic artifact types certain attributes (specifically material, texture, and amount of cortex), were recorded for each, while others were specific to certain artifact types.

Core Typology

Cores are "a nucleus or mass of rock that show signs of detached piece removal which function primarily as a source for detached pieces" (Andrefsky 2005: 254). Core types recorded (see Appendix B) include unidirectional, bidirectional, multidirectional, bifacial, bipolar, core flakes, and tested cobbles. Identifying cores in this manner, as well as recording their attributes (Table 2.1) provides a useful understanding of raw material use as well as tool production strategies and material conservation (Parry and Kelly 1987).

Debitage Typology

Debitage classification was based on definitions of morphological attributes modeled after definitions used by Karen Harry (see Appendix B) and include, primary decortication flake, secondary decortication flakes, bifacial thinning flakes, bipolar flakes, retouch/bifacial rejuvenation flakes, tertiary flakes, and shatter. One topic to make clear concerns the first two debitage types, which are dependent on the amount of cortex present on a flake. Some, especially Sullivan and Rozen (1985: 756) have specifically warned against the use of debitage classifications that depend on cortex (see discussion under *cortex*). However, their argument stemmed from a lack of consistently defined traits and terminology (756-757). Others have noted the usefulness of this form of typology. For instance, Odell (1989) notes that dorsal cortex on bifacial thinning flake helps to differentiate stages of bifacial reduction (185). Magne (1985) also noted that dorsal cortex has helped act as an indicator of early stage reduction. Ultimately, this typology was used for this analysis as the traits of the other lithic types are easily discernable and useful for flake identification. However, this typology was cross-referenced with flake portion and cortex amount, with statistics and proportion comparisons limited to complete flakes.

Biface Stage

Biface stage, or biface reduction sequence, recognizes stages of change in the shape of a biface as it is knapped from a relatively thick unshaped mass, a flake or a core, to a uniformly flaked tool (Andrefsky 2005). As a tool for analysis, it is a useful method of distinguishing preform stage for bifaces and helps in interpreting reduction strategy with regard to how material was used and brought into a site. There are a few ways to distinguish which stage of production a biface had reached upon discard. Whittaker (1994) for example placed emphasis on edge angle and the amount of cortex remaining on both surfaces to help define stages, with more acute angles cortex-less biface representing later stages of reduction. Callahan (1979) and later Andrefsky (2005), while noting the presence of cortex, place more emphasis on the development of uniform edge shapes as well as the invasiveness of flake removals to produce a more thin, uniform item. They also suggest the use of a width to thickness ratio to help differentiate reduction stage. Following Andrefsky (2005: 187-190), five stages of preforms were identified for all bifaces; these include Stage 1: Flake Blank, Stage 2: Edges Biface, Stage 3: Thinned Biface, Stage 4: Preform, and Stage 5: Finished Biface. Although more emphasis was placed on whole biface, broken bifaces were subject to this analysis as well.

Raw Material and Intensity of Use

Raw material categories included chert, chalcedony, petrified wood, obsidian, quartzite, sandstone, mudstone, rhyolite, vesicular and non-vesicular basalt, andesite, and dolostone. Of all the attributes recorded for this study, raw material was one of the few to change since 2006. This was primarily due to more accurate classification of material stone recovered during the course of UNLV's field seasons. Nearly all of these materials can be found in varying quantities on the Shivwits Plateau due to the plateau's underlying rock layers and intrusive volcanic basalt flows (McLaurin 2007). The only known exception to this is obsidian which was imported into the region from sources in Nevada, Utah, and Arizona (Martin 2009). In terms of overall quantity, chert makes up the vast majority of raw material stone, followed by chalcedony, due in large part to outcroppings of the material from the Kaibab Formation. However, during the course of analysis, material type was coupled with material texture which, for some raw material, is variable and linked to the quality of the material stone. To interpret raw material use intensity, a method described by Henry (1989) and Martin (2009) was utilized, in which the smallest complete tool is compared to the complete unmodified flakes. This is calculated as a percentage of flakes that could have been utilized to produce a tool. For instance, if the percentage of complete unmodified flakes larger than the smallest tool is great, then the chances are that raw material was not utilized intensively in creating stone tools.

Texture

In many ways material texture is one of the most influential attributes recorded for this study. Bifacial technology works best with rock types that fracture in a predictable manner when force is applied to them (Sliva 1997: 14). Thus, fine-grained crystalline materials, especially those that do not contain large-grain inclusions that would otherwise misdirect the force applied in removing a suitable flake, are best suited for tool production. Texture proved one of the most challenging attributes to record. Its difficulty stems two areas. First, raw material from the Shivwits Plateau often exhibits a variety of textures within a single nodule. Second, while differences in texture can be noted with the naked eye, no model exists that objectively determines the texture of artifacts made from different varieties of chert. However, Martin (2009) developed and successfully utilized a method in her thesis dissertation research that dealt specifically with material texture from fine grained to course grained materials, and her methods were used in the present study.

Texture was identified on a five category scale. Category 1 (very fine) was reserved for the finest textured material (obsidian). Category 2 (fine) referred to fine grained material, but not as fine as obsidian, that otherwise did not contain intrusive minerals. Category 3, (medium) referred to material such as chert containing a few grit inclusions or material with a sugary texture such as quartzite. Category 4 (course) referred to materials such as large grained quartzite, mudstone, and cryptocrystallines containing a medium amount of grit. Finally Category 5 (very course) referred to material such as basalts, sandstone, and cryptocrystallines with great amount of intrusive minerals and internal fractures. While Martin (personal communication 2013) admitted that these categories are subject to the interpretation of the analyst, it is the only available method of differentiating between texture within and across specific raw material stone types.

Cortex

The percentage of cortex was recorded on all core, tool/cobble tool, and debitage artifacts. A few methods exist for recording cortex on lithic artifacts (Andrefsky 2005: 104-106). For this study, the percentage of cortex was recording in a manner similar to DeMaio's (2013; 46) and Andrefsky's (2005: 105) method, using an ordinal scale categories of increasing fields of percentages. The categories were, 1.) 0%, 2.) 1-25%, 3.) 26-50%, 4.) 51-75%, 5.)76 – 99%, 6.) 100%, and 99.) Indeterminate (in the case of certain basalt and sandstone artifacts). However, unlike cores and tools/cobble tools, in which cortex was recorded over the entire surface of the artifact, cortex on debitage was recorded on the dorsal surface of complete flakes. Cortex, when recorded on cores and tool stone, is useful both in determining reduction efficiency in addition to determining tool expediency. The reason for limiting how cortex was recorded for debitage relates to a few issues on using cortex as an indicator of what stage of reduction was occurring.

While it is likely that cortex will be present on flakes resulting from early-stage reduction (Odell 1989), this is not always the case. Cortex can be removed at any stage of tool production, although a majority of it is likely to be removed during early stages of reduction. Additionally, attempting to account for cortex on flake fragments may not provide an accurate measure of the amount or cortex that was actually present. Likewise, broken flakes that lack cortex need not have been fully interior flakes, as the missing section may have cortex (Sullivan and Rozen 1985: 756). Due to these complications the amount of cortex was recorded only for complete flakes.

Heat Treatment

Heat treatment is defined as the use of heat to modify the physical properties of a material. This process improves the fracture mechanics and control available to the knapper (Mercieca 2000: 40). Ferguson et al. (2013) studied bifaces from Virgin Branch Puebloan sites and found that inhabitants of the Shivwits Plateau often heat treated their raw material during the later stages of bifaces production. Recording the presence of heat treatment on raw material stone can help to discern differences in lithic reduction strategy in addition to tool curation, especially since lower quality material will likely be heat treated to better improve flaking. While identifying heat treatment on raw material stone can be challenging, a number of experimental studies have identified certain common characteristics of heat treatment, especially cryptocrystalline cherts. The first is color change; for instance, when compared to non-heat treated cherts, heat altered materials tend to range in colors between orange, pink, purple, and red tones (Collins and Fenwick 1974:135-136). The second characteristic is flake scar size, flaking quality, and ripple marks. Ferguson et al (2013?) and Collins and Fenwick (1974: 138) have noted that that ripple marks, as a result of the force applied to remove a flake from its parent material, tend to be more pronounced in heat altered cherts, with flake being larger and ending in cleaner terminations. The third characteristic is luster produced by heat alteration, especially for cryptocrystallines (1974: 137). When heat is applied, cherts will often take on a reflective, waxy appearance and feel, which when compared to non-heat altered materials is visibly noticeable. Another way to identify heat treatment is through the presence of potlids and excessive fracturing. While the presence of potlids are a good indication that material has been exposed to high temperatures, using fractures and other signs of thermal stress proved difficult due to the varying quality and texture of raw material stone. For this study, heat treatment was recorded as present, absent, or indeterminate.

Flake Portion

Flake portion refers to the part of the flake that was recovered and was recorded for debitage alone. The categories recorded for this included, complete (whole), proximal, distal, lateral, medial, fragment, and shatter. Originally, flake portion was recorded with the intention of discerning production behavior. However, previous work by a number of others (Sullivan and Rozen 1985; Tomka 1989; Odell 1989) has shown that, unless the flakes are whole, proximal, or even distal flakes, flake portion does little to inform on tool production or core reduction, as different flakes fragments can be produced at nearly any stage of use. Additionally, a number of factors can cause a flake to break including, but not limited to, pretreatment of the parent material (for example, heat treatment), the type of raw material, its texture, or the size of the parent material.

Therefore, although this attribute was recorded, it was used primarily to differentiate complete and proximal flakes from other forms of incomplete, non-platform fragments, and shatter. However, shatter is also important as it is linked to core reduction (Carr and Bradbury 2001: 129).

Size Class

As lithic artifacts are formed by reductive processes, it is a forgone conclusion that as a tool is manufactured the resulting flakes removed at different stages of reduction will generally become progressively smaller (Andrefsky 2001: 3). Size class categories were used to group debitage into specific sizes. This was performed by placing debitage within a set of nested screens each having sieves of descending size. Debitage that fell between two different sieve openings were judged as one class. The size classes of the debitage were as follows: 1.) <1/4” (less than 6.3 mm); 2.) ¼” to ½” (6.3 mm – 12.5 mm); 3.) ½” to ¾” (12.5 mm – 19 mm); 4.) ¾” to 1” (19 mm – 25 mm); 5.) > 1” (more than 25 mm). While additional measures were obtained for complete flakes, this system was used for all incomplete flakes. Andrefsky (2001); (2005) has praised this method of measuring debitage size in its use for aggregate, or mass, analysis. However, an argument could be made that small flakes could be produced throughout lithic reduction (Magne 1989). This is especially true for general flakes and shatter. Nevertheless, the use of screened size classes has been used to great success both in the field (Ahler 1989) and experimentally (Morrow 1997). Therefore, its strengths far outweigh its weaknesses.

Platform and Lip Presence

Platform (or striking platform) morphology can act as an important indicator of the type of force that was applied to remove a flake (Andrefsky 2001). The platform morphological characteristics recorded for this study were based on Andrefsky (2005: 94) categories, and included plain (single-facet), cortical, multi-facet, abraded, split, indeterminate, and absent. If present, the type of platform can provide an indication of what form of reduction was occurring. For example, core reduction, as well as early to middle stage reduction, is often associated with the presence of single-facet platforms (Tomka 1989). Likewise, more precise flake removals, such as bifacial thinning and retouching, are more associated with abraded or multi-facet platform which represent greater care in flake removal practices via platform preparation (Morrow 1997). Related to this is the presence of lip; a projection of the platform on the ventral face of a flake. Lipping is caused by bending forces which, in many cases is the result of soft hammer percussion or pressure flaking (Andrefsky 2005: 118), and tend to be rare in hard hammer reduction (Whittaker 1994: 187). Often soft hammer percussion is associated with bifacial reduction and later stages of tool reduction. For this study, the presence or absence of lipping was recorded for all debitage that retained an intact platform, otherwise flakes with an absent platform, or indeterminate (in the case of shatter), were listed as not applicable.

Number of Dorsal Scars

Dorsal flake scars are the result of removal of previous flakes before the objective piece (Andrefsky 2005: 106). Some believe that dorsal scars increase with the level of reduction, with more dorsal scars appearing in later stages of reduction (Magne 1985) and with very little to no dorsal scars seen in earlier stages of reduction. However, Andrefsky (2005) and Shott (1994) argue that dorsal scar count can be influenced by a number of factors related to the size and material of a flake, as well as the type of tool being produced. Because of this, recording the number of dorsal scars on a flake can produced mixed results in terms of determining reduction stage. A preliminary examination of the complete flakes compared to size class for this study indicates that dorsal scar count is influenced by flake size, thus indicating that dorsal scar count alone may not act as a tangible representation of reduction stage. In an attempt to correct for this, Andrefsky (2005: 109) suggested recording dorsal scar count on an ordinal scale of four categories; that is, category 1 contains no flake scars (just cortex), category 2 – 1 flake, category 3 – 2 flakes, and category 4 – 3 or more flakes. Previously, Magne (1985) had utilized this method, distinguishing each category as representative of a stage of lithic reduction; categories 1 and 2 representing early lithic reduction, category 3 representing stage middle, and category 4 representing later stage reduction (Magne 1985: 120). Andrefsky (2005) suggested this over use of interval scale data as it can be difficult to replicate actual counts of dorsal scar removals consistently. Carr and Bradbury utilized a method similar to this with success, but suggested cross-referencing dorsal scar count with other variables, including weight and platform facet count, among others (Carr and Bradbury 2001: 135). For this study dorsal scar count was recorded using both ordinal categories influenced by Andrefsky (2005) and Magne (1985) and in interval scale. While the interval scale data is not reported in the results, it was recorded for future examination if necessary. The ordinal scale data that was used does not act as a final indicator of reduction stage that occurred at each site, rather in combination with other attributes – cortex, platform, and debitage type – it helped to suggest the likelihood of certain stages of reduction at each site.

Dimensions and Weight

The dimensions of lithic artifacts were recorded using the same instruments. Length, width, and thickness were all recorded using a digital caliper to the nearest hundredth centimeter. Weight was recorded using a digital scale with measures taken to the nearest tenth grams for all items excluding incomplete flakes. Following DeMaio's (2013) methods for tools/cobble tools and core, length was recorded along the longest dimension, width was the longest perpendicular to length, and thickness was recorded on a 90 degree plane of length and width. For tools, measures were also taken for broken items as well; however its status as a broken or complete item was recorded in addition to the portion that remained (see Tool Condition and Portion). For debitage, dimensions were recorded in the same manner as tools/cobble tools and cores, but were restricted to complete flakes.

CHAPTER 4

SITES AND LITHIC ANALYSIS

This chapter is organized into eight main sections describing the results of the lithic artifact analyses at each site. Interpretations of each site are reported in a summary section following the results of each site. Further interpretations comparing the results between sites within the study area with regards to the research questions are discussed in Chapter Five. Each of the eight main sections are divided into subsections that detail the artifact types and attributes recorded for each of the three lithic artifact categories examined; tool/cobble tools, cores, and debitage. The attributes recorded for each lithic type are described in each section. Before the results of each analysis are reported a brief background on each of the eight sites (Table 4.1) is provided. The temporal period for each site is based on the percentage of corrugated sherds found within the sites' ceramic

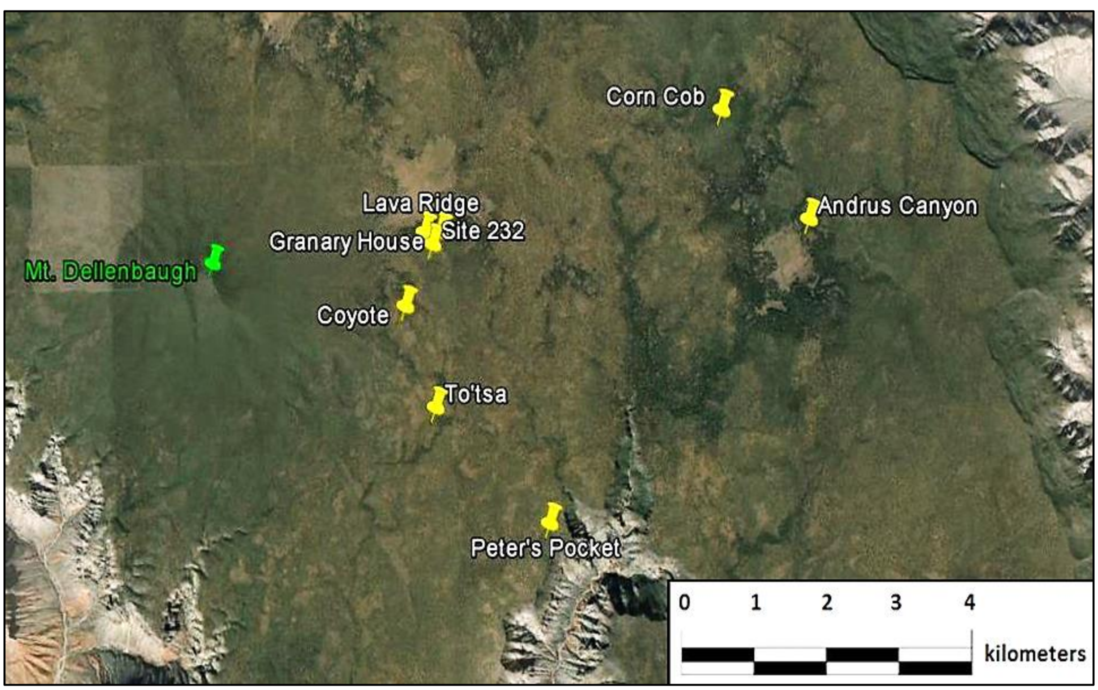


Figure 4.1. Site Location within the Project Area.

Table 4.1. Information on sites used in this study.

Site Name	Site Type	Temporal Period	Total # ceramics	% Corrugated ceramics	Total # lithics	Area excavated	Distance to closest Kaibab Formation outcrop
Peter's Pocket	Pueblo	Middle P II*	1,410	11.0	3,389	3 m²**	0.60 km
To'tsa	Pueblo	Early P III	2,510	51.0	3,282	32 m²	2.67 km
Coyote Site	Pueblo	Early P III	1,051	58.0	2,531	132.4 m²	3.65 km
Lava Ridge Ruin	Pueblo	Late P II	2,467	38.0	16,094	140.3 m²	3.69 km
Granary House	Hamlet	Middle P II	46	7.0	831	14.5 m²	3.80 km
Site 232	Hamlet	Middle P II	823	4.0	734	29 m²	3.85 km
Andrus Canyon	Pueblo	Late P II	66	32.0	220	2 m²	4.53 km
Corn Cob Site	Pueblo	Early P III	160	54.5	337	4 m²	5.04 km

*- structures are discontinuous and may represent different occupations.

assemblages (Table 4.1). The eight sites under examination were selected primarily for two reasons. First, the lithic assemblages from all eight sites are accessible to me for study. Second, these sites represent all of the sites excavated by the UNLV field schools. With this in mind, an in depth study of the lithic assemblages at these sites would allow us to interpret trends in site activities and raw material use within a specific region of the VBP territory.

LAVA RIDGE RUIN (AZ A: 14: 50 ASM)

Lava Ridge Ruin (AZ A: 14: 50 ASM), one of two sites excavated during the 2006 – 2007 archaeological field schools, is a single component, sixteen room C- shaped pueblo believed to have been occupied during the late Pueblo II and possibly the early Pueblo III period (Harry 2010). Macrobotonical evidence in the form of flotation and pollen samples indicates that the inhabitants practiced a mixed subsistence pattern relying on both cultivated and wild resources (Harry 2010). Lava Ridge Ruin is located among a cluster of three sites located less than 0.3 km from each other (Granary House and Site 232). Twelve rooms were completely or partially excavated; of these, four of which are believed to have functioned as habitation rooms, seven as storage rooms, and one had an unknown function. In addition excavation units were set up in the plaza and outside of the room block. In total, an area of 140.3 m² was excavated. A total of 16,094 lithic artifacts were collected from this site during the 2006 – 2007 field seasons.

The sample analyzed from Lava Ridge Ruin included 772 lithic artifacts encompassing all artifact categories identified for this thesis, with the exception of bipolar debitage flakes which were absent. Of the sample, 290 (38%) were tools/cobble tools, 107 (14%) were cores, and 375 (48%) were debitage. While tools/cobble tools and cores were found in a multitude of surface and subsurface contexts, debitage artifacts sampled from the surface were collected from Collection Units 2, 3, 4, 5, 6, and 7. Subsurface debitage was collected from Room 3, Room 5, Room 8, Room 21, and Feature 23. Debitage from the subsurface was sampled from floor fill contexts.

Tools and Cobble Tools

Bifaces

A total of 158 bifaces were analyzed from the tool/cobble tool artifacts, making up approximately 21% of the lithic artifacts recovered from Lava Ridge Ruin. Fifty-one (36%) came from a surface context, while 107 (64%) came from subsurface deposits. The number of identifiable biface stages included 21 (13%) stage two biface, 55 (35%) stage 3 bifaces, 43 (27%) stage four bifaces, and 22 (14%) stage 5 bifaces. Seventeen (11%) of

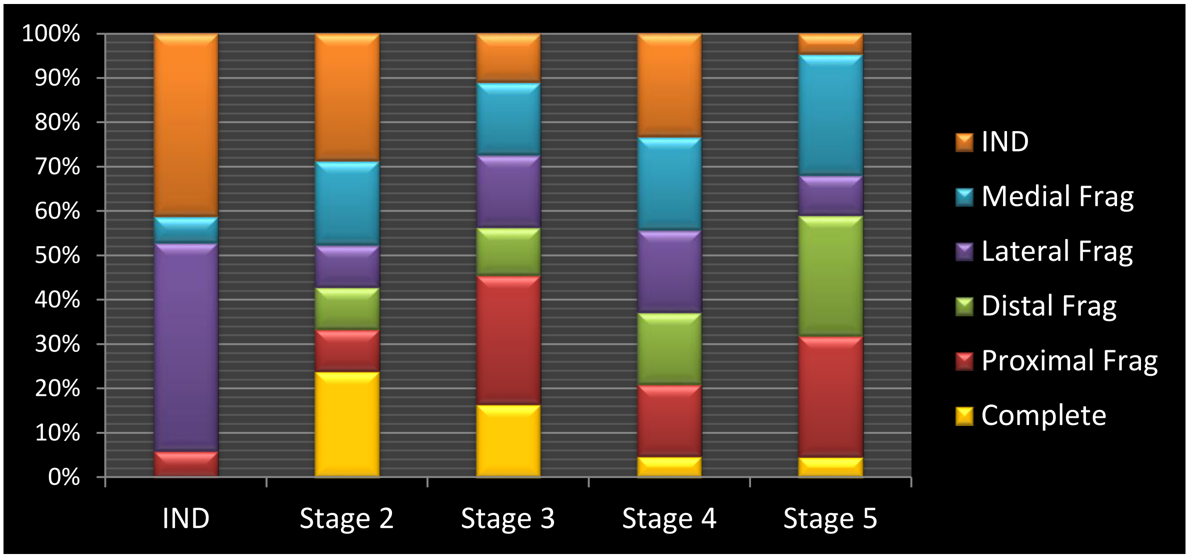


Figure 4.2. Percentage of different preform stages by potion.

these items could not be determined due to their small size and fragmentation. On a separate note, one stage three biface bore saw-like retouch on one edge and may have doubled as a denticulate.

One hundred and forty of the bifaces recovered were found broken across multiple preform stages (Figure 4.2). Of these, 10.8% (n=17) that were complete, 20.3% (n=32) proximal fragments, 13.3% (n=21) distal fragments, 18.4% (n=29) lateral fragments, 18.4% (n=29) medial fragments, and 19% (n=30) of an indeterminate portion. A majority of the bifaces also show signs of heat alteration (Figure 4.3). The bifaces for which heat treatment could not be determined were made up of twelve chalcedony, two obsidian, and eight chert biface. Given chalcedony's partial transparency discerning heat treatment on it is almost impossible, unless the presence of another material embedded within it shows signs of heat treatment. While it is possible for obsidian to be heat treated (Aaron Woods, personal communication 2013), given its glass-like texture heat treatment would be redundant. One hundred and forty-three of these biface were composed of

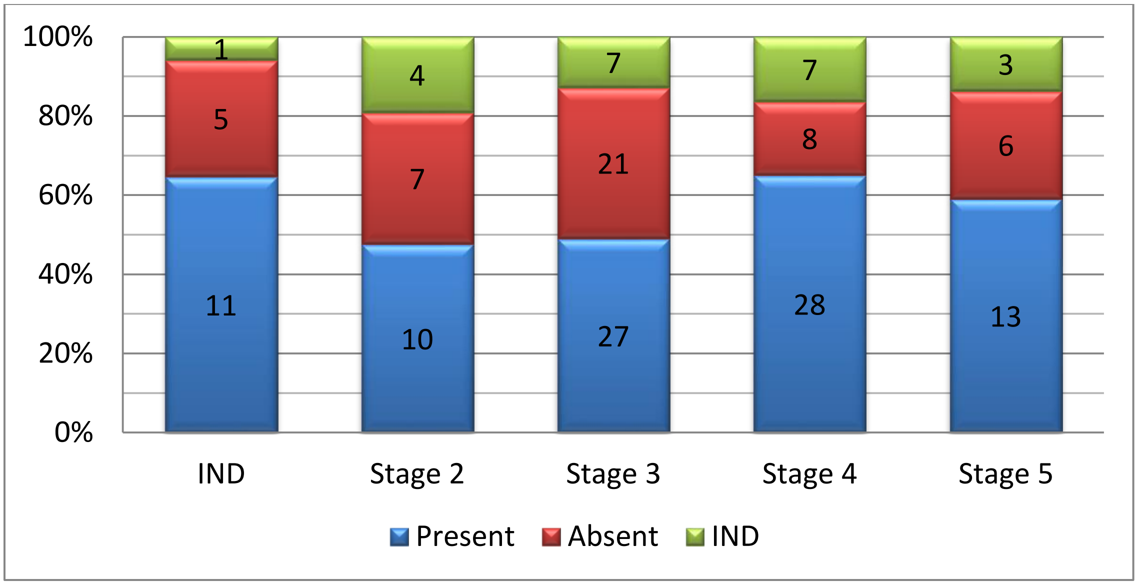


Figure 4.3. Percentage and number of heat altered biface by preform stage.

chert, 13 from chalcedony, and 2 from obsidian. A majority of the biface were made up of Category Two fine grain material (n=119), followed by Category Three medium grain material (n=36). Two obsidian bifaces were recovered and represent the only Category One (very fine grained) materials observed. This was followed by one Category Four (coarse grained) material.

Projectile Points

Thirty-eight projectile points were analyzed in this sample and make up approximately 5% of the total lithic artifacts examined. However, of these, seven projectile points were not accounted for within the collection; as a result an in depth description of their attributes cannot be provided and they were left out of this section. Some of the attributes of the projectile points are detailed in Table 4.2. Parowan Basal Notch points are thought to appear at A.D 950 and last until A.D. 1150 (Justice 2002: 336), and this helps to confirm the age of Lava Ridge Ruin. One of the five proximal

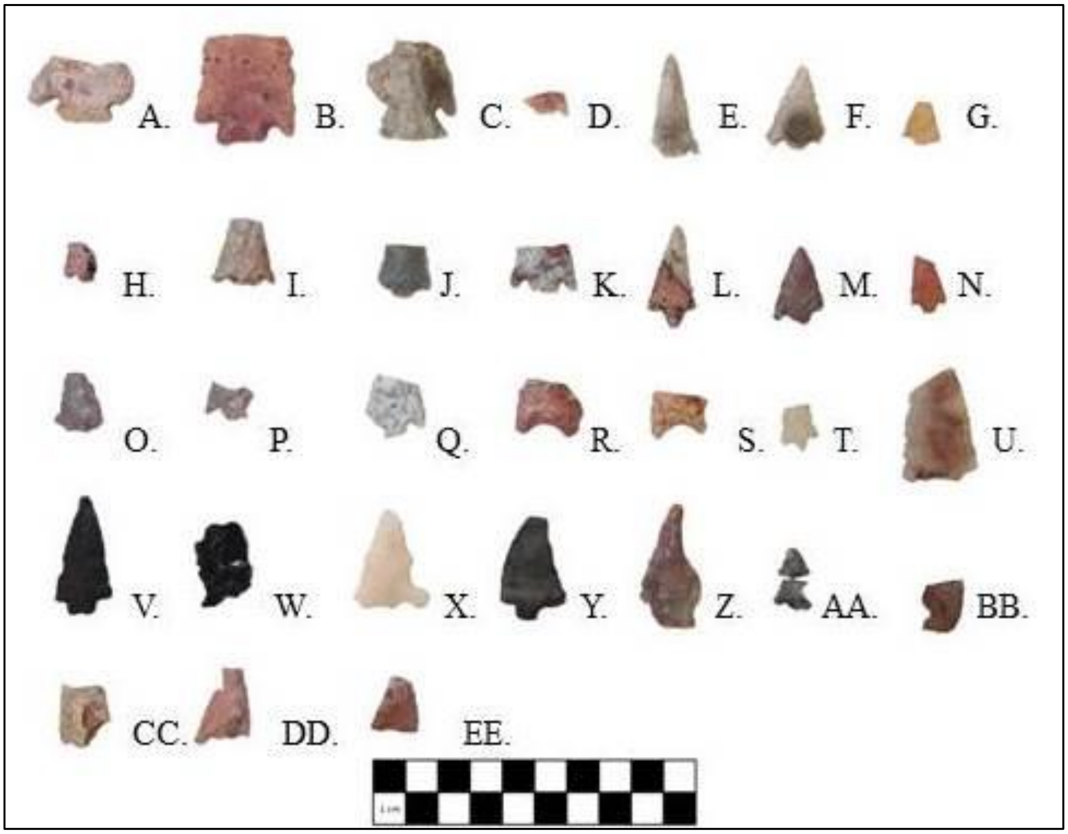


Figure 4.4. Lava Ridge Ruin projectile points. (A) Elko Corner Notch (PD 188 FS 10), (B) Elko Corner Notch (PD 215 FS 18), (C) Elko Corner Notch (PD 235 FS 13), (D) Parowan Basal Notch (PD 84 FS 10), (E) Parowan Basal Notch (PD 110 FS 10) (F) Parowan Basal Notch (PD 68 FS 9), (G) Parowan Basal Notch (PD 41 FS 19), (H) Parowan Basal Notch (PD 183 FS 13), (I) Parowan Basal Notch (PD 230 FS 13), (J) Parowan Basal Notch (PD 124 FS 11), (K) Parowan Basal Notch (PD 199 FS 13), (L) Rosegate Corner Notch (PD 85 FS 18), (M) Rosegate Corner Notch (PD 86 FS 14), (N) Rosegate Corner Notch (PD 0 FS 12), (O) Rosegate Corner Notch (PD 79 FS 9), (P) Rosegate Corner Notch (PD 128 FS 16), (Q) Rosegate Corner Notch (PD 201 FS 10), (R) Humboldt (PD 12 FS 10), (S) Humboldt (PD 207 FS 14), (T) Parowan Basal Notch/Rosegate (PD 161 FS 11), (U) General Archaic (PD 235 FS 11); (V) General Archaic (PD 235 FS 9), (W) Pinto (PD 0 FS 31), (X) Indeterminate (PD 0 FS 24), (Y) Indeterminate (PD 175 FS 10), (Z) Indeterminate (PD 216 FS 10), (AA) Indeterminate (PD 31 FS 10), (BB) Indeterminate (PD 31 FS 11), (CC) Indeterminate (PD 47 FS 9), (DD) Indeterminate (PD 201 FS 13), (EE) Indeterminate (PD 214 FS 9).

Parowan Basal Notch points, found on the surface of Room 8, exhibited signs of retouch along its base. The Rosegate series, which also includes Rose Spring points, appear around A.D.500 – 700 and terminate prior to A.D. 1300. Of the six Rosegate points, three

Table 4.2. Projectile points analyzed from Lava Ridge Ruin.

Type	Condition	Material	Texture	Count
Elko Corner Notched	Proximal	Chert	Fine	**3**
Parowan Basal Notch	Proximal	Chalcedony	Fine	**1**
Parowan Basal Notch	Complete	Chert	Fine	**2**
Parowan Basal Notch	Proximal	Chert	Fine	**5**
Rosegate Corner Notch	Complete	Chert	Fine	**2**
Rosegate Corner Notch	Proximal	Chert	Fine	**4**
Humboldt	Proximal	Chert	Fine	**1**
Humboldt	Proximal	Chert	Medium	**1**
Parowan Basal Notch /Rosegate Corner Notched	Proximal	Chalcedony	Fine	**1**
General Archaic	Proximal	Chalcedony	Fine	**1**
General Archaic	Complete	Chert	Fine	**1**
Pinto	Near Complete	Obsidian	Very Fine	**1**
Indeterminate	Complete	Chalcedony	Fine	**1**
Indeterminate	Complete	Chert	Fine	**1**
Indeterminate	Nearly complete	Chert	Fine	**1**
Indeterminate	Proximal	Chert	Fine	**4**
Indeterminate	Proximal	Chert	Medium	**1**
-*	Complete	Chert	-	**6**
-*	Complete	Chalcedony	-	**1**

CN = Corner Notched, BN = Basal Notch; * - unaccounted for.

exhibited signs of reworking; one complete point from a surface context had retouch along every margin (so much that it was almost mistaken as a Gypsum point); one of the proximal points, from the surface of Feature 18, exhibited retouch along one of its lateral margins producing an asymmetrical edge; and another proximal point, from the subsurface wall context (10-20 cm) of Feature 18 showed signs of retouch along its base. Justice (2002: 321) notes that this point type typically replaces Elko Corner Notched, of which there are three at Lava Ridge Ruin. Elko Corner Notched, appear during the Late Archaic period around 1500 – 1300 B.C. and continue until A.D. 600 – 700. All three points came from a subsurface context from different features from 10-20 cm or lower.

This could imply that these points were collected and saved, especially since there is no evidence of retouch on them.

Humboldt points are noted to exist over an inordinately long time span starting is 6000 B.C. and lasting till A.D. 600, spanning the Middle, Late Archaic, and Intermediate periods (Justice 2002: 156). None of these points showed signs of retouch or reworking with one being recovered from the surface while the other was recovered 0-10 cm below the surface.

One obsidian Pinto point recovered from the general site surface exhibited signs of heavy retouch along all of its margins and was missing one of its lateral margins. Justice (2002) reports that Pinto points are found all over the Great Basin, California, and Southwestern region. Pinto series points are dated to sites occupied during the Early Archaic to Middle Archaic (6000-3000 B.C.).

Two points were classified as general Archaic and had characteristics of Archaic period points, but otherwise could not be linked to a particular type identified these as an intermediary between the two styles. Both came from the same subsurface context in Room 8 (60-70 cm), one of which exhibited retouch along one of its lateral margins. Eight points could be identified to a specific point type based on their attributes and were listed as indeterminate. Of these eight two showed signs of retouch; one from 30-40 cm below the surface in Room 3 had retouch along its base and one lateral margin, while the second point, from 10-20 cm below the surface in Room 3 had retouch along its base.

During the initial identification of these projectile points, Aaron Woods and Barbara Roth (personal communication 2014) identified another group of points sharing attributes of both Parowan Basal Notch and Rosegate points (Figure 4.5). Their distinction as a separate group lies in the morphology of their haft elements. This group has what appears to be the corner notching observed from Parowan points, but with a contracting stem that extends just beyond the shoulder of the point like that of a Rosegate series point. Chronologically and morphologically, the shared characteristics of these

Figure 4.5. Projectile points with Parowan Basal Notch and Rosegate point morphology. (A) Lava Ridge Ruin (PD 161 FS 11), (B) Corn Cob Site (PD 7 FS 9), (C) Corn Cob Site (PD 15 FS 9), (D) Granary House (PD 0 FS 10).

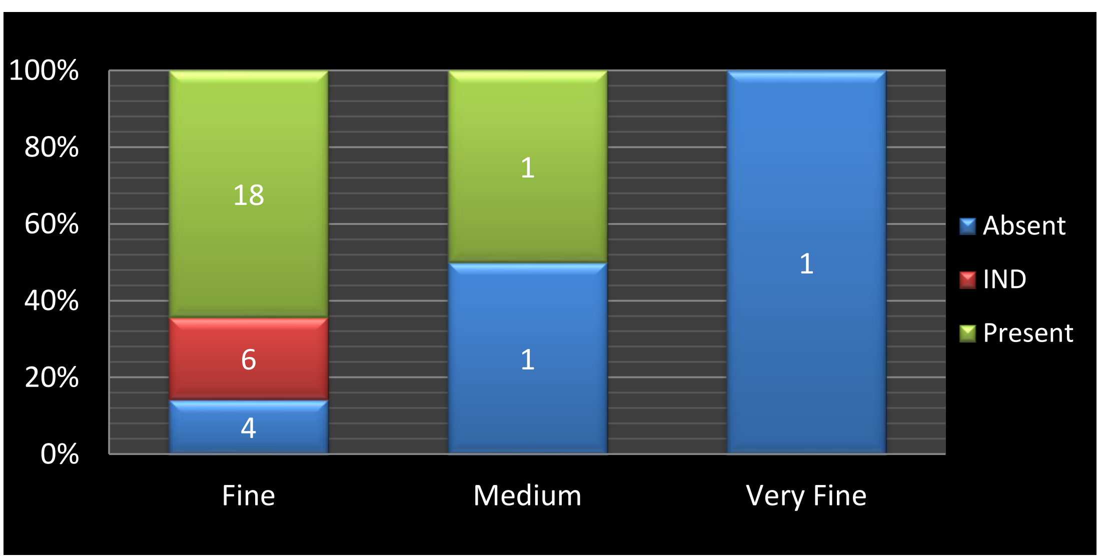


Figure 4.6. Percentage and number of projectile point heat treatment by material texture.

points make sense as both were present during the Late Pueblo II and Early Pueblo III periods and are classified in the same cluster of projectile points (Rosegate) (Justice 2002). One of these points was recovered at Lava Ridge Ruin (Figure 4.5, A). Material texture was fairly predictable for the accounted projectile points. A majority showed signs of heat alteration through the presence of a waxy, reflective luster. As observed in Figure 4.6, a majority of heat altered materials tend to be fine grained quality tool stone. The one very fine-grained material is refers to the obsidian Pinto point, while the six indeterminate fine grained materials refer to those points flaked from chalcedony.

Drills

Four drills were found at Lava Ridge Ruin, and comprise 0.1% of the site's sample. All drills were flaked from fine grained chert, with all but one showing signs of heat treatment. The presence of heat treatment makes sense as skill is required to create a drill. Thus, having a material of good quality is necessary to decrease the chances of unpredictable flaking in the raw material. As with some of the projectile points, three of

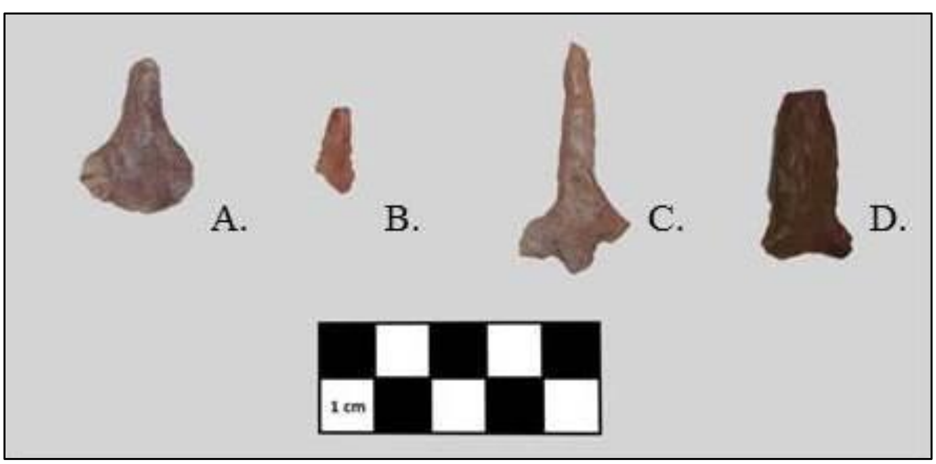


Figure 4.7. Lava Ridge Ruin Drills. (A) PD 223 FS 9, (B) PD 175 FS 12, (C) PD 94 FS 11, (D) PD 125 FS 10.

the drills came from subsurface contexts (30-50 cm) from Room 8, with a fourth point from the subsurface (30-40cm) of Room 3. Only two drills (both from Room 8) were complete; the first measured 3.79 cm in length, 1.81 cm in width, 0.32 cm thick, and 1 .5 grams in weight; the second measures 2.48 cm in length, 1.84 c in width, 0.41 cm thick, and 1.6 grams in weight. The two broken drills were a proximal and medial portion respectively. The proximal drill fragment was heavily retouched and may have been recycled from a projectile point.

Utilized Flakes and Informally Retouched Flakes

Utilized flakes are defined as flakes that exhibit regular edge damage on one or more edges, while informally retouched flakes refer to flakes that exhibit consecutive flake scars that cover at least 1 cm that can be unifacial or bifacial. Both are classified as tools, but differ from the other tools described in that it believed that their use was

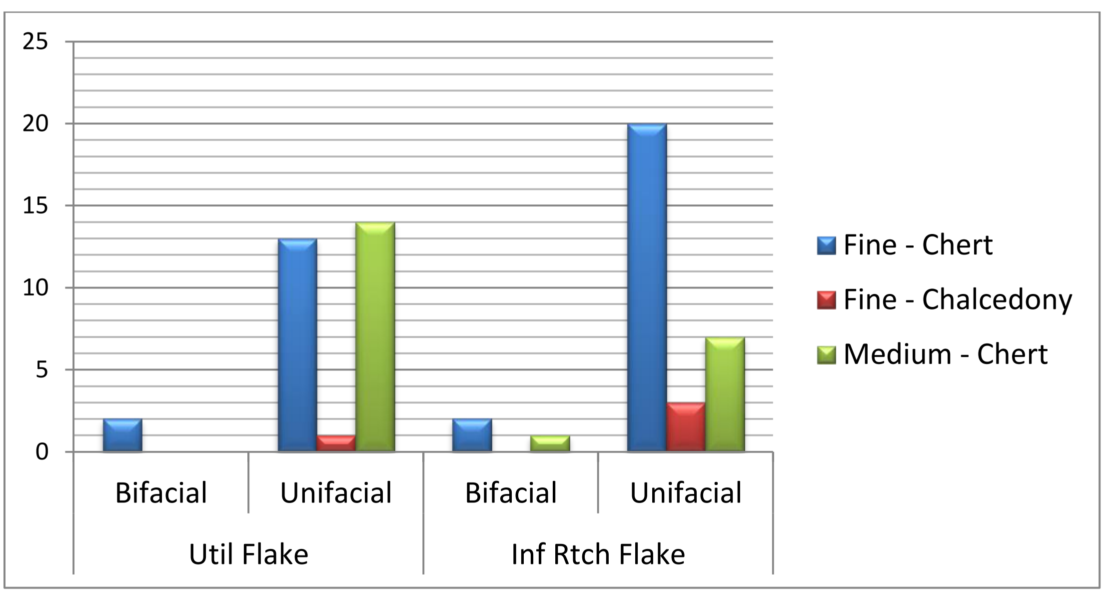


Figure 4.8. Utilized flakes and informally retouched flakes, retouch by texture and raw material.

Table 4.3. Presence of heat treatment on informally retouched and utilized flakes.

Heat Treatment	Informally Retouch Flake	Utilized Flake	Total
Present	12	9	21
Absent	19	21	40
Indeterminate	2	-	2
Total	**33**	**30**	**63**

temporary (expedient). Lava Ridge Ruin contained a total of 63 tools of these types, specifically 30 utilized flakes and 33 informally retouched flakes; these makes up approximately 7% of the site assemblage. Twenty-three utilized flakes were recovered from subsurface context, with 7 from the surface. Twenty-one informally retouched flakes were recovered from subsurface contexts, with 12 recovered from the surface. Of the 30 utilized flaked, 28 contained unifacial retouch. The remaining two utilized flakes contained bifacial retouch. Of the informally retouched flake, thirty had unifacial retouch along while 3 had bifacial retouch. All of these flakes were composed of chert of both fine and medium quality followed by fine grained chalcedony (Figure 4.8). In addition to this, the presence of heat treatment was not as common compared to the other tools

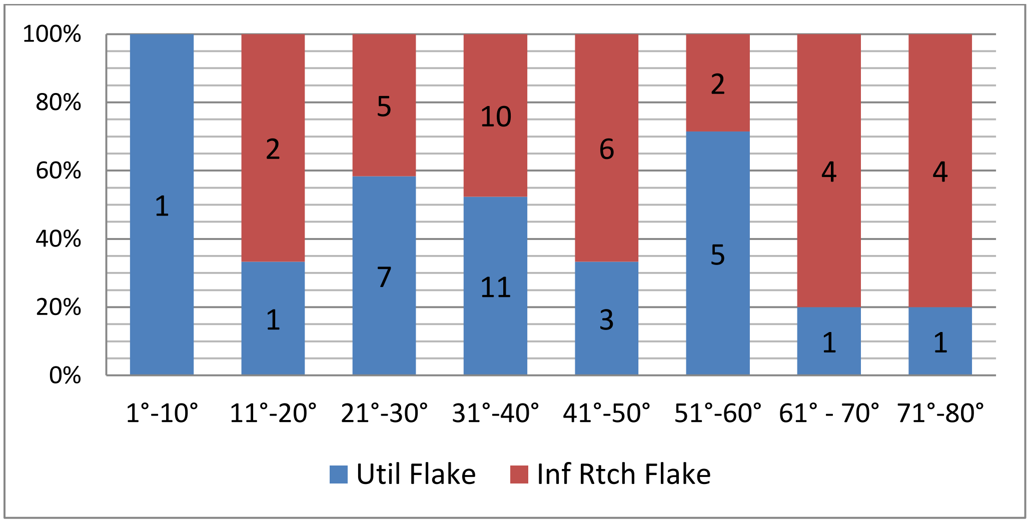


Figure 4.9. Edge angles of utilized flakes and informally retouched flakes.

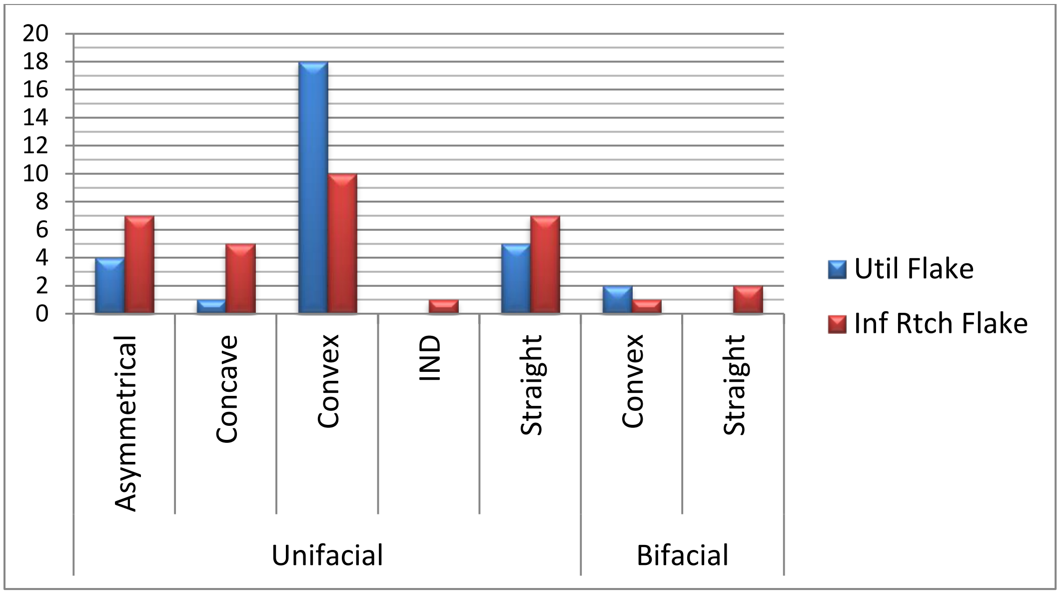


Figure 4.10. Edge shape of informally retouched and utilized flakes.

previously discussed, with a total of nineteen informally retouched flakes and twenty-one utilized flakes showing no signs of heat treatment (Table 4.3).

A majority of these materials bore edge angles less than 41°, suggesting that they were used in cutting activities. However, this contradicts edge shape (Figure 4.10), as a vast majority of informally retouched and utilized flakes had convex edge shapes which are more suitable for scraping (Keeley 1980: 111).

Scrapers

Twenty-one scrapers were sampled and made up approximately 3% of the lithic assemblage; four were collected from a surface context. All scrapers (n=20) had unifacial retouch. In addition, one chert scraper included a toothed edge of retouch possibly making it a denticulate scraper. Chert made up nineteen of the scrapers analyzed, with the remaining two composed of chalcedony (Table 4.4). The presence of heat treatment on scrapers is also somewhat low, with twelve (57%) of the scrapers lacking heat treatment;

Table 4.4. Number and percentage of material and texture of Lave Ridge Ruin scrapers.

Material	**Fine**	**Medium**	**Total**
Chalcedony	1 (5%)	1 (5%)	**2 (10%)**
Chert	11 (52%)	8 (38%)	**19 (90%)**
Total	**12 (57%)**	**9 (43%)**	**21 (100%)**

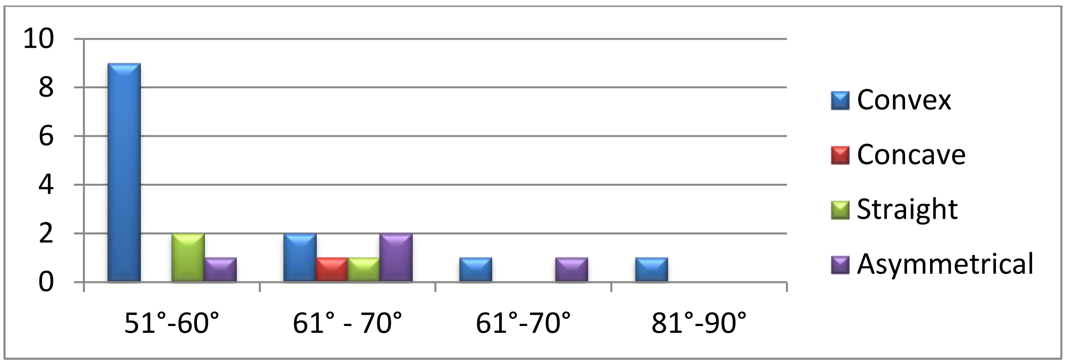


Figure 4.11. Edge angle and edge shape of Lava Ridge Ruin scrapers.

these twelve refer to eleven fine-grained chert scrapers and one medium-grained scraper. Most of the scrapers exhibit edge angles between 51° - 60° and have convex edge shapes.

Cobble Tools

Six (0.8% of the total sample) cobble tools were identified from the sample. One chopper/pecking stone, two core/hammer stones, and three hammer stones made up this portion of the assemblage. With the exception of one hammer stone, which was composed of coarse-grained quartzite, all other cobble tools were composed of medium and coarse-grained cherts, which would allow the material to withstand blunt force when in use. All of the cobble tools appear to have varying numbers of flake removals. In the case of the three hammer stones and two core/hammer stones it is believed that flakes were removed for the purpose of holding them; this is supported by a greater presence of

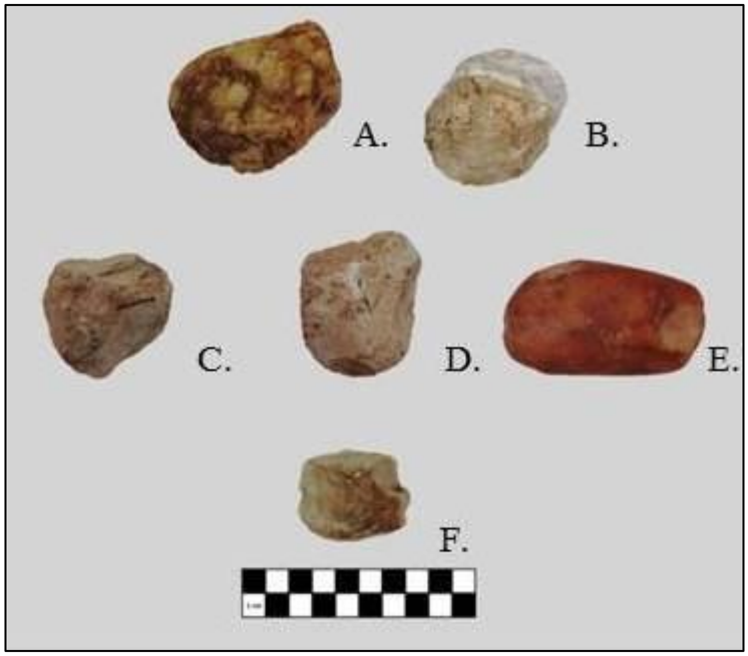


Figure 4.12. Lava Ridge Ruin cobble tools. (A) PD 26 FS 9, (B) PD 236 FS 11, (C) PD 213 FS 11, (D) PD 108 FS 9, (E) PD 102 FS 9, (F) PD 199 FS 19.

Table 4.5. Cobble tool recovered from Lava Ridge Ruin.

Artifact	Material	Texture	Heat Treatment	Cortex	Length (cm)	Width (cm)	Thick (cm)	Weight (g)
Core/Hammer Stone	Chert	Coarse	Absent	76-99%	7.26	6.73	5.17	278.6
Hammer Stone	Quartzite	Coarse	IND	76-99%	8.78	4.82	2.5	167.9
Hammer stone	Chert	Coarse	Absent	76-99%	6.66	5.87	4.71	206.1
CHP/PCK stone	Chert	Medium	Present	1-25%	4.89	3.64	2.06	45.2
Hammer Stone	Chert	Medium	Absent	51-75%	5.54	4.72	3.72	98.8
Core/Hammer stone	Chert	Medium	Absent	26-50%	6.25	4.83	4.76	179

cortex on these artifacts. The chopping/pecking stone is of noteworthy mention as it is the only cobble tool in which flakes were removed to form a working edge, which occurred as unifacial retouch forming a 53° convex edge. It is also the only cobble tool with evidence of heat treatment, which may have been done in order to help remove flakes to form its working edge.

Cores

One hundred and seven cores were recorded in the sample, making up approximately 14% of the Lava Ridge Ruin lithic assemblage. All possible core types recorded for this study were represented in the sample in varying amounts (Figure 4.13) and, with the exception of a tested cobble and a bipolar core, nearly half of the materials from every core type came from a surface context. Unidirectional cores made up the majority of the core sample with 40 (37%), followed by multidirectional cores with 30

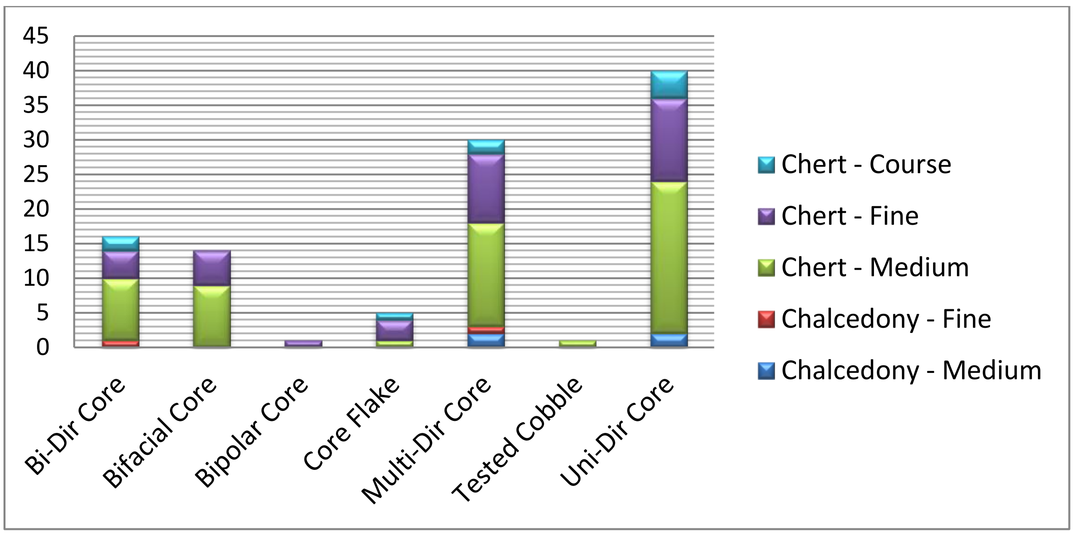


Figure 4.13. Core types by material and texture.

Table 4.6. Amount of cores and percentage of remaining cortex.

Core Types	**0%**	**1-25%**	**26-50%**	**51-75%**	**76-99%**	**Total**
Unidirectional Core	8	22	8	2		**40**
Bidirectional Core	6	7	3			**16**
Multidirectional Core	8	17	5			**30**
Bifacial Core	7	7				**14**
Bipolar Core		1				**1**
Core Flake	1	3	1			**5**
Tested Cobble					1	**1**
Total	**30**	**57**	**17**	**2**	**1**	**107**

(28%), bidirectional cores with 16 (15%), bifacial cores with 14 (13%), core flakes with 5 (5%), and a tested coble and a bipolar core each representing 1% of the sample. Medium and fine-grained cherts dominated the raw material and texture categories, with coarse-grained chert and fine and medium-grained chalcedony making up the rest of the sample. The amount of cortex remaining on most cores was relatively small, with 81.3% of cores covered in less than 25% cortex (Table 4.6).

Debitage

The debitage sample included 375 flakes making up 49% of the Lava Ridge Ruin sample. Of these flakes 167 came from surface contexts, while 208 flakes came from subsurface contexts, primarily floor fill contexts. Of the debitage, 45 (12%) were complete, 21 (6%) were distal fragments, 33 (9%) were lateral fragments, 15 (4%) were medial fragments, 158 (41%) were proximal fragments, 67 (18%) were indeterminate fragments, and 36 (10%) were shatter. Summaries of complete flake dimensions and weights are listed in Table 4.7. The size classes of complete flakes included a majority that fell within Class 3 (1/2" – 3/4") with 19 flakes (42%), followed by Class 2 (1/4" – 1/2") with 14 flakes (31%), Class 4 (3/4" – 1") with 7 flakes (16%), and Class 5 (>1") with 5 flakes (11%). Conversions of these measures in millimeters are listed in Appendix A. 12. 1-5. The amount of cortex remaining on the dorsal sides of complete flakes is summarized in Table 4.8. For the most part, debitage was flaked primarily from fine-grained cherts, that is it made up 73.9% (n= 277) of the debitage. Medium-grained cherts followed with 77 (20.5%), fine-grained chalcedony with 16 (4.3%), and coarse and very coarse- grained chert, chalcedony, and quartzite with one flake each (1.3% total).

The percentage of debitage which showed evidence of heat treatment was 50%, with those showing no signs of heat treatment at 44%; the remaining 6% could not be

Table 4.7. Size and weight summaries of complete flakes in Lave Ridge Ruin sample.

Complete Flake (n=45)	**Length (cm)**	**Width (cm)**	**Thickness (cm)**	**Weight (g)**
Average	2.63	1.87	0.64	3.79
Range	1.28 – 5.16	0.85 – 3.58	0.18 – 2.13	0.2 – 28.4

Table 4.8. Percentage of cortex on the dorsal face of complete flakes.

Amount of Cortex	**0%**	**1-25%**	**26-50%**	**51-75%**	**76-99%**	**100%**
Complete Flakes	34 (76%)	5 (12%)	2 (4%)	2 (4%)	1 (2%)	1 (2%)

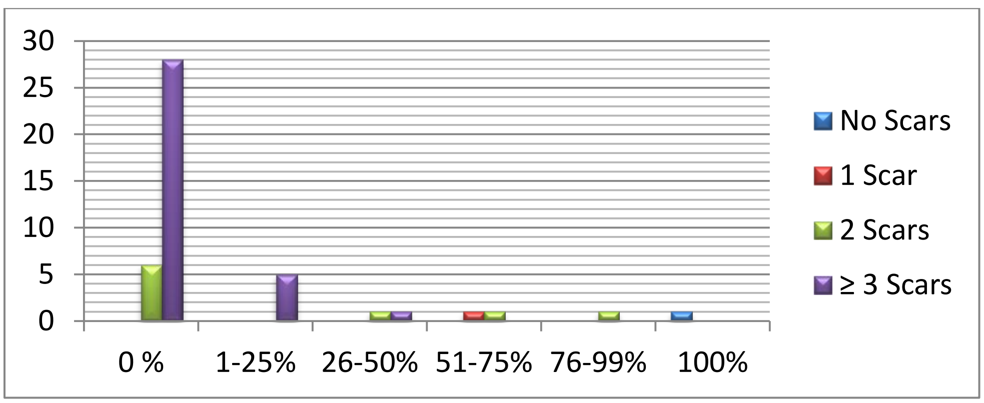


Figure 4.14. Complete flakes percentage of cortex by number of dorsal scars.

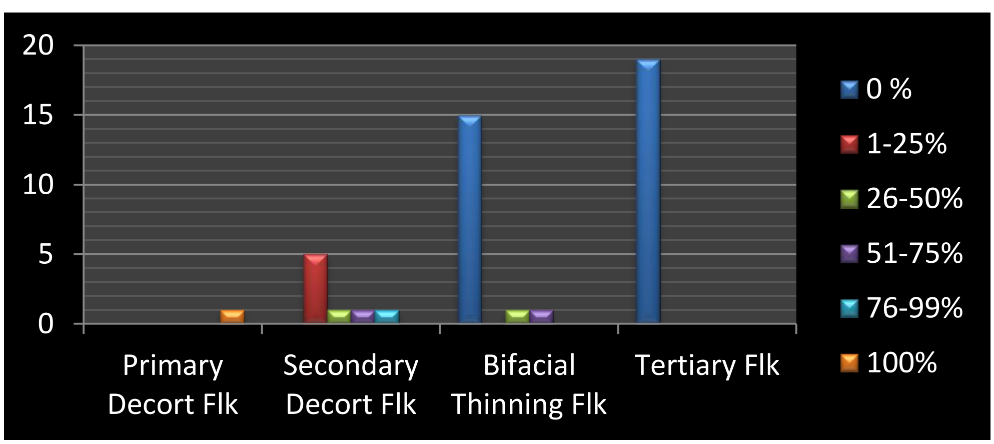


Figure 4.15. Complete flake debitage category by percentage of cortex remaining.

determined. Of the 203 flakes with platforms, single-facet platforms made up the majority at 89 (44%), 22(10.8%) were cortical, 45 (22.2%) were multi- facet, 44 (21.8%) were abraded, and 3 (1.2%) were split. The presence of lipping was also recorded on 25 (12.3%) of the flakes exhibiting platforms, with the remaining 178 (87.7%) lacking lipping.

Dorsal scar attributes were recorded on all complete flakes, into categories of ascending counts (see dorsal scar count discussion is Chapter Three). Of the 45 complete flakes, one flake had no dorsal scars, while another flake yielded one dorsal scar. Nine flakes contained two dorsal scars, while a total 34 had three or more dorsal scars. Dorsal scar count was compared with the percentage of cortex as well. As expected, complete flakes with three or more flake removals also tended to have no cortex. While debitage type categories cannot be accurately reported for flake fragments, they are useful when applied to complete flakes (Figure 4.15). Of the complete flakes, one (2.2%) flake was classified as a primary decortication flake, eight (17.8%) of the flakes were classified as secondary decortication, 17 (37.8%) were classified as bifacial thinning flakes, and 19 (42.2%) were classified as tertiary flakes.

Tool and Raw Material Use Intensity

How intensively stone tools were utilized at Lava Ridge Ruin was interpreted by using the number of retouch edges on all non-bifacial tools. For this site, the number of retouched edges ranged from one to four and was calculated using 80 unifacial tools. Forty (50%) of these items had only 1 margin of retouch, with 29 (36.3%) displaying 2 retouched margins, 10 (12.5%) exhibiting 3 retouch margins, and 1 (1.2%) exhibiting 4 retouch margins. The artifact with four retouched margins was a scraper collected from a surface context that exhibited discontinuous retouch on a four edges. Thus, half of the non-bifacial tools from this sample bore more than one utilized margin.

Complete unmodified flakes were compared to the smallest complete tool in the assemblage to examine the intensity of raw material use. For this assemblage, 75.6% of the complete unmodified flakes were larger than the smallest complete tool. One of these flaked was a coarse-grained chert, while the rest were composed of fine and medium grained chert and chalcedony. The percentage of expedient (informal) versus formal tools was also calculated; more formal tools (72.8%) were present compared to informal tools (27.2%). A majority of both formal and informal tools were made up of fine-grained materials. All of this suggests that while tool stone does not appear to have been used intensively, the inhabitants of Lava Ridge Ruin had a preference for more formal tools to be made from fine-grained material which appears to be abundant.

GRANARY HOUSE (AZ A: 14: 46 ASM)

Granary House (AZ A: 14:46 ASM), is a small four room farming hamlet associated with a lithic scatter. This site was partially excavated in 2006 and 2010, with excavations occurring within two of the four rooms during both field seasons. In total, an area of 14.5 m² was excavated. The site is believed to have been occupied during the Middle Pueblo II period by residents who focused primarily on agricultural activities but who supplemented their diet with wild resources (Harry 2012). In addition to these four rooms, which were recorded as Features 1 through 4, two other features including a circular feature of unknown function and a clearing adjacent to a rock pile are also associated with the site. A total of 831 lithic artifacts recovered from these investigations.

The sample analyzed from Granary House included 378 lithic artifacts. Of the sample, 37 (10%) were tools, 11 (3%) were cores, and 330 (87%) were debitage. The surface debitage sample was collected from Collection Units 1 and 2 and was made up 174 pieces of debitage. The tool/cobble tool assemblage at this site was somewhat limited yielding only bifaces, projectile points, utilized flakes, and informally retouch flakes, and may be reflection of the limited testing conducted at this site. The subsurface debitage sample was collected from Features 2 and 4 and included 156 pieces of debitage. Floor fill assemblages could only be obtained from Feature 4, 40-50 cm below the surface. The remainders of the subsurface artifacts were obtained from feature fills.

<u>Tools and Cobble Tools</u>

Bifaces

Twenty-one bifaces were analyzed from the tool/cobble tool artifacts, making up 5.6% of the lithic assemblage from Granary House. Eleven of these biface were recovered from a surface context with 7 bifaces recovered from Feature 2, 0-30 cm below the surface, and the remaining 3 bifaces recovered from Feature 4, 20-30 cm below the surface. The stages of the bifaces included 4 stage two bifaces, 9 stage three biface, 6 stage four bifaces, and 1 stage five biface. The stage five biface was the complete biface recovered from Feature 2.

Fine-grained chert and chalcedony made up a majority (n=14) of the bifaces, including the complete biface. The remaining seven bifaces were composed of medium-grained chert and chalcedony. Fifteen of the bifaces recovered exhibited signs of heat treatment (including the complete biface), 3 had no signs of heat treatment, and the

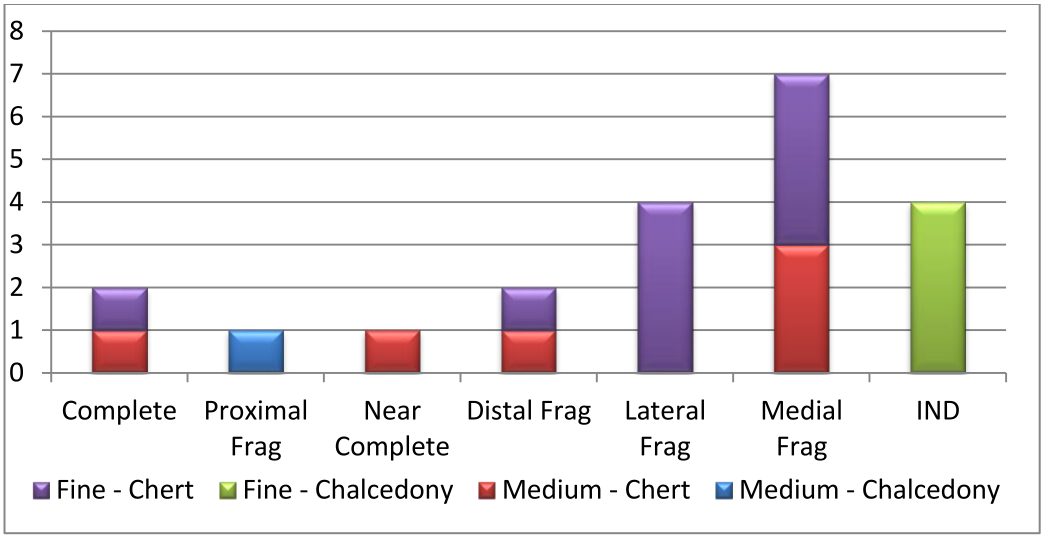


Figure 4.16. Biface portion by raw material and texture quality at Granary House.

remaining 3 bifaces could not be determined; two of these were composed of fine-grained chalcedony while one was composed of fine-grained chert.

Eighteen of the biface recovered were broken, with 1 complete biface recovered from Feature 2, 10-20 cm below the surface, and 1 preform recovered from the general site surface. Another biface was near-complete missing only one of its lateral margins and was recovered 20-30 cm below the surface of in Feature 2. Of note was one indeterminate biface, from the surface of Collection Unit 2, that was broken into two pieces; while the two could not be refitted, they were of the exact same material and texture (fine-grained chalcedony). Figure 4.16 provides an overview of the biface portion and material type and texture. While a distal portion of a biface at some of the sites might be considered to be the distal ends of projectile points, especially if it is a stage five biface, this is not the case at Granary House. The distal portions recovered were those of a stage two and a stage 3 biface, indicating that these may have been broken during manufacture.

Projectile Points

Eight projectile points were analyzed in this sample and make up 2.1% of the total lithic artifacts examined. Table 4.9 provides an overview of the projectile points

Table 4.9. Projectile point descriptions from Granary House.

Type	**Retouch**	**Portion**	**Material**	**Texture**
Elko Side Notched	Tang & both lateral margins	Near Complete	Chert	Fine
Indeterminate	On 1 lateral margin	Complete	Chert	Fine
Indeterminate	-	Proximal	Chert	Fine
Indeterminate	Base	Proximal	Chert	Fine
Parowan Basal Notch	-	Complete	Chert	Fine
Parowan Basal Notch/ Rosegate Corner Notch	Point & both lateral margins	Complete	Chert	Fine
Rose Spring Corner Notched	-	Complete	Chert	Fine
Rose Spring Corner Notched	On 1 lateral margin	Complete	Chert	Fine

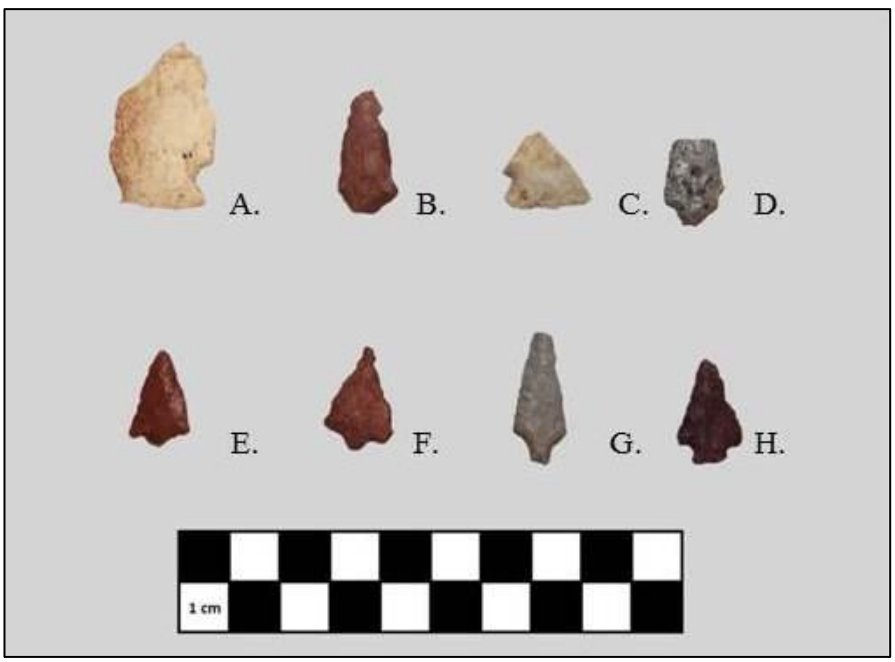


Figure 4.17. Granary House projectile points. (A) Elko Side Notch (PD 9 FS 9), (B) Indeterminate (PD 0 FS 18), (C) Indeterminate (PD 1 FS 13), (D) Indeterminate (PD 1 FS 12), (E) Parowan Basal Notch (PD 2 FS 11), (F) Parowan Basal Notch (PD 0 FS 10), (G) Rose Spring Corner Notch (PD 0 FS 11), (H) Rose Spring Corner Notch (PD 0 FS 9).

recovered from Granary House. With the exception of one Elko Side Notched point, which was recovered 20-30 cm below the surface of Feature 2, all other points were recovered from the surface. The Parowan Basal Notch and Parowan Basal Notch/ Rosegate Corner Notch points are contemporaneous with this site. Of these points, the Parowan Basal Notch/ Rosegate Corner Notch was retouched on both its point and lateral margins. One Elko Side Notched point had retouch on its tang as well as both lateral margins. Given its subsurface context it may be possible that this point was being reworked into a new point. Two of the indeterminate points showed signs of retouch; the first had retouch on one of its lateral margin, and the second had retouch along its base. Rose Spring Corner Notched, classified as part of the Rosegate series, dates to approximately A.D. 500-700 and terminates at some time prior to A.D. 1300 (Justice 2002: 321). These dates put it at roughly the time of site occupation.

As can be observed in Table 4.9, all projectile points were composed of fine-grained chert. Heat treatment was present on five of the projectile points. The remaining three showed no signs of heat treatment; these included the Elko Side Notched point, the complete indeterminate point, and the indeterminate point exhibiting retouch along its base.

Utilized Flakes and Informally Retouch Flakes

Six utilized flakes and two informally retouched flakes were recovered from Granary House, and together make up 2.1% of the sample analyzed. Half of the utilized and informally retouch flakes were recovered from a surface context with the other half of both artifact types recovered from a subsurface context. Medium-grained chert made up the majority of raw material for these tool types, with one of the utilized flakes being composed of medium-grained quartzite and two from medium-grained chert. The informally retouched flakes were both made of medium-grained chert. The presence of heat treatment was rare for these artifacts, with the exception of two utilized chert flakes which had heat treatment and the quartzite flake which could not be determined. All edge angles for these artifacts, save for one informally retouched flake, were 38° or less, indicating that they may have been used for cutting.

Cores

Eleven cores were recovered from Granary House, and composed 2.9% of the artifacts analyzed. Table 4.10 provides an over view of the core artifacts recovered. Of these, the unidirectional core, both bidirectional cores, and three multidirectional cores were recovered from a surface context, with the remaining five cores (4 multidirectional cores and 1 core flake) recovered from a subsurface context.

All cores were composed of fine and medium-grained cherts. Heat treatment was

Table 4.10. Core artifacts recovered from Granary House.

Core Type	**Texture**	**Heat Treatment**	**Cortex**	**Length (cm)**	**Width (cm)**	**Thickness (cm)**	**Weight (g)**
Unidirectional	Fine	Indeterminate	1-25%	4.03	1.88	1.31	12.6
Bidirectional	Medium	Absent	1-25%	3.65	2.67	1.51	20.2
Bidirectional	Medium	Absent	1-25%	4.54	3.72	1.96	38.9
Core Flake	Fine	Present	1-25%	5.35	2.4	1.46	16.4
Multidirectional	Fine	Present	1-25%	4.38	3.35	2.96	55.6
Multidirectional	Fine	Absent	0%	4.96	3.85	2.2	39.9
Multidirectional	Fine	Absent	26-50%	3.84	2.8	2.62	22.5
Multidirectional	Medium	Absent	1-25%	3.29	3.55	2.24	18.7
Multidirectional	Medium	Absent	26-50%	4.79	1.97	1.34	13
Multidirectional	Medium	Absent	26-50%	5.33	3.9	3.57	100.1
Multidirectional	Medium	Absent	26-50%	5.54	2.42	2.41	45.4

present on two cores; in this case, the core flake and one multidirectional core. Seven of the cores yielded 25% or less cortex on their exterior surfaces, which implies that they were manipulated extensively. The presence of unidirectional and bidirectional cores indicates that some formal core reduction was taking place. However, for the most part core reduction is believed to have been informal due to the majority of multidirectional cores recovered from the site.

Debitage

The debitage sample included 58 (17.6%) complete flakes, 113 (34.3%) proximal fragments, 23 (7%) distal fragments, eight (2.4%) lateral fragments, 31 (9.4%) medial fragments, 70 (21.1%) indeterminate fragments, and 27 (8.2%) shatter. Tables 4.11 displays the size, weight, and range summaries of complete flakes and Table 4.12 displays the percentage of cortex on the dorsal face of the complete flakes. For the size class of complete flake both Class 2 (1/4" – 1/2") and Class 3 (1/2" – 3/4") contained 19 flakes (32.8% each) which comprised the majority. This was followed by Class 4 with 11 (19%) flakes, Class 5 (>1") with 6 (10.3%) flakes, and Class 1 (<1/4") with 3 (5.2%). The raw material and texture of the debitage included fine and medium-grained chert and chalcedony with fine-grained chert composing 65.2% of the sample. This was followed by medium-grained chert which made up 27.9%, fine- grained chalcedony making up 6.7%, and medium-grained chalcedony making up 0.3%. Fifty-eight percent (n=190) of the flakes displayed signs of heat treatment, with 30% (n=100) showing no signs of heat treatment, and 12% (n=40) being indeterminate.

Platforms were identified on 171 flakes. Of these, 90 (52.6%) were single-

Table 4.11. Size and weight summaries of complete flakes at Granary House.

Complete Flake (n=58)	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Average	2.46	1.89	0.57	3.46
Range	0.67 – 4.87	0.62 – 4.49	0.13 – 1.68	0.05 – 28.4

Table 4.12. Percentage of cortex on the dorsal face of complete flakes.

Amount of Cortex	0%	1-25%	26-50%	51-75%	76-99%	100%
Complete Flakes	34 (58.6%)	19 (32.8%)	1 (1.72%)	3 (5.17%)	-	1 (1.72%)

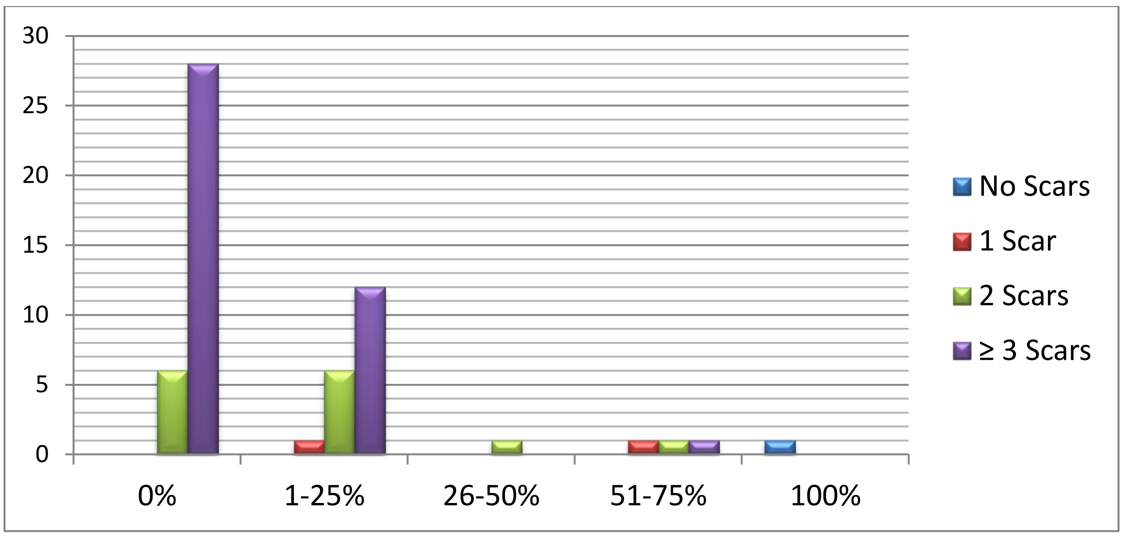


Figure 4.18. Percentage of cortex by number of dorsal scars for complete flakes.

faceted, 34 (19.9%) had cortical platforms, 14 (8.2%) had multi-faceted platforms, 32 (18.7%) had abraded platforms, and one (0.6%) had a split platform. Of the flakes with platforms lipping was observed on 26 flakes (15.2%), 144 flakes (84.2%) had no lipping, and one flake (0.6%) that could not be determined.

Dorsal scar counts on complete flakes show a majority of flakes bore three or more dorsal scars and accounted for 41 (70.7%) of the complete flakes. Flakes bearing two dorsal scars made up 14 (24.1%) of the complete flakes, those bearing one dorsal scar made up 2 (3.4%) of the complete flakes, and 1 flake (1.7%) had no dorsal scars. One (1.7%) flake was classified as a primary decortication flake, 21 (36.2%) flakes were secondary decortication flakes, 15 (25.9%) were bifacial thinning flakes, three (5.2%) were bifacial rejuvenation flakes, and 18 (31%) were tertiary flakes.

Tool and Raw Material Use Intensity

The number of retouched edges on all non-bifacial tools indicate that out of 8 tools, 5 (62.5%) exhibited a single retouched edge, and 3 (37.5%) had two retouched edges. When compared to the smallest complete tool in the sample – a utilized flake measuring 12.57 cm in length, 1.5 cm in width, 0.47 cm in thickness, and 01.6 grams in weight composed of medium-grained non-heat treated chert – 46.6% (n=27) of the complete unmodified flakes were smaller. Thus, a majority of complete unmodified flakes in this sample were larger than the smallest complete tool, encompassing 53.4% (n=31) of the complete flake sample. It should be noted that a majority of these flakes were composed of fine- grained, heat treated chert.

SITE 232 (AZ A: 14: 232)

Site 232 (AZ A: 14: 232 ASM) is a small site containing at least three structures. This site was subjected to limited testing during the 2011field season. Excavation units were placed in all three structures. In total, an area of 29.0 m² was excavated. Associated with these structures was a large artifact scatter. Surface collections at the site occurred within three 5 x 5 meter units, and additional test units measuring 2 x 2 m were excavated in two of these surface collection units. A large quantity of architectural rubble suggests that several rooms were present at the site; however, only a few sections of definite wall alignments were discernible due to heavy disturbance from tree roots (Harry 2012). The small proportion of corrugated ceramics (4.1% of the ceramics sample) at this site suggests that its primary occupation occur during the Middle Pueblo II period. A total of 734 lithic artifacts were recovered from the site.

The sample analyzed from Site 232 included 297 lithic artifacts. Of the sample, 64 (21.5%) were tool/cobble tools, 10 (3.4%) were cores, and 223 (75.1%) were debitage. Of the debitage, 153 were from surface contexts (i.e., from Collection Unit 4) and 70 were from subsurface contexts Collection Unit (from the fills of Features 1 and 2, and from Test Units 3, 4, 5, 6, and 7.

Tools and Cobble Tools

Bifaces

A total of 13 bifaces were analyzed from the tool/cobble tool artifacts, making up 4.4% of the lithic assemblage. Ten bifaces were recovered from the surface of the site, with 3 collected below the surface; in this case, the first of these subsurface bifaces was recovered from 0-10 cm below the surface in TU 1, the second from 0-10 cm below the surface in TU 4, and the third from 10-20 cm below the surface in TU6. With the exception of one biface, all other bifaces were broken. The complete biface was collected from the general site surface. Preform stage was identified for all bifaces at the site, and included three stage three bifaces, seven stage four bifaces (including the complete biface), and two stage five bifaces.

The complete biface recovered was composed of fine-grained chalcedony, seven from fine-grained chert, and five from medium-grained chert. While heat treatment could not be identified on the complete biface, 11 of the bifaces displayed signs of heat treatment, while one did not. The 11 heat treated bifaces included those in stages three, four, and five, while the one non-heat treated biface was at stage four of reduction. Two of the broken bifaces, one of which was a stage three and the other a stage five biface, were distal portions and were listed as possible projectile points; although this is more likely for the stage five biface.

Projectile Points

Eight projectile points were analyzed in this sample, accounting for 2.7 % of the total lithic artifacts examined. Table 4.13 provides a summary of these items. With the exception of one Parowan Basal Notch point and one indeterminate point, all other points showed signs of heat treatment. As stated above, Parowan Basal Notch points appear during the Pueblo II period and continue to the Pueblo III period. One Parowan Basal Notch point was recovered from the surface, while two were recovered 10-20 cm below the surface. The first Parowan Basal Notch point exhibited signs of reworking along its base, while the second showed signs of retouch along one lateral margin. The Rosegate Corner Notch point, believed to be contemporaneous with the time of the site's occupation, was recovered from the surface and contained retouch along one lateral margin. One indeterminate point, recovered from 0-10 cm below the surface, had signs of retouch along its tang.

One San Raphael Stemmed point was recovered from the surface and represents one of three Archaic points recovered from the site. This projectile point style is believed to date to the Middle Archaic period 6000 – 5000 B.C. till roughly 3000 B.C. (Justice 2002: 157). The San Raphael Stemmed point exhibited heavy retouch along its base and

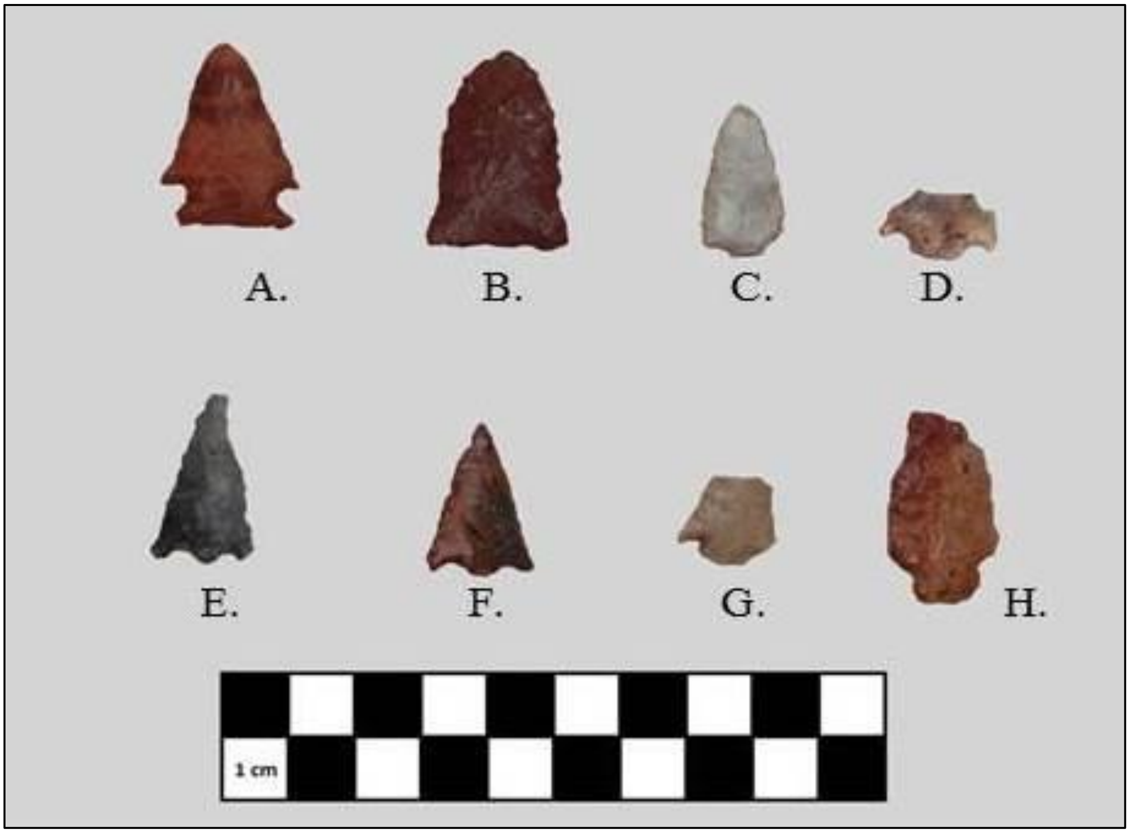


Figure 4.19. Site 232 projectile points. (A) Elko Site Notched (PD 7 FS 9), (B) General Archaic (PD 2 FS 9), (C) Indeterminate (PD 4 FS 9), (D) Parowan Basal Notch (PD 8 FS 10), (E) Parowan Basal Notch (PD 22 FS 12), (F) Parowan Basal Notch (PD 18 FS 10), (G) Rosegate Corner Notch (PD 1 FS 12), (H) San Raphael Stemmed (PD 0 FS 11).

Table 4.13. Projectile points analyzed from Site 232.

Type	**Portion**	**Material**	**Texture**	**Retouch**	**Count**
Elko Side Notched	Complete	Chert	Fine	1 lateral margin; dulled point	**1**
General Archaic	Complete	Chert	Medium	Base; lateral margins	**1**
Indeterminate	Complete	Chalcedony	Fine	Tang	**1**
Parowan Basal Notch	Proximal	Chalcedony	Fine	Base	**1**
Parowan Basal Notch	Complete	Chert	Fine	1 lateral margin	**1**
Parowan Basal Notch	Complete	Chert	Fine	-	**1**
Rosegate Corner Notched	Proximal	Chert	Fine	1 lateral margin	**1**
San Raphael Stemmed	Proximal	Chert	Medium	Base; lateral margins	**1**

both lateral margins. The two other Archaic points were classified as a General Archaic point while the latter was classified as an Elko Side Notched point, which is considered to be part of the Northern Side Notched series (Justice (2002: 170) and dates to approximately the same time as that of the San Raphael Stemmed point. The General Archaic point was found on the surface and displayed retouch along its base and both lateral margins. The Elko Side Notched point contained retouch along one lateral margin and what appears to have been a heavily used point; the point was dulled as if ground down rather than crushed or fractured. This could indicate that this point may have been used as a drilling implement.

Utilized Flakes and Informally Retouched Flakes

Site 232 contained a total of 27 utilized flakes and 7 informally retouched flakes together representing 11.5% of the sample. However, many of these artifacts were collected from the surface, with 22 utilized flakes and 6 informally retouched flakes recovered from this context. All of these tools had unifacial retouch and were composed of medium and fine-grained chert, with the exception of 1 utilized flake made of fine-grained chalcedony. Fine-grained material appears to have been preferred for these tools

Table 4.14. Heat treatment on informally retouch and utilized flakes at Site 232.

Heat Treatment	**Informally Retouch Flake**	**Utilized Flake**	**Total heat treated**
Present	3	11	14
Absent	4	12	16
Indeterminate	-	4	4
Total	**7**	**27**	**34**

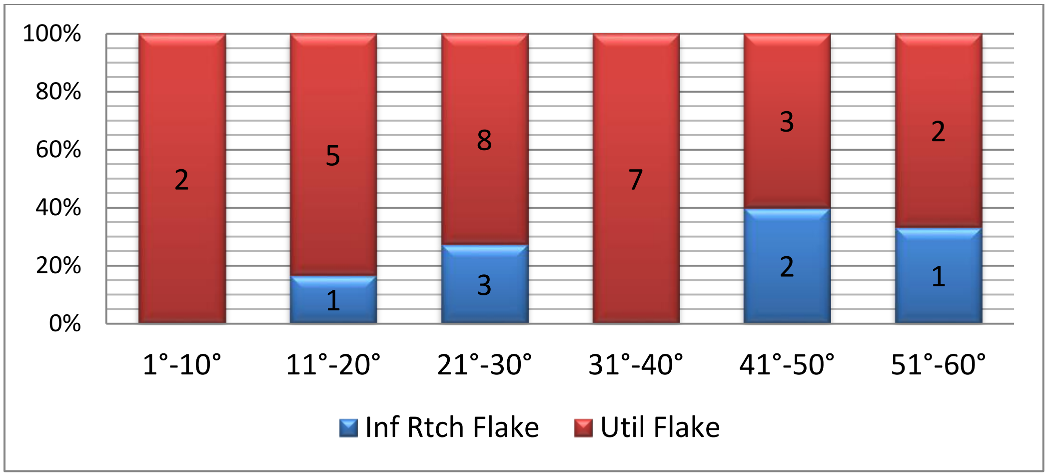


Figure 4.20. Utilized and informally retouched flake edge angles.

making up 20 of the utilized flakes (74.1%) and 4 of the informally retouched flakes (57.1%) of the informally retouched flakes. For both tool categories (Table 4.14), most materials were not heat treated.

The edge angles of both tool types display angles less than 40°, thus indicating that these items may have been used more for cutting. A majority of the utilized flakes and informally retouched flakes exhibit convex edge shapes (n=17; 50%) and straight edges (n=9; 26.5%) emphasizing their role in cutting. Two utilized flakes and 1 informally retouched flake contained edge angles greater than 51° indicating that these could have been used for scraping.

Scrapers

Four scrapers were recovered from Site 232 and make up 1.4% of the sample analyzed. All scrapers came from a surface context. All scrapers were composed of medium-grained chert. Heat treatment was present on only one scraper recovered from the surface of Collection Unit 1.

Table 4.15. Scrapers recovered from Site 232.

Feature	Material	Texture	Edge Angle	Edge Shape
Collection Unit 4	Chert	Medium	67°	Recurved
Collection Unit 1	Chert	Medium	62°	Convex
Collection Unit 2	Chert	Medium	78°	Straight
Collection Unit 2	Chert	Medium	74°	Concave

Cobble Tools

Three Core/Hammer Stones, one chopper/pecking stone, and one hammer stone were recovered from Site 232, and make up 1.7% of the sample analyzed. All came from surface contexts with the exception of one core/hammer stone which was recovered 20-30 cm below the surface of Feature 1. The 3 core/hammer stones were composed of medium and coarse-grained materials and appear to have had flakes removed possibly for easier manipulation. However, the hammer stone (Figure 4.21), collected from the general site surface among ground stone artifacts, was unlike any tool seen on the Shivwits Plateau as it was composed of dolostone. The tool also exhibits some wear along it sides attributed to manipulation. Although dolostone is considerably more brittle

Figure 4.21. Dolostone hammer stone (Site 232 PD 0 FS 21).

Table 4.16. Core/Hammer Stones recovered from Site 232.

Feature	Material	Texture	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
General Site	Chert	Medium	7.61	5.69	4.5	248.62
General Site	Chert	Medium	6.97	6.89	5.37	317.1
Feature 1	Chert	Coarse	8.92	7.51	7.21	566.5
General Site	Dolostone	Coarse	6.25	4.08	3.98	165.24
General Site	Basalt	Very Coarse	9.84	9.41	2.91	319.3

than chert, the dolostone that makes up this artifact is compact and dense. In addition to this one chopper/pecking stone composed of very coarse-grained non-vesicular basalt was also recovered.

Cores

Table 4.17. Core artifacts recovered from Site 232.

Core Type	Texture	Heat Treatment	Cortex	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Multidirectional	Medium	Absent	26-50%	3.93	3.6	3.57	75.1
Core Flake	Medium	Absent	0%	5.48	5.11	1.81	32.64
Multidirectional	Medium	Absent	0%	5.14	4.35	2.32	43.57
Bifacial	Medium	Present	0%	5.95	4.15	1.98	53.65
Multidirectional	Coarse	Absent	26-50%	5.62	4.27	4.89	148.1
Multidirectional	Very Coarse	Present	26-50%	6.24	4.74	3.54	98.4
Multidirectional	Medium	Present	26-50%	5.91	4.11	2.25	71.85
Multidirectional	Coarse	Absent	26-50%	5.94	3.69	2.56	69.93
Multidirectional	Medium	Absent	26-50%	7.2	5.73	5.06	222.99
Bidirectional	Medium	Absent	1-25%	7.13	5.34	28.2	109.52

Ten cores were recovered during excavation and make up 3.4% of the sample analyzed. Of these, only one was recovered from a subsurface context; it was bidirectional core recovered from Test Unit 5 0-10 cm below the surface. Table 4.17 provides an overview of these artifacts. All of the cores were composed of medium, coarse, and very coarse-grained chert, most of which was found in nodular form. The presence of heat treatment on the bifacial core is logical if more precise flake removals were the goal.

Debitage

The debitage sample included 223 flakes, making up 75.1% of the analyzed sample from Site 232. While the ideal debitage sample (150 flakes) was obtained from the surface context (n=153), the subsurface context for the entire site was made up of only 70 flakes. As a result, all subsurface flakes were analyzed and recorded. Of the debitage, 33 (14.8%) were complete, 107 (48%) were proximal fragments, 14 (6.3%) were distal fragments, 9 (4%) were lateral fragments, 12 (5.4%) were medial fragments, 33 (14.8%) were indeterminate fragments, and 15 (6.7%) were shatter. Summaries of complete flake dimensions are provided in Table 4.18 and percentage of cortex remaining on the dorsal side displayed in Table 4.19. The size class for complete flakes included, 2 flakes (6.1%) within Class 1 (<1/4"), 8 (24.2%) within Class 2 (1/4" – 1/2"), 11 (33.3%) within Class 3 (1/2" – 3/4"), 6 (18.8%) within Class 4 (3/4" – 1"), and an additional 6 (18.8%) within Class 5 (>1"). A vast majority of debitage was composed of fine- grained chert (75.1%) and chalcedony (3.1%), followed by medium-grained chert (19.7%), coarse-grained chert (1.6%), and one basalt flake (0.5%). Heat treatment was more prevalent at Site 232 for all flake portions than at Lava Ridge Ruin, with a total of 165

Table 4.18. Size and weight summaries of complete flakes in Site 232 sample.

Complete Flake (n=33)	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Average	2.9	2.01	0.66	5.36
Range	1.02 – 5.2	0.69 – 4.52	0.19 – 1.92	0.1 – 27.9

Table 4.19. Percentage of cortex on the dorsal face of complete flakes.

Amount of Cortex	**0%**	**1-25%**	**26-50%**	**51-75%**	**76-99%**	**100%**
Complete Flakes	17 (51.5%)	9 (27.3%)	3 (9.1%)	2 (6.1%)	1 (3%)	1 (3%)

(74%) exhibiting heat treatment, 49 (22%) with no signs of heat treatment, and 9 (4%) that could not be determined.

Platform characteristics recorded on all complete flakes and platform flakes were made up of 223 flakes. Of these flakes single-facet platforms made up the majority at 82 (58.6%), cortical platforms with 22 (15.7%), multi-facet platform with 13 (9.3%), and abraded platforms with 23 (16.4%). Lipping was absent from 117 (83.6%) of the flakes that contained platforms, 21 flakes (15%) had lipping, while two flakes (1.4%) could not be determined.

The dorsal scar counts on complete flakes showed that of the 33 flakes, 1 (3%) had no dorsal scars, 1 (3%) bore one dorsal scar, 7 (21.3%) bore two dorsal scars, and 24(72.7%) included three or more dorsal scars (Figure 4.22). The debitage type

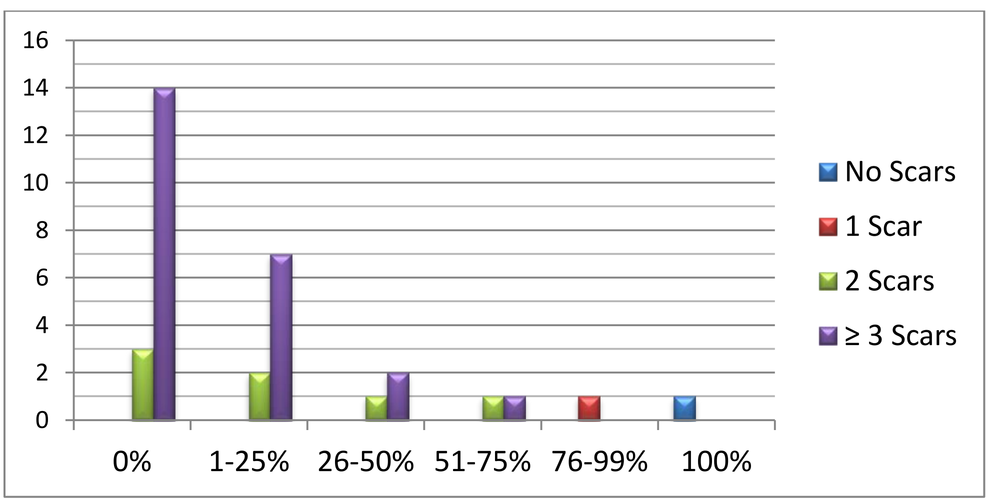


Figure 4.22. Percentage of cortex by number of dorsal scars for complete flakes.

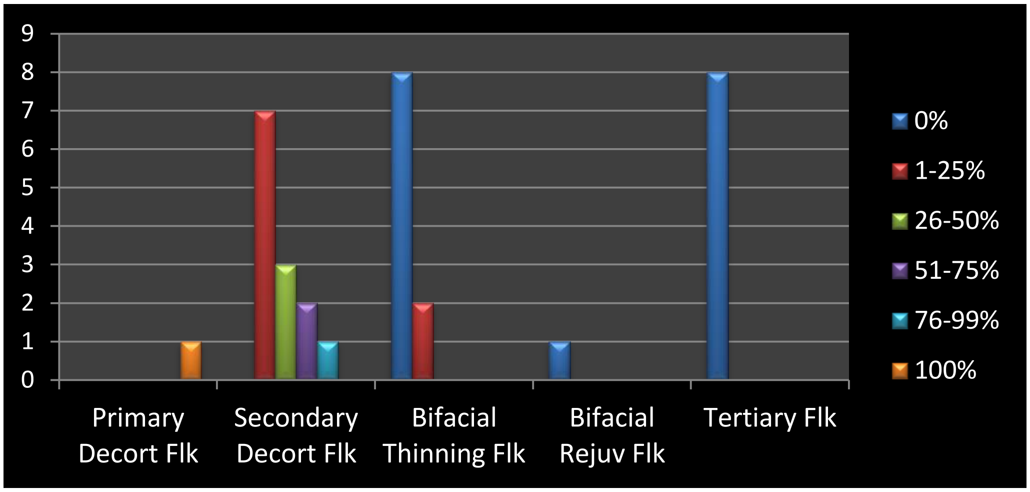


Figure 4.23. Debitage type by percentage of cortex for complete flakes.

categories on complete flakes included, 1 (3%) primary decortication flake, 13 (39.4%) secondary decortication flakes, 10 (30.3%) bifacial thinning flakes, 1 (13%) bifacial rejuvenation flakes, and 8 (24.3%) tertiary flakes.

Tool and Raw Material Use Intensity

The number of retouched edges on all non-bifacial tools indicated that out of 39 tools, 28 (71.8%) bore one retouched margin, with 9 (23.2%) exhibiting two retouched margins, 1 (2.5%) exhibiting three retouched margins, and1 exhibiting four retouched margins. The tool with four retouched margins was a utilized flake recovered 0-10 cm below the surface. This indicates that tool stone was not used intensively at this site. Likewise, raw material use intensity does not appear to be great either. Out of the 33 complete unmodified flakes within the sample, 29 (87.9%) were larger than the smallest complete tool recovered 0-10 cm below the surface of Test Unit 1 (a fine-grained utilized flake). It should also be noted that these complete flakes were mostly composed of fine-grain chert and were heat treated, making them ideal flakes for tool use. Both of these proportions indicate that tools and raw materials were not intensively used suggesting that high quality material stone was available and accessible. The presence of formal and informal tools composed of fine-grained materials supports this interpretation.

CORN COB SITE (AZ A: 14: 56 ASM)

Corn Cob Site (AZ A: 15: 56 ASM), is an early Pueblo III period pueblo that contains between thirteen to fifteen rooms and an associated artifact scatter. Testing at this site was limited to a surface collection of artifacts and the excavation of three test units. The test units included two 1 x 1 meter units (one outside of the pueblo and one within a room) and a third 1 x 2 meter test unit (within another room). A total of 337 lithic artifacts were recovered from this site during its investigation in 2008.

Of the sample examined from Corn Cob Site, 29 (8.6%) were tools/cobble tools, 3 (0.9%) were cores, and 305 (90.5%) were debitage. The surface assemblage for the debitage was collected from Collection Unit 2, 3, 4, 7 and Test Unit 5 & 6, as well as the general site surface and accounted for 198 flakes. The subsurface assemblage accounts for 107 flakes and were collected from Collection Unit 4 & 7 and Test Unit 5 & 6. It should be noted that Test Unit 6 was excavated within Room 4 and Test Unit 5 was excavated in Room 10. The total number of subsurface debitage did not reach the ideal sample size of 150. Hence all subsurface debitage was analyzed. Likewise, when the final artifact bag containing debitage was reached from the surface assemblage, the sample size had not been met. The contents of this bag caused the surface assemblage count to exceed 150. As a result, all artifacts recovered during the 2008 excavation of this site were analyzed for this study. Given the size of the site, it is acknowledged that the sample does not fully represent the full range of activities being performed there.

<u>Tools and Cobble Tools</u>

Bifaces

Eight bifaces were analyzed from the tool/cobble tool artifacts, making up 2.4% of the lithic assemblage recovered from Corn Cob. Three of these bifaces were recovered from the surface, while 5 were obtained from subsurface fill within Test Unit 5 and Test Unit 6. All of the bifaces recovered were broken and included one proximal fragment,

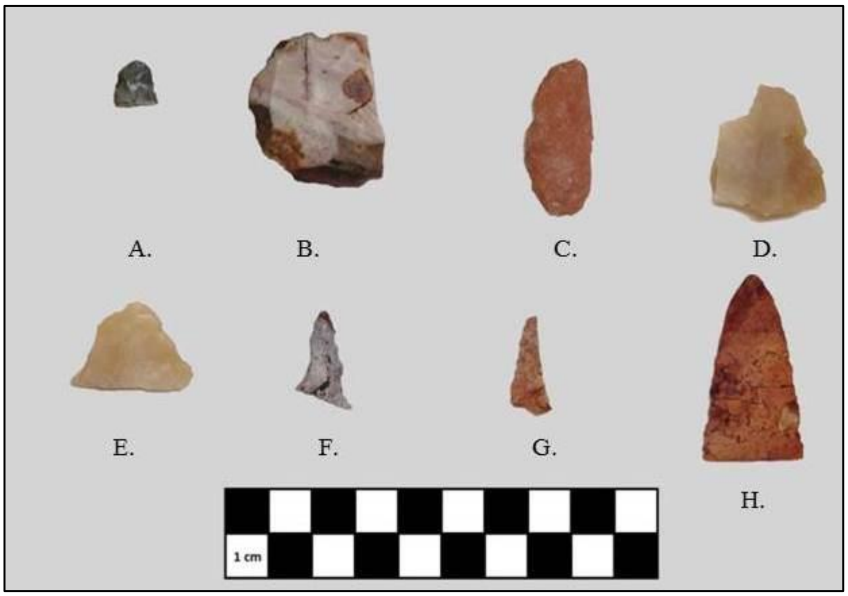


Figure 4.24. Corn Cob Site bifaces. (A) PD 1 FS 9, (B) PD 15 FS 10, (C) PD 18 FS 12, (D) PD 19 FS 12, (E) PD 19 FS 11, (F) PD 13 FS 9, (G) PD 11 FS 10, (H) PD 14 FS 10.

Table 4.20. Biface descriptions from Corn Cob Site.

Preform Stage	**Feature/ Room**	**Depth Recovered**	**Portion**	**Material**	**Texture**	**Heat Treatment**
Stage 3	CU 3	Surface	Distal	Chalcedony	Fine	IND
Stage 3	TU 5	20 – 30 cm*	Distal	Chert	Fine	Present
Stage 4	TU 5	30 - 40 cm	Distal	Chert	Medium	IND
Stage 4	TU 6	30 – 40 cm	Distal	Chert	Fine	Present
IND	CU 4	0 – 10 cm	IND	Chert	Fine	Present
Stage 2	CU 3	Surface	IND	Chalcedony	Fine	IND
Stage 3	CU 2	Surface	Lateral	Chert	Medium	Absent
Stage 3	TU 6	40 – 50 cm*	Proximal	Chert	Fine	Absent

CU – Collection Unit; IND – Indeterminate; * - Floor Context one lateral fragment, four distal fragments, and two indeterminate fragments. The two of the four distal fragments were originally believed to have been from projectile points due to their late stage morphology (they were stage 4 bifaces). An overview of the bifaces analyzed is provided in Table 4.20. Fine-grained chert made up the majority of the bifaces with four artifacts, with fine-grained chalcedony and medium-grained chert making up two artifacts a piece. Although at least three bifaces – two fine-grained chert and one fine-grained chalcedony – were heat treated, an equal amount could not be determined due to material composition. Two bifaces did not show signs of heat treatment.

Projectile Points

Seven projectile points were recovered from Con Cob Site and account for 2.1% of the sample. Table 4.21 provides a description of these points. Two Parowan Basal Notch proximal fragments and two Rosegate Corner Notch proximal fragments were recovered from the general site surface; this includes two re-worked points. The third Parowan Basal Notch point, which was complete, was recovered from a the sub-floor of Test Unit 5, while the two complete Parowan/Rosegate points were found 0 – 20 cm below the surface of Test Unit 5 and from the floor fill of Test Unit 6 respectively.
Of the eight sites under examination, Corn Cob Site is the only site to include projectile points that are all contemporaneous with the site's occupation. The amount of retouch seen on these points is also not as prevalent as it was with the previous sites, with only two instances of retouch. The greater number of proximal fragments for these points suggests that points were being brought back to the site, possibly to be re-worked, which

Figure 4.25. Corn Cob Site projectile points. (A) Parowan Basal Notch (PD 0, FS 20), (B) Parowan Basal Notch (PD 14 FS 9), (C) Parowan Basal Notch (PD 0 FS 26), (D) Parowan Basal Notch/ Rosegate (PD 15 FS 9), (E) Rosegate Corner Notch (PD 7 FS 9), (F) Rosegate Corner Notch (PD 0 FS 39) (G) Rosegate Corner Notch (PD 0 FS 25).

Table 4.21. Projectile point descriptions from Con Cob Site.

Type	**Retouch**	**Portion**	**Material**	**Texture**	**Heat Treatment**
Parowan Basal Notch	On 1 lateral margin	Proximal	Chert	Fine	Present
Parowan Basal Notch	-	Complete	Chert	Fine	Present
Parowan Basal Notch	-	Proximal	Chert	Fine	Present
Parowan Basal Notch/ Rosegate Corner Notch	-	Complete	Chalcedony	Fine	Indeterminate
Parowan Basal Notch/ Rosegate Corner Notch	-	Complete	Chert	Fine	Present
Rosegate Corner Notch	Base	Proximal	Chert	Fine	Present
Rosegate Corner Notch	-	Proximal	Chalcedony	Fine	Indeterminate

appears to be the case for the two proximal fragments that bore retouch. All projectile points were composed of fine-grained chert and chalcedony and, with the exception of the chalcedony points; heat treatment was present on all.

Utilized Flakes and Informally Retouched Flakes

Five utilized flakes and eight informally retouched flakes were recovered from Corn Cob Site and make up 3.9% of the sample analyzed. All utilized flakes were recovered from the general site surface and the surface of Collection Unit 3. Six informally retouched flakes were recovered from the general site surface context, and from the surfaces of Collection Units 2 and 3, with the two subsurface informally retouched flakes recovered from Collection Unit 7 and Test Unit 6. Fine-grained chert makes up the majority of these tools with 2 utilized flakes and 5 informally retouched flakes (53.8%). This is followed by medium-grained chert which makes up two of each tool type (30.8%), and fine-grained chalcedony making up one of each tool type (15.4%). Heat treatment is more prevalent on informally retouched flakes with 4 exhibiting heat treatment, 2 with an absence of heat treatment, and 2 that could not be determined. Heat treatment was only slightly less prevalent on the utilized flakes, with 3 showing no signs of heat treatment, 1 with heat treatment, and 1 that could not be determined. . Four informally retouched flakes had edge angles less than 40° and 4 had edge angles greater than 40°. An almost equal distribution was seen with utilized flakes, with 3 artifacts bearing edge angles less than 40° and 2 bearing edge angles greater than this. One informally retouched tool – collected from 10-20 cm below Test Unit 6 – had bifacial retouch, unlike the others which all had unifacial retouch.

Cobble Tools

A single Chopper/Pecking stone was recovered from Corn Cob Site making up 0.3% of the analyzed sample. It was recovered from Collection Unit 7, 0 – 10 cm below the surface. It exhibited battering along its single bifacially retouched, convex edge and bore an edge angle of 42°; this edge was also heavy retouched. It was composed of medium-grained, non-heat treated chert and measured 5.78 cm in length, 4.34 cm in width, 2.25 cm in thickness, and weighed 61.5 g.

<u>Cores</u>

Three cores were analyzed and make up 0.9% of the sample recovered and included one core flake and two multidirectional cores. Table 4.22 provides a description of some of the attributes recorded for these materials. All cores were composed of chert, with the core flake composed of fine-grained chert, while the multidirectional cores were composed of fine and coarse-grained chert respectively; none of the cores bore signs of heat treatment. While the core flake and one of the multidirectional cores were recovered from a surface context, the second multidirectional core was recovered from the floor fill of Test Unit 5.

Table 4.22. Core artifacts recovered from Con Cob Site.

Core Type	**Depth**	**Texture**	**Cortex**	**Length (cm)**	**Width (cm)**	**Thickness (cm)**	**Weight (g)**
Core Flake	Surface	Fine	0%	4.11	3.44	1.46	22.9
Multidirectional	20-30 cm	Fine	1-25%	4.28	3.69	2.96	32.7
Multidirectional	Surface	Coarse	1-25%	2.69	2.68	2.33	27.6

<u>Debitage</u>

The debitage assemblage included 53 (17.4%) complete flakes, 146 (47.9%) proximal fragments, 20 (6.6%) distal fragments, three (1%) lateral fragments, 21 (6.9%) medial fragments, 43 (14.1%) indeterminate fragments, and 19 (6.2%) shatter. Table 4.23 displays the average size dimensions and weight ranges of all complete flakes and Table 4.24 displays the percentage of cortex on the dorsal face of the complete flakes. For the size classes of complete flakes, Class 2 (1/4" – 1/2") accounted for 23 (43.4%) of the complete flakes. This was followed by Class 3 (1/2" – 3/4") which was made up of 15 (28.3%) flakes. Class 4 (3/4" – 1") was made up of 7 (13.2%) flakes, Class 5 had 5 (9.4%), and Class 1 (<1/4") had 3 (5.7%) flakes. As with the other sites under study, fine-grained chert made up a majority of the debitage with 182 (59.7%) flakes (Figure 4.26). This was followed by medium-grained chert flakes with 80 (26.2%) and fine-grained chalcedony flakes with 32 (10.5%). Other medium-grained materials included four quartzite flakes and one chalcedony flake which together made up 1.6% of the debitage sample. Other coarse-grained materials included four chert flakes which made up 1.3% of the debitage sample. Finally, two very coarse-grained basalt flakes made up 0.7% of the debitage sample; it is possible that one of these basalt flakes may have been a flaked from a ground stone. Heat treated flakes made up 51.5% of the debitage, while flakes with no signs of heat treatment made up 36%, and indeterminate made up 12.5%.

Table 4.23. Size and weight summaries of complete flakes at Corn Cob Site.

Complete Flake (n=53)	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Average	2.39	1.55	0.45	2.48
Range	0.83 – 5.54	0.35 – 3.84	0.1 – 1.45	0.06 – 28.1

Table 4.24. Percentage of cortex on the dorsal face of complete flakes.

Amount of Cortex	**0%**	**1-25%**	**26-50%**	**51-75%**	**76-99%**	**100%**
Complete Flakes	30 (56.6%)	18 (33.9%)	1 (1.9%)	2 (3.8%)	1 (1.9%)	1 (1.9%)

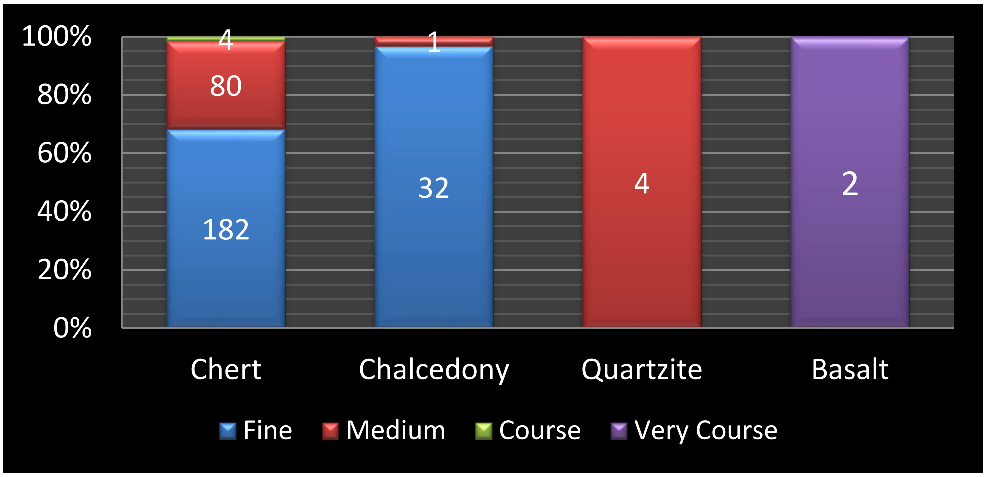


Figure 4.26. Percentage and number of flakes by material and texture.

One hundred and ninety-nine flakes retained platforms. Of these flakes, 82 (41.2%) were single-facet platforms, 40 (20.1%) were cortical platforms, 28 (14.1%) were multi-facet platforms, 42 (21.1%) were abraded platforms, and 7 (3.5%) were split platforms. The presence of lipping on these flakes accounted for 25 (12.6%) of these flakes, while 174 (87.4%) did not include a lip.

Dorsal scars counts on compete flakes show that flakes bearing three or more dorsal scars make up the majority with 44 (83%) flakes (Figure 4.27). Complete flakes bearing two dorsal scars included seven (13.2%) flakes. Complete flakes bearing one dorsal scar and no scars each had one flake and together made up 3.8% of this sample. The debitage type (Figure 4.28) for complete flakes included 1 (1.9%) primary decortication flake, 19 (35.9%) secondary decortication flakes, 17 (32.1%) bifacial thinning flakes, 2 (3.8%) bifacial rejuvenation flakes, and 14 (26.4%) tertiary flakes.

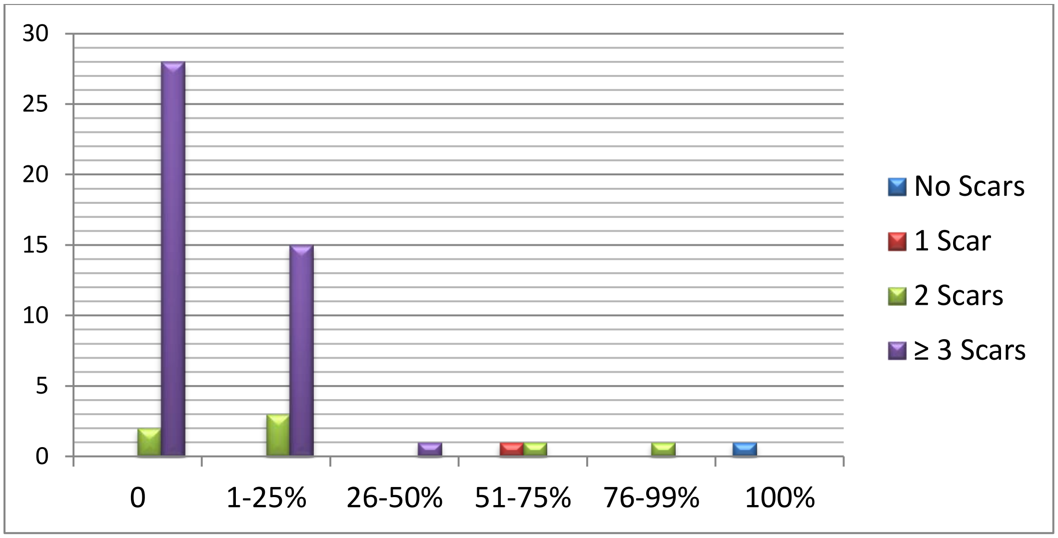


Figure 4.27. Percentage of cortex by number of dorsal scars for complete flakes.

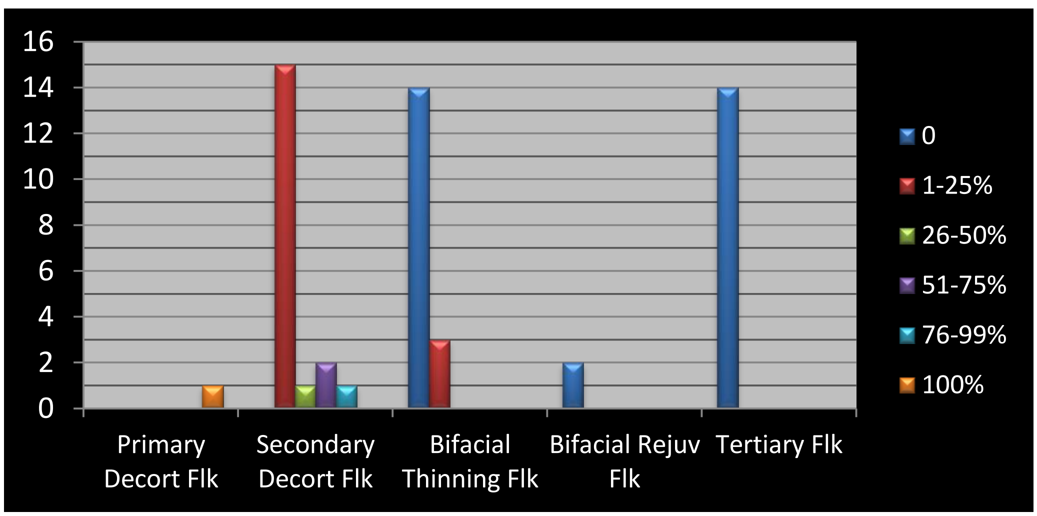


Figure 4.28. Complete flake debitage type by percentage of cortex.

Tool and Raw Material Use Intensity

The number of retouched margins on unifacial tools ranged from one to three edges. However, 7 tools had only one retouched edge, making up 58.3% of the unifacial tools, with 4 tools bearing two retouched edges (33.3%), and 1 tool with three reworked edges (8.3%). This indicates that tools were not used intensively at the site. As it pertains to raw material use intensity, the percentage of complete unused flakes that could have been used as tools – those larger than the smallest tool – was 32.1% and included 17 of the 53 complete flakes. This indicates that raw material may have been used more intensively and that fine-grained materials were being conserved. This is questionable, because of majority of these unused flakes were fine grained chert (n=10) and chalcedony (n=3). However, as stated above, there was a preference to form bifacial and unifacial technology from fine-grained chert and chalcedony. Thus, it is possible that raw material was being conserved at this site.

ANDRUS CANYON (AZ A: 14: 151 ASM)

Andrus Canyon (AZ A: 15:151 ASM), contained seventeen rooms within two room blocks and a dense artifact scatter. This site, excavated in 2008, was subjected to limited testing. In this case, the site was subjected to a three 2 x 2 meter surface collections and two 1 x 1 meter excavated test units within the site's artifact scatter; subsurface deposits ended 15 cm below the surface. Artifacts were also collected from the general site surface. The ceramic assemblage from the site indicates habitation during the late Pueblo II period (Velasquez 2006). A total of 220 lithics were recovered during excavation.

Given Andrus Canyon's small sample size, all of the artifacts recovered during its excavation were analyzed for this study. The sample consisted of nine (4.1%) tools, three (1.4%) cores, and 208 (94.5%) pieces of debitage; no cobble tools, utilized flakes, or informally retouched flaked were recovered during the site's excavation. The surface assemblage for the debitage was collected from Collection Units 1, 2, and 3; in total 173 pieces of debitage were collected from the surface. The subsurface debitage assemblages were collected from Test Units 4 and 5; Test Unit 4 was placed within Collection Unit 3, while Test Unit 5 was placed with Collection Unit 1. The subsurface assemblage consists of 35 pieces of debitage. Given the extensive features of this site, interpretations based on the lithic assemblage presented below are limited and do not reflect the full range of activities performed here.

Tools

Bifaces

Table 4.25. Biface descriptions from Andrus Canyon.

Preform Stage	Area Recovered	Depth Recovered	Portion	Material	Texture	Heat Treatment
Stage 2	Gen. Site	Surface	Complete	Chalcedony	Fine	IND*
Stage 2	Test Unit 5	10-15 cm	Complete	Chert	Fine	Present
Stage 3	Gen. Site	Surface	Distal	Chert	Fine	Absent
Stage 4	Gen. Site	Surface	Proximal	Chert	Fine	Present

*IND – Indeterminate

Four bifaces were analyzed from the tool artifacts, making up 1.8% of the total lithic artifact assemblage. One distal fragment, one proximal fragment, and one complete biface were collected from the general site surface, while another complete biface was recovered within 10-15 cm below the surface of Test Unit 5. Table 4.25 provides a description of these bifaces. The biface stages indicate that early and middle stage biface production was occurring at the site and probably extended into later stages of biface production as well. If these bifaces are an indication of preference, fine-grained chert and chalcedony was the preferred material of choice for bifacial technology.

Projectile Points

Four projectile points were recovered from Andrus Canyon and made up 1.8% of the sample. One of these points was collected from the surface of Collection Unit 1, the remaining three represent isolate artifacts recovered from the surface within the vicinity of the site. Two of these points, however, were not accounted for during the analysis of these materials. As a result, this section reports only the attributes that were recorded by

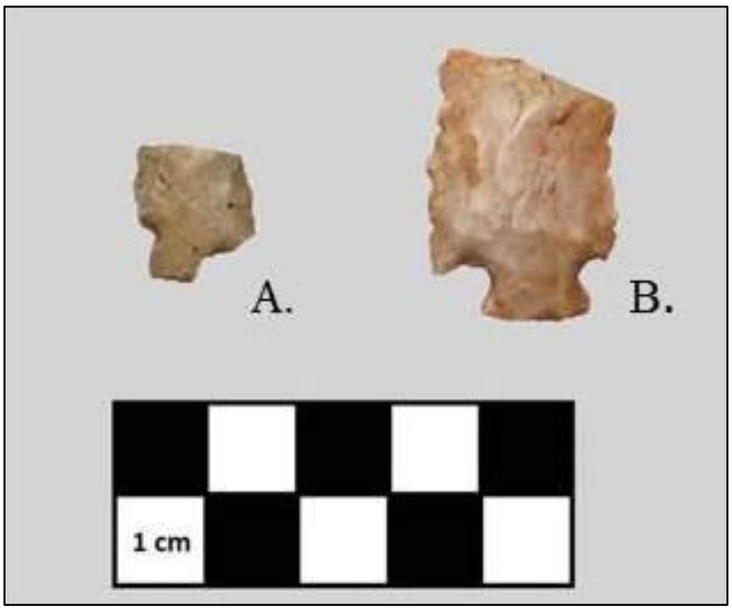


Figure 4.29. Andrus Canyon projectile points. (A) Indeterminate (PD 5 FS 10), (B) Elko Corner Notch (Isolate N 4000864 E 275760).

Table 4.26. Projectile points recovered from Andrus Canyon.

Type	Area Recovered	Retouch	Portion	Material	Texture	Heat Treatment
Elko Corner Notch	Isolate	None	Proximal	Chert	Fine	Present
Indeterminate	Collection Unit 1	Tang	Proximal	Chert	Fine	Present
-	Isolate	-	Complete	Chert	-	-
-	Isolate	All margins	Broken	Obsidian	Very Fine	IND

The last two projectile points were not accountable; IND – Indeterminate.

the site's previous analyst with limited extrapolation based on the attributes recorded. Table 4.26 provides a description of these projectile points.

One of the points accounted for was classified as an Elko Corner Notch which, as discussed above, dates to the Archaic period. It bore no signs of retouch and had only its proximal end. The second point accounted for was an indeterminate point with retouch along its tang. It is possible that this point was being re-worked into a usable form. The two points that were not accounted for included one complete chert point and a broken obsidian point. Although its type is unknown, the previous analyst of this site noted that all of the point's margins were heavily retouched. Martin (2009: 141-142) found that on that Virgin Branch Puebloans on the Uinkaret Plateau did not go to great lengths to preserve the material, possibly due to adequate raw material being present in the area. Hence, while it was exotic it was not a precious commodity. However, heavy retouch on a point in an attempt to re-purpose it would suggest that at this site, such a position may not be accurate.

Scrapers

One scraper was recovered from Andrus Canyon and made up 0.5% of the sample analyzed. This tool was found on the surface of Collection Unit 2 and was composed of fine-grained non-heat treated chert. It bore a 56° edge angle on a single convex edge. It measured 3.72 cm in length, 1.99 cm in width, 1.05 cm in thickness, and weighed 6.6 g.

Cores

Three cores were analyzed from Andrus Canyon and made up 1.4% of the sample analyzed. Table 4.27 provides an overview of these cores. All cores were composed of chert with heat treatment present on only one fine-grained multidirectional core. It is possible that this core was in the process of being reduced to produce usable flakes. Given that the cores had very little cortex and given their small size it is assumed that they were heavily reduced.

Table 4.27. Core artifacts recovered from Andrus Canyon.

Core Type	Depth	Texture	Cortex	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Unidirectional	Surface	Medium	0%	3.53	3.1	1.74	22.7
Multidirectional	0-10 cm	Fine	0%	3.23	2.79	1.65	14.6
Multidirectional	0-10 cm	Medium	1-25%	3.96	3.15	1.98	30.2

Debitage

The debitage assemblage included 39 (18.8%) complete flakes, 99 (47.6%) proximal fragments, seven (3.4%) distal fragments, two (1%) lateral fragments, five (2.4%) medial fragments, 31 (14.8%) indeterminate fragments, and 25 (12%) shatter. The average size, weight, and dimensional ranges of all complete flakes are provided in Table 4.28, and the percentage of cortex on the dorsal face of complete flakes is provided in Table 4.29.

Table 4.28. Size and weight summaries of complete flakes at Andrus Canyon.

Complete Flake (n=53)	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Average	2.3	1.59	0.52	2.52
Range	0.95 – 4.4	0.84 – 3.45	0.12 – 1.35	0.1 - 15

Table 4.29. Percentage of cortex on the dorsal face of complete flakes.

Amount of Cortex	0%	1-25%	26-50%	51-75%	76-99%	100%
Complete Flakes	24 (61.5%)	10 (25.6%)	3 (7.7%)	1 (2.6%)	-	1 (2.6%)

The size classes of complete flakes included all size classes, with a majority falling into Class 2 (1/4" – 1/2") which included 20 flakes (51.3%). This was followed by Class 4 (3/4" – 1") which included eight flakes (20.5%), Class 3 (1/2" – 3/4") which included seven flakes (17.9%), and Classes 5 (>1") and 1 (< 1/4") which both had two flakes respectively (5.1% each).

A majority of the debitage was composed of fine-grained chert with 96 flakes (46.2%) Figure 4.30). This was followed by medium-grained chert which was made up of

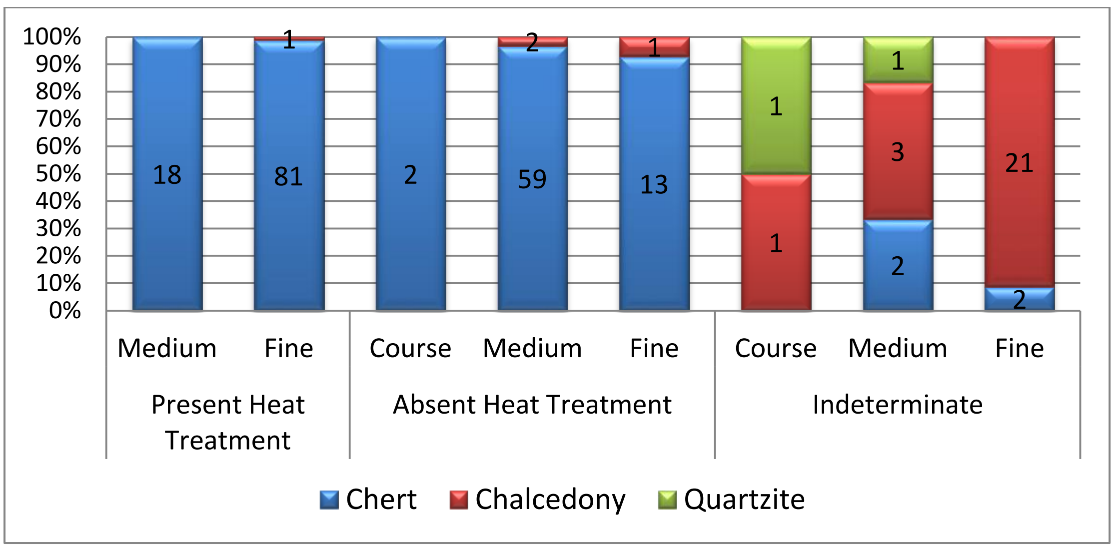


Figure 4.30. Percentage and number of flakes by material and texture.

79 flakes (38%). Fine grained-chalcedony included 23 flakes (11.1%). Other medium-grained materials included five chalcedony flakes and one quartzite flake, which made up 2.9% of the debitage sample. This was followed by coarse-grained materials which included two chert flakes, one chalcedony flake, and one quartzite flake, which in total made up 1.9% of the debitage sample. Heat treatment was present on 100 flakes (48.1%)

of the total debitage sample. Seventy seven flakes (37%) did not exhibit heat treatment, while heat treatment on 31 flakes (14.9%) could not be determined.

One hundred and thirty-eight flakes retained their platforms. Of these flakes 68 (49.3%) were single-facet, 35 (25.4%) flakes were cortical, 20 (14.5%) were multi-facet, and 15 (10.9%) were abraded. Lipping was present on 18 flakes (13%). One hundred and nineteen flakes showed no signs of lipping (86.2%), and one flake (0.7%) was indeterminate.

Dorsal scar counts on complete flakes indicate that 28 out of 39 flakes (71.8%) had three or more dorsal scars. Seven flakes (17.9%) had two dorsal scars, 3 (7.7%) had one dorsal scar, and one flake (2.6%) had no dorsal scars. A majority of complete flakes

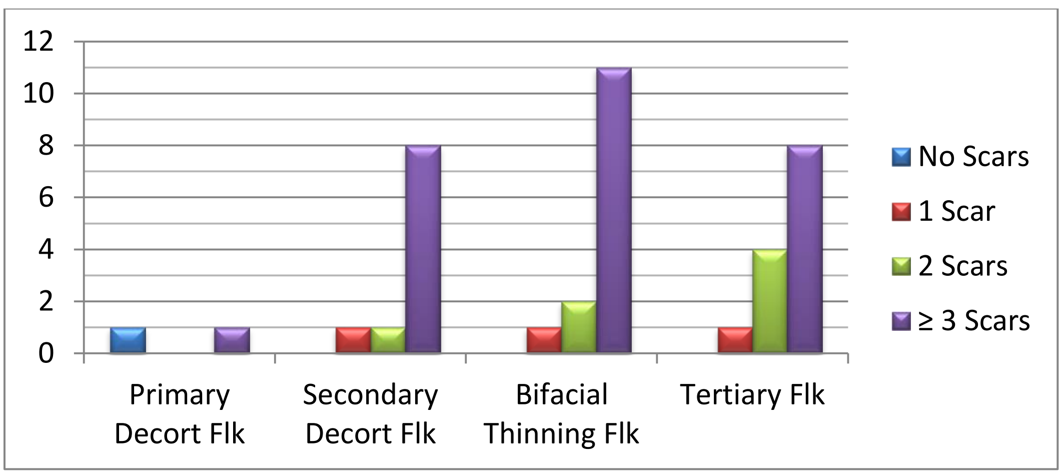


Figure 4.31. Complete flake debitage type by dorsal scar count.

were classified as bifacial thinning flakes and were made up of 14 flakes (35.9%). Thirteen flakes (33.3%) were classified as tertiary flakes, 10 (25.6%) were classified as secondary decortication flakes, and 2 flakes (5.1%) were classified as primary decortication flakes (Figure 4.31).

Tool and Raw Material Use Intensity

One unifacial tool recovered from the site only exhibited a single edge of retouch. However, this cannot be viewed as an accurate portrayal of tool use intensity at the site. The same possibly holds true for raw material use intensity, given the small sample of tools. However, a calculation was established given the adequate amount of complete unmodified flakes. Forty-six percent (n=18) of the complete flakes that could have been used as tools – those larger than the smallest tool – were not used in tool production. This may reflect that some material conservation was occurring at the site as some of the flakes larger than the smallest tool included five medium-grained chert flakes and one coarse-grained chert flake. However, this also included 12 fine-grained chert flakes. Likewise, flakes that were smaller than the smallest tool included seven fine-grained chert flakes, three fine-grained chalcedony flakes, and 11 medium-grained chert flakes. It is expected that if material conservation were occurring at this site then those flakes that were larger than the smallest tool would not have been composed of more fine-grained raw material. Still, sample size may have affected these results.

COYOTE SITE (AZ A: 14: 82 ASM)

Coyote Site (AZ A: 14:82 ASM) is a pueblo consisting of eight structural features and a plaza excavated in 2010 and 2011. During the 2010 field work, seven of the eight features were partially or totally excavated and surface artifacts were collected from four collection units around the site. Because it could not always be discerned if a feature was a room, all constructs were labeled “features.” The 2011 excavation focused primarily on excavating the plaza. In total, an area of 132.4 m^2 was excavated. A high presence of corrugated sherds in the ceramic collection indicates that the site dates to the early Pueblo

III period (Harry 2012: 24). Flotation samples from the site yielded evidence of a mixed subsistence base dependent on corn and wild resources. However, an equal proportion of agave and maize was recovered from the site, which was unusual because agave remains were not recovered at the other sites. This suggests that the residents here emphasized agave gathering and processing.

A total of 2,531 lithic artifacts were collected during the 2010 and 2011 excavations. The sample analyzed from Coyote Site included 457 lithic artifacts encompassing almost every artifact type identified during this study. Of the sample 87 (19%) of the artifacts analyzed were tools and cobble tools, cores were made up of 35 items (7.6%), and debitage included 335 flakes (73.3%). Debitage collected from the surface included 183 flakes and were collected from one collection unit (Collection Unit 4). Subsurface debitage included 152 flakes and were collected almost entirely from floor fill, with the exception of one which came from a room fill context above the floor. Specifically subsurface debitage were collected from Features, 1, 3, 4, 5, and 6.

Tools

Bifaces

Forty-one bifaces were recovered from Coyote Site, making up 8.9% of the sample analyzed. Forty of these were accounted for in the collection, while one (a broken obsidian biface) was not accounted for, but is included in this sample when applicable; this biface was collected from the surface. Of these bifaces 26 came from a surface context, while the remaining 15 came from a subsurface context. Biface stages included12 stage two bifaces (29.3%), 17 stage three bifaces (41.5%), 11 stage four

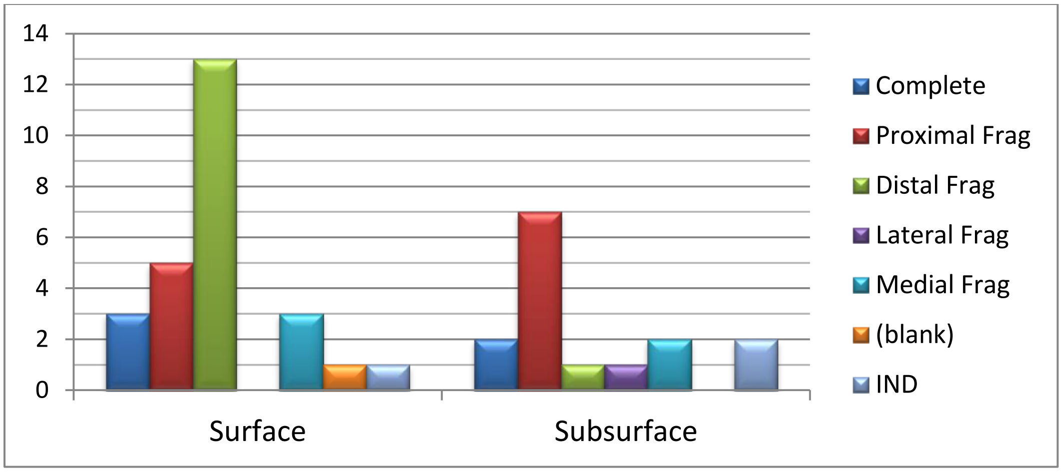


Figure 4.32. Bifaces portions found in surface and subsurface contexts.

bifaces (26.8%), and one biface which could not be determined; the final biface refers to the missing obsidian biface. Although this item was broken its thickness (0.35 cm) suggests that it was possibly a stage four or five biface.

A majority of these bifaces were broken, with five complete biface recovered in total, three of which were recovered from the surface (Figure 4.32). Of the five complete bifaces, one was a stage one biface while the remaining four were stage two bifaces. Stage three and stage four bifaces were composed of fragments. A majority of the bifaces were distal fragments made up of14 items (34.1%), followed by proximal fragments with 12 items (29.3%).

Twenty-one of the bifaces recovered were composed of fine-grained chert which made up a majority of the sample (51.2%). Bifaces composed of medium-grained chert included 14 items (34.1%). Bifaces composed of fine-grained chalcedony included four items (9.7%), while the remaining very-fine grained (obsidian) biface and a single medium-grained chalcedony biface represented 2.4% each. Heat treatment was present on 32 items (78%) all of which were chert, with two chert bifaces (4.9%) with no signs of heat treatment. The remaining seven bifaces (9.7%) were indeterminate and included five chalcedony bifaces, one chert biface, and one obsidian biface.

Projectile Points

Ten projectile points were recovered from Coyote Site, making up 2.2% of the sample analyzed. Eight of these points were recovered from surface contexts, while the remaining 2 were recovered from 0-10 cm below the surface of Feature 1 and test unit 22 (just outside of Feature 3. Table 4.30 provides a description of these artifacts. Two points can be said to be contemporaneous with the site; in this case, the single Parowan Basal Notch point and the single Bull Creek point. Bull creek points are found in the Southwest, California, and the Great Basin appearing in the archaeological record around A.D. 900 continuing into the Historic period (Justice 2002: 265). However, the

Table 4.30. Projectile points recovered from Coyote Site.

Type	**Depth**	**Retouch**	**Portion**	**Material**	**Texture**	**Heat Treatment**
Bull Creek	Surface	-	Proximal	Chert	Fine	Present
Elko Side Notch	Surface	Base and margins	Proximal	Chalcedony	Fine	Present
Elko Side Notch	Surface	-	Proximal	Chert	Fine	Present
Elko Side Notch	0-10 cm	-	Proximal	Chert	Fine	Indeterminate
Indeterminate	0-10 cm	1 lateral margin	Proximal	Chert	Fine	Present
Indeterminate	Surface	-	Proximal	Chert	Fine	Absent
Parowan Basal Notch	Surface	-	Proximal	Chalcedony	Fine	Indeterminate
Pinto	Surface	Tang	Complete	Chert	Fine	Present
Pinto	Surface	1 lateral margin	Complete	Chert	Fine	Present
San Raphael Stemmed	Surface	-	Complete	Chert	Medium	Present

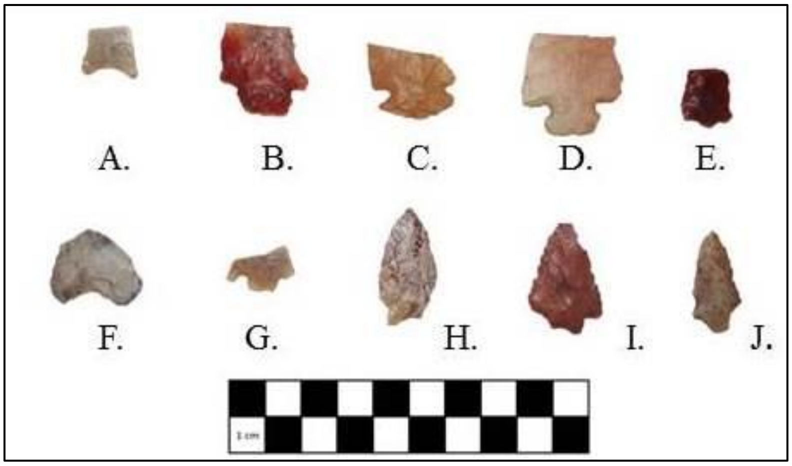


Figure 4.33. Coyote Site projectile points. (A) Bull Creek (PD 120 FS 9), (B) Elko Corner Notched (Catalog # 11282). (C) Elko Side Notched (# 10947), (D) Elko Side Notched (# 17326), (E) Indeterminate (# 10833), (F) Indeterminate (# 20075), (G) Parowan Basal (PD 122 FS 9), (H) Pinto (# 10875), (I) Pinto (# 11100), (J) San Raphael Stemmed (# 11903).

association between these points and the site cannot be fully accepted as both were recovered from the surface. Remarkably, with the exception of two points whose type could not be determined, the rest of the points date multiple times in the Archaic Period. Four projectile points displayed retouch along a side margin or base indicating that they were being reused. However, as these points are not temporally diagnostic of the site, it cannot be determined if this retouch occurred during the site's occupation or during the Archaic period.

With the exception of one San Raphael Stemmed point, all projectile points were composed of fine-grained chert and chalcedony. Also all points, with the exception of those flaked from chalcedony, exhibited signs of heat treatment. However, while these attributes may be meaningful in discerning raw material use on the Parowan Basal Notch and Bull Creek points, these same attributes are not as helpful when examining the surface collected Archaic Period points.

Drills

Two drills were analyzed, making up 0.4% of the sample. Of these drills, one was a medial fragment recovered from the surface, while the other was a complete drill recovered at 0-10 cm from Feature 1. The complete drill measured 3.03 cm in length, 3.1 cm in width, and 0.57 in thickness, with a weight of 4.46 g. Both drills were composed of fine-grained heat treated chert.

Utilized Flakes and Informally Retouched Flakes

Eighteen utilized flakes and five informally retouched flakes were recovered from Coyote Site and make up 5% of the sample analyzed. Eleven utilized flaked were recovered from the surface, while the remaining seven were found in subsurface contexts; one of these items came from floor fill in Feature 6. Four informally retouched flakes were recovered from a surface context, while one came from floor fill in Feature 3. Most utilized flakes were composed of fine-grained chert which were followed by medium-grained chert (Figure 4.34). Informally retouched flakes included two flakes

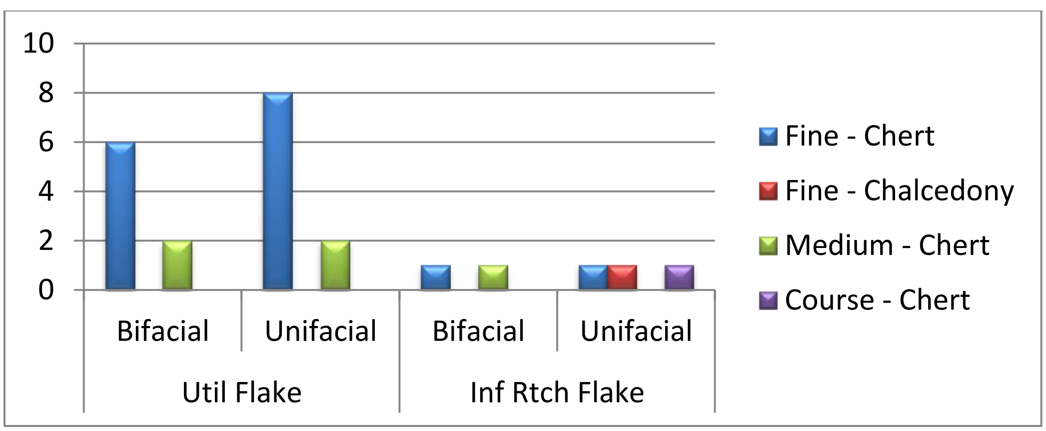


Figure 4.34. Utilized flakes and informally retouched flakes, retouch by texture and raw material.

composed of fine-grained chert, and one flake composed of fine-grained chalcedony, medium-grained chert, and coarse-grained chert respectively. As for heat treatment, utilized flakes contained more items with signs of heat treat with 15 flakes, and three flakes with no signs of heat treatment. Informally retouched flakes included one heat treated flakes, two non-heat treated flakes, and two that could not be determined. Eight utilized flakes exhibited bifacial retouch as did two of the informally retouched flakes. The edge angle of these items included an equal number of utilized flakes exhibiting edge angles greater and less than 40° with nine flakes below and above this measure (Figure 4.35). Conversely, informally retouched flakes had edge angles

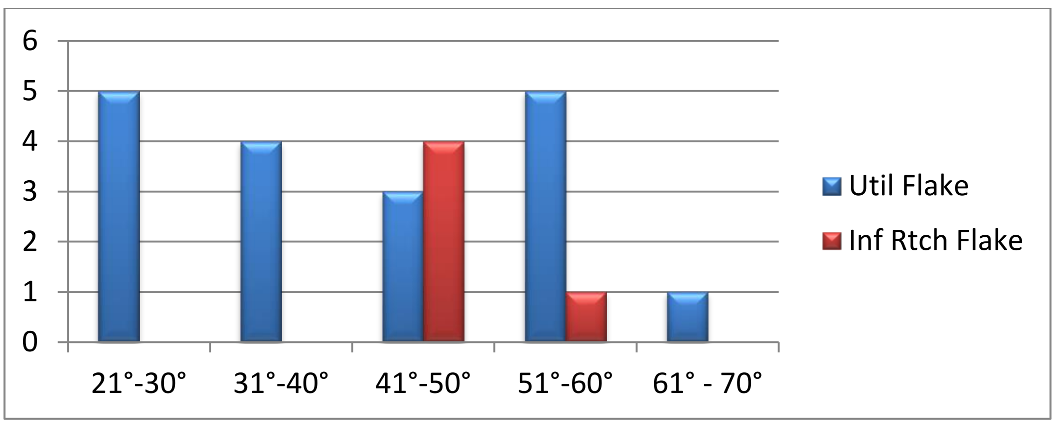


Figure 4.35. Edge angles of utilized and informally retouched flakes at Coyote Site.

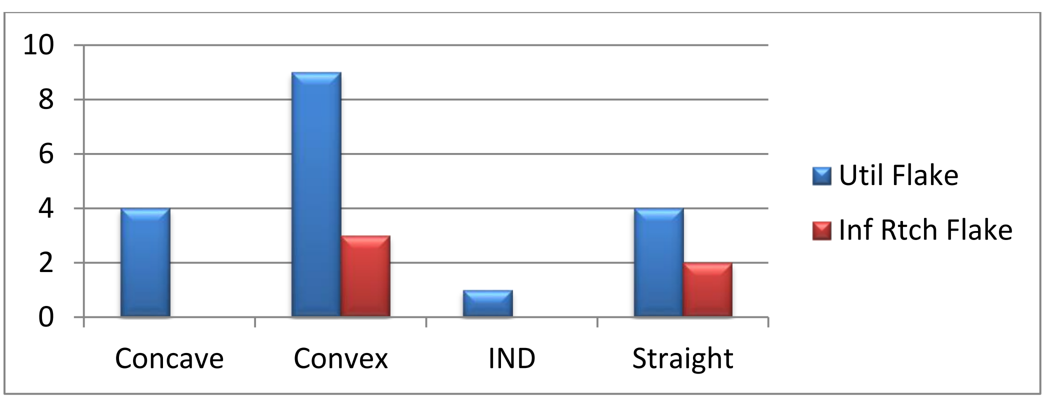


Figure 4.36. Edge shape of utilized flakes and informally retouched flakes.

above 40°. Convex edges made up a majority in both utilized and informally retouched flakes. Utilized flakes also had 4 concave edged flakes, 4straight edges flakes, and asymmetrical edged flake. Two informally retouched flakes had straight edges.

Scrapers

Ten scrapers were analyzed from the sample, making up 2.2% of the sample. Six of these were recovered from surface contexts, with the remaining four recovered from subsurface contexts in Features 1, 4, 6, and 7. A majority of scrapers (n=7) were composed of fine-grained chert, with three flaked composed of medium-grained chert. Eight of the scrapers had be signs of heat treatment, while one exhibited no signs of heat treatment, and one which could not be determined. Nine scrapers exhibited convex edge shapes and one exhibited a straight edge. A majority of scrapers also bore edge angles greater than 50° with a majority of these falling between 51° - 60°.

Cobble Tools

One chopper/pecking stone was recovered from the general site surface making up 0.2% of the analyzed sample. The tool is large, measuring 7.89 cm in length, 6.29 cm in width, 4.86 cm in thickness, and weighs 315.93 g. It had 26-50% cortex and is composed of fine-grained heat treated chert. Its single working edge is a bifacially retouched with a straight edge margin bearing an edge angle of 73°.

<u>Cores</u>

Thirty-five cores were recovered from Coyote Site, making up 7.6 of the analyzed sample. These cores included four unidirectional cores, one bidirectional core, 25 multidirectional cores, two bifacial cores, and four core flakes. Sixteen of these cores (2 bifacial cores, 11 multidirectional cores, and 3 unidirectional cores) were recovered from the surface. The remaining artifacts were recovered from a subsurface context; of these,

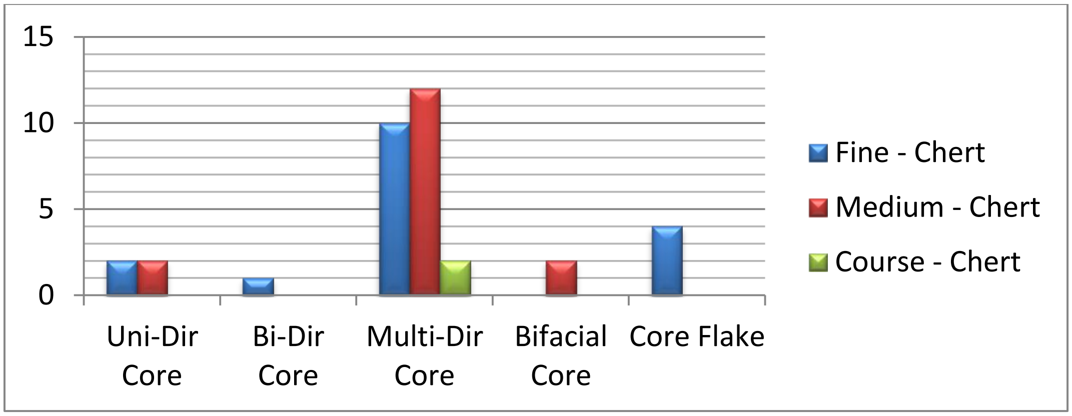


Figure 4.37. Core types by material texture and raw material.

Table 4.31. Heat treatment on Coyote Site core assemblage.

Core Types	**Present**	**Absent**	**Indeterminate**	**Count**
Unidirectional Core	3	1	-	**4**
Bidirectional Core	1	-	-	**1**
Multidirectional Core	13	10	1	**24**
Bifacial Core	1	1	-	**2**
Core Flake	4	-	-	**4**
Total	**22 (62.9%)**	**12 (34.3%)**	**1 (2.8%)**	**35**

Table 4.32. Percentage of cortex on cores from Coyote Site.

Core Types	**0%**	**1-25%**	**26-50%**	**51-75%**	**Count**
Unidirectional Core	-	1	1	2	**4**
Bidirectional Core	-	1	-	-	**1**
Multidirectional Core	5	16	3	-	**24**
Bifacial Core	2	-	-	-	**2**
Core Flake	1	1	1	1	**4**
Total	**8 (22.8%)**	**19 (54.3%)**	**5 (14.3)**	**3 (8.6%)**	**35**

one core flake came from the floor fill context in Feature 4. Multidirectional cores composed the majority of the core types recovered from Coyote Site, making up 69.4% of the sample. The raw material and texture of cores included items composed of chert, with fine-grained chert (n=17) holding a slight majority over medium-grained chert (n=16), with two coarse-grained chert nodules remaining (Figure 4.37). Heat treatment was present on 22 (62.9%) of the cores, while 12 cores (34.3%) did not exhibit heat treatment, and 1 core could not be determined (Table 4.31). Additionally, 77.1% of cores had less than 25% of their cortex (Table 4.32).

Debitage

The debitage sample included 26 complete flakes (9.7%), 130 proximal fragments (48.7%), 16 distal fragments (6%), 25 lateral fragments (9.4%), 27 medial fragments (10.1%), 30 indeterminate fragments (11.2%) and 13 (4.9%) pieces of shatter. Table 4.33 displays the average size dimensions and weight ranges of all complete flakes and Table 4.34 displays the percentage of cortex on the dorsal face of these flakes. For complete flakes, a majority of flakes fell into Class 2 (1/4" – 1/2") with 9 flakes (34.6%). However,

Table 4.33. Size and weight summaries of complete flakes at Coyote Site.

Complete Flake (n=26)	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Average	2.52	1.85	0.55	3.93
Range	0.55 – 6.42	0.52 – 4.02	0.14 – 1.15	0.05 – 30.7

Table 4.34. Percentage of cortex on the dorsal face of complete flakes.

Amount of Cortex	0%	1-25%	26-50%	51-75%	76-99%	100%
Complete Flakes	21 (80.7%)	3 (11.5)	1 (3.9%)	1 (3.9%)	-	-

this was followed closely by flakes falling within Class 4 (3/4" – 1") with 8 flakes (30.8%). Five flakes (19.2%) made up Class 3 (1/2" – 3/4"), 3 flakes (11.5%) made up Class 1 (<1/4"), and one flake (3.9%) made up Class 5 (>1").

Fine-grained chert made up a majority of the debitage with 251 flakes (74.9%). This was followed by medium-grained chert with 71 flakes (21.2%). Eight flakes were composed of fine- grained chalcedony (2.4%), and five flakes were composed of coarse-grained chert (1.5%). For heat treatment, 259 flakes (77.3%) had evidence of heat treatment, 65 flakes (19.4%) exhibited no signs of heat treatment, and 11 flakes (3.3%) were indeterminate.

One hundred and seventy-one flakes retained a platform. Of these, 71 flakes (41.5%) had single-facet platforms and made up the majority. Cortical platforms made up 16 of these flakes (9.4%), multi-facet platforms included 28 flakes (16.4%), abraded platforms included 53 flakes (31%), and split platforms included three flakes (1.7%). Of the 171 flakes that retained their platforms, 130 flakes did not have lipping (76%), 36 flakes (21.1%) had lipping, and five flakes (2.9%) could not be determined.

Unlike the other sites, with the exception of To'tsa (AZ: A: 14: 283 ASM), which

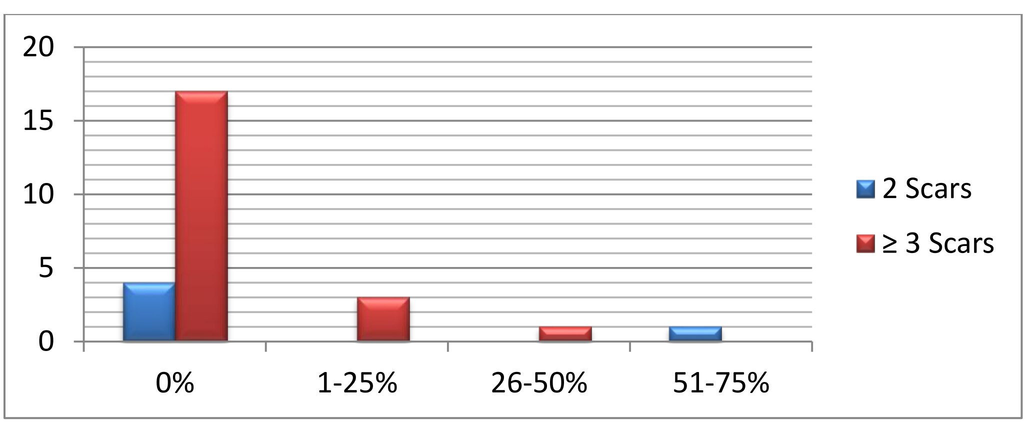


Figure 4.38. Percentage of cortex by number of dorsal scars for complete flakes.

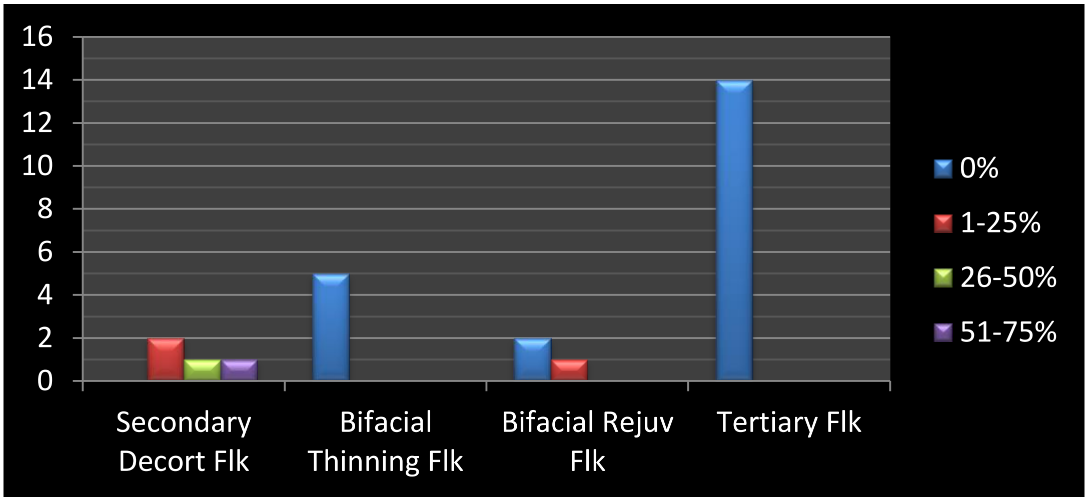


Figure 4.39. Complete flake debitage type by percentage of cortex.

contained complete flakes bearing zero or one dorsal scar, Coyote Site's complete flake assemblage included 21 flakes with three of more dorsal scars (80.8%) and five flakes with two flake scars (19.2%) (Figure 4.38). The debitage type for complete flakes included 4 flakes (15.4%) identified as secondary decortication flakes, 5 bifacial thinning flakes (19.2%), 3 bifacial rejuvenation flakes (11.5%) and 14 tertiary flakes (53.9%) (Figure 4.39).

<u>Tool and Raw Material Use Intensity</u>

The number of retouched edges on unifacial tools ranged from one to three edges. Eighteen of these tools (78.3%) had one retouched edge, 4 tools (17.4%) had two retouched edges, and 1 (4.3%) tool had three retouched edges. These numbers indicate that tools were not intensely used at the site. The percentage of complete flakes larger than the smallest complete tool – those that could have been used as tools – was 65.4% and included 17 out of 26 complete flakes. This indicates that raw material was not used that intensively at Coyote Site. The larger complete flakes were composed of fine-grained materials and were heat treated; this same trend holds true for those smaller than the smallest complete tool as well. All of this indicates that the inhabitants of Coyote Site had access to abundant fine-grained materials that could be easily flaked or easily modified for flaking.

PETER'S POCKET (12-034)

Peter's Pocket (12-034) was excavated during the summer 2012 field season. Peter's Pocket is a dispersed site believed to date to the middle P II period. It consists of eight rooms and a rock rubble feature, designated as Features 1 through 9, and a large, dense artifact scatter. However, these room blocks are discontinuous and, as a result, there is a possibility that they may not be contemporaneous (Karen Harry, personal communication, 2014). Two test units were excavated within two of the eight rooms. The total area excavated at this site was 3 m^2 with a volume of 1.05 m^3 of soil moved. A majority of the recovered artifacts came from ten surface collection units which encompass 521 m^2 of the site. This site contains a large "figure 8" structure comprised of two contiguous rooms; this structure is distinct from other structures that have been found on the Shivwits Plateau. A total of 3,389 lithic artifacts were recovered during the 2012 field season.

The sample analyzed from Peter's Pocket included 478 lithic artifacts. Of this sample, 113 were tools and cobble tools (23.6%), cores included 27 items (5.7%), and debitage included 338 flakes (70.7%). Debitage collected from the surface included 150 flakes and were collected from Feature 7. The debitage collected from the subsurface included 188 flakes, 123 of which were collected from the feature fill context of Feature

6 (30-40 cm below the surface). The remaining 65 flakes were collected from the floor context of Feature 6 (40-50 cm below the surface).

Tools

Bifaces

Fifty-five bifaces were recovered from Peter's Pocket and make up 11.5% of the sample analyzed. A majority of these bifaces (n=47) were recovered from a surface context, while the remaining eight were recovered from the subsurface contexts; two came from Feature 5 (20-30 cm below the surface), five came from a feature fill context in Feature 6, and two came from the floor context of Feature 6. Biface stages included one indeterminate stage biface (1.8%) (a very small lateral portion), 17 stage two bifaces (30.9%), 20 stage three bifaces (26.4%), 15 stage four bifaces (27.3%), and two stage five bifaces (3.6%). Three complete bifaces came from subsurface context and included two stage three biface and one stage four biface. The two bifaces recovered from the floor context of Feature 6 were both lateral portions of a stage two and stage three biface

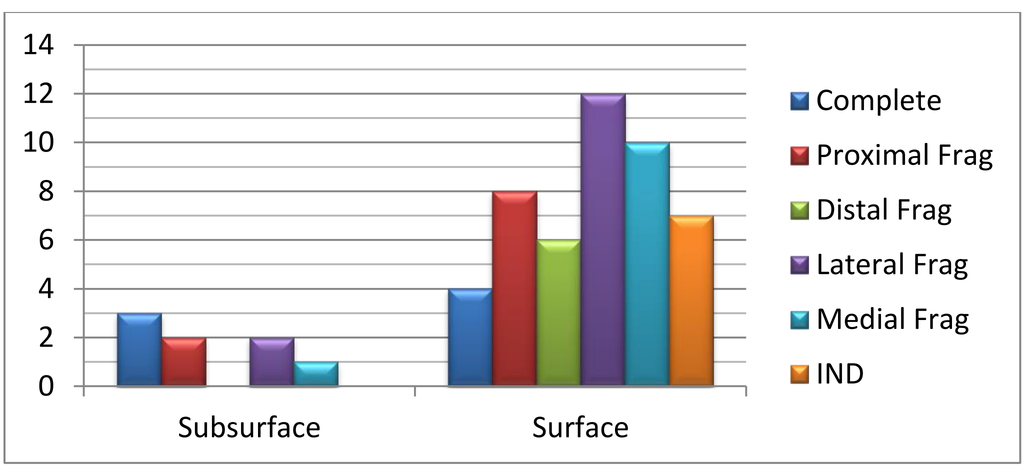


Figure 4.40. Biface portions found in surface and subsurface contexts.

respectively. As observed in Figure 4.40 a majority of the bifaces were broken with most being lateral and medial portions. The portion of seven bifaces could not be determined as these were too small and fragmented for identification.

Similar to bifaces recovered from the other sites, a majority of the bifaces were flaked from chert (n=52), while the remaining three were chalcedony. However, material texture was very different in that fine-grained chert did not make up the majority of raw material (Figure 4.41). In this case, medium-grained chert made up a majority of the raw material with 32 items (58.2%). This was followed by fine grained-chert with 19 items (34.5%). One coarse-grained chert biface was recovered as well (1.8%). Three chalcedony bifaces were of fine, medium, and coarse-grained quality respectively (1.8% each). Bifaces followed a similar trend as seen at the others sites, in that a majority of them (n=27; 49%) showed signs of heat treatment, while 17 (31%) had no heat treatment; heat treatment on the remaining the remaining 11 (20%) could not be determined.

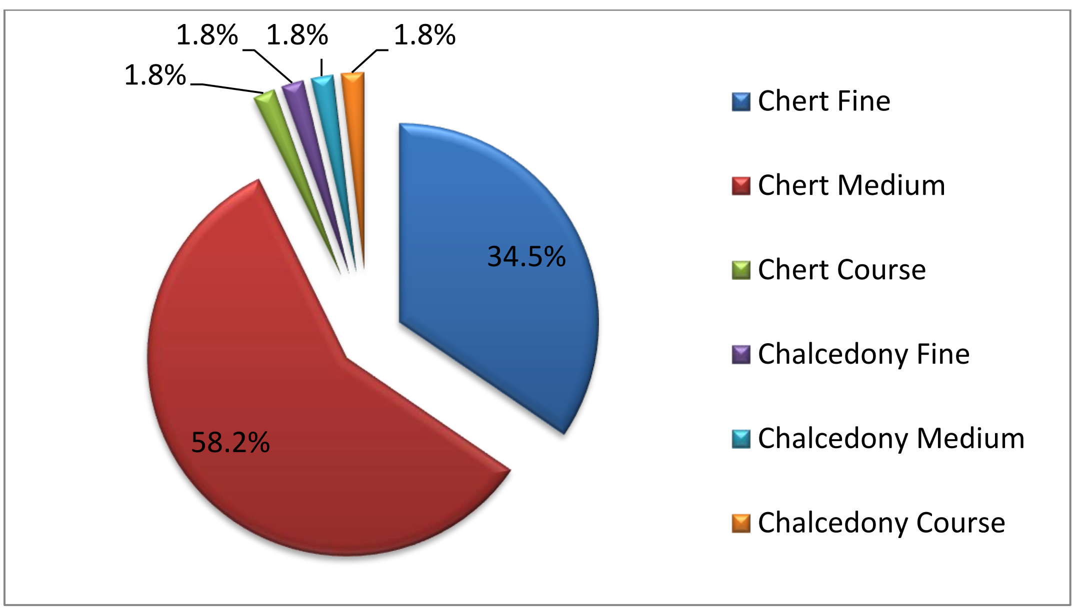


Figure 4.41. Percentage of biface raw material and texture composition.

Projectile Points

Four projectile points were recovered from Peter's Pocket, and make up 0.8% of the sample analyzed. One projectile point was not accounted four during the analysis. It represented one of two subsurface projectiles point and was recovered from Test Unit 2 within 20-30 cm of the surface; the second point was found in the floor context of Feature 6. Table 4.35 describes some of the attributes recorded for the projectile points recovered. The missing point retained only its proximal end and like the other projectile points was composed of chert. The other three points had a fine grained texture. Of these three points, only one could be identified by type; in this case, it was a Parowan Basal Notch point with retouch along its base and one lateral margin. While it could have been

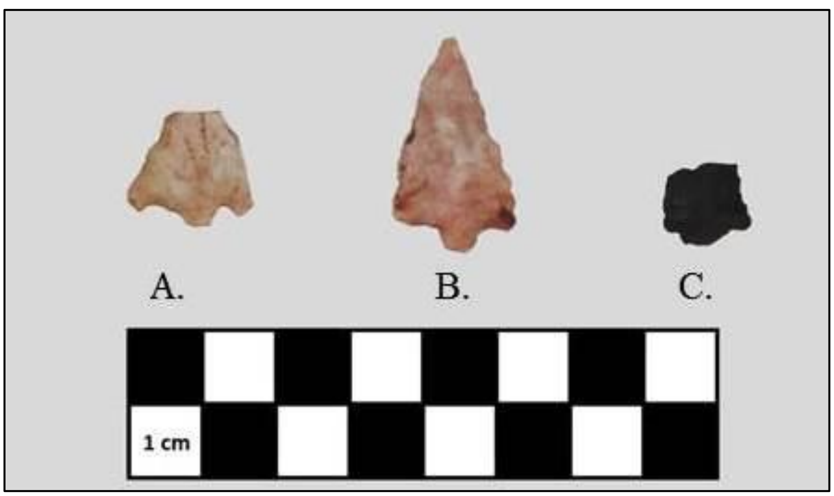


Figure 4.42. Peter's Pocket projectile points. (A) Parowan Basal Notch (PD 13 FS 2), (B) Indeterminate (PD 0 FS 17), (C) Indeterminate (PD 19 FS 2).

Table 4.35. Projectile points recovered from Peter's Pocket.

Type	Portion	Heat Treatment	Retouch
Parowan Basal Notch	Proximal	Present	Base and 1 lateral margin
Indeterminate	Complete	Present	
Indeterminate	Proximal	Present	Base
-	Proximal	-	-

produced by the inhabitants of this site, its surface context does not allow it to be diagnostic of the time of occupation. This is heightened by the possibility that the site may have been occupied at multiple times. The remaining two projectile points included a complete indeterminate point and a proximal indeterminate point. The complete point is unusual in that it was discarded before completion; it was produced from a small flake as opposed to resulting from biface reduction. The proximal indeterminate point appears to be in the process of re-hafting as its base shows signs of retouch. However, due to its surface context it cannot be determined at what time this task was performed.

Drills

Table 4.36. Drills recovered from Peter's Pocket.

Area Recovered	Depth Recovered	Material	Texture	Portion
Feature 6	Surface	Chert	Fine	Distal
Feature 6	0-10 cm	Chalcedony	Fine	Indeterminate
General Site	Surface	Chert	Fine	Complete

Figure 4.43. Peter's Pocket drills. (A) PD 7 FS 2, (B) PD 1 FS 2, (C) PD 0 FS 13.

Three drills were recovered from Peter's Pocket and make up 0.8% of the sample analyzed. Of these items, one drill (a drill perforator) came from a subsurface context, in this case from Test Unit 1 in Feature 6 within 0-10 cm of the surface. This drill was composed of fine- grained chalcedony and was not heat treated. Table 4.36 provides a description of some of the attributes recorded for the drills recovered.

Utilized Flakes and Informally Retouched Flakes

Twenty-nine utilized flakes and eighteen informally retouched flakes were recovered from Peter's Pocket and make up 9.8% of the sample analyzed. A vast majority of each tool type was recovered from a surface context; one utilized flake was recovered from Feature 6 within 20-30 cm below the surface and two informally retouched flakes were recovered from the same context.

Utilized flakes were composed of an almost equal number of medium-grained chert (n=14) and fine-grained chert (n=13), with the remaining two composed of coarse-grained chert. Informally retouched flakes were primarily composed of fine-grained chert

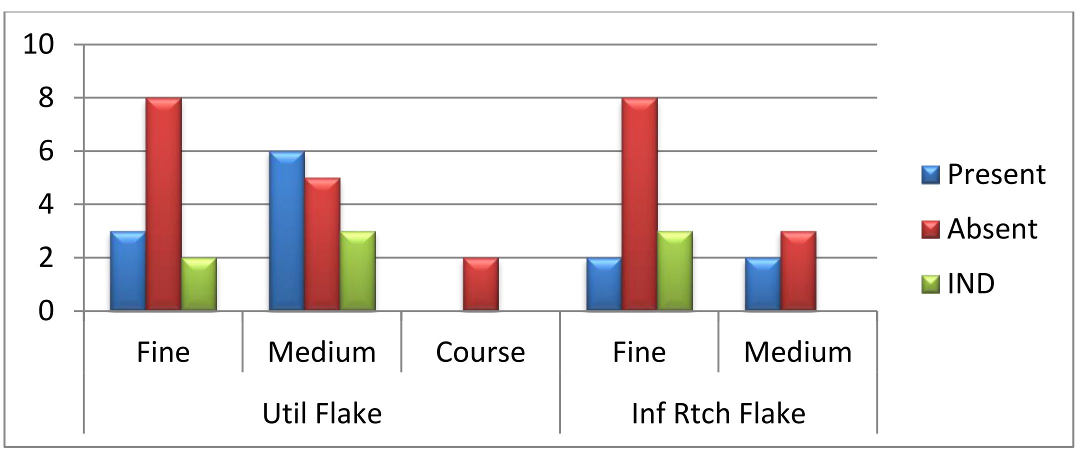


Figure 4.44. Utilized flakes and informally retouched flakes by texture and heat treatment.

(n=13) with the remaining flakes composed of medium-grained chert (n=5). For both tool types, a majority of the items were not heat treated (Figure 4.44).

Both utilized flakes and informally retouched flakes had only unifacial retouch. Most utilized flakes bore edge angles less than 40° making up 72.4% of these items (n=21). Most informally retouched flakes bore edge angles less than 40° as well, making up 77.8% of these items (n=14) (Figure 4.45). A majority of utilized flakes bore convex edge angles making up 48.3% of the utilized flakes, with other edge shapes found in

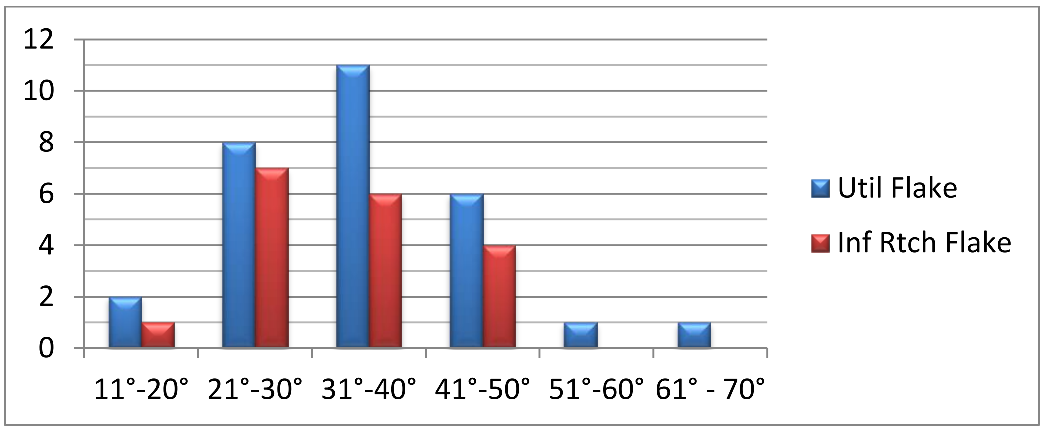


Figure 4.45. Edge angles of utilized and informally retouched flakes at Peter's Pocket.

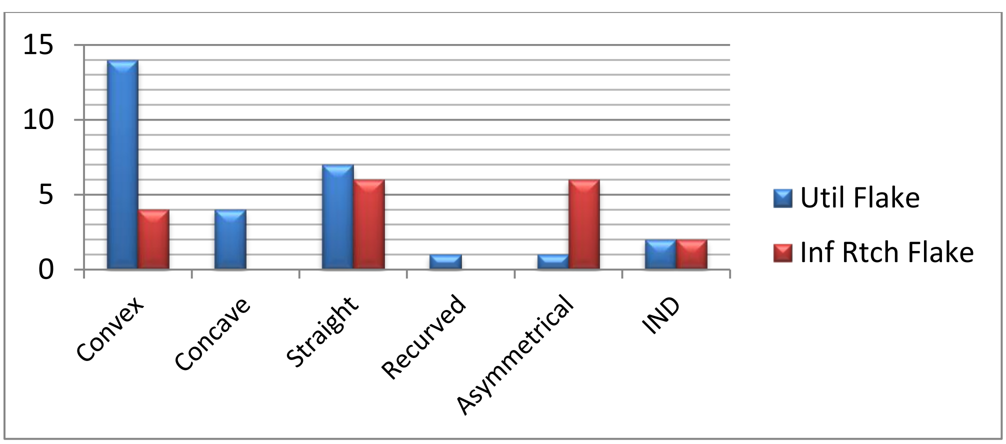


Figure 4.46. Edge shape of utilized flakes and informally retouched flakes.

smaller proportions (Figure 4.46). For informally retouched flakes, straight and asymmetrical edges made up the majority of these items with 6 flakes a piece (33.3% each).

Scrapers

One scraper was recovered from Peter's Pocket and makes up 0.2% of the samples analyzed. This artifact was recovered from the surface of Feature 7 and was composed of medium-grained chert that showed no signs of heat treatment. It had a single unifacial retouched working edge with a straight edge shape measuring 67°. It also had 26 – 50% cortex and measured 4.74 cm in length, 2.97 cm in width, 1.32 cm in thickness, and weighed 25.5 g.

Cobble Tools

Three cobble tools were recovered from Peter's Pocket, making up 0.6% of the sample analyzed. These tools included two core/hammer stones, and one hammer stone. All items were recovered from the surface with the two core/hammer stones recovered from Feature 4 & 5 and the hammer stone recovered from Feature 1. Table 4.37 provides a description of the cobble tools recovered. All cobble tools are composed of medium and

Table 4.37. Cobble Tools recovered from Peter's Pocket.

Artifact	**Material**	**Texture**	**Heat Treatment**	**Cortex**	**Length (cm)**	**Width (cm)**	**Thick (cm)**	**Weight (g)**
Core/Hammer Stone	Chert	Medium	Absent	26-50%	8.37	7.87	4.06	265.2
Core/Hammer Stone	Quartzite	Coarse	IND	51-75%	3.51	2.95	1.26	13.5
Hammer stone	Chert	Coarse	Absent	51-75%	6.72	5.49	4.31	212.5

coarse-grained materials which makes them well suited as hammers. In the case of the core/hammer stones it is possible that these items may have been tested cores but then reused as hammer stones after desirable flakes could not be removed from it. Although the texture qualities of each cobble tool are indicative of their use as hammers, one was fairly small when compared to others in this category. This particular core/hammer stone was made of quartzite and was found broken.

<u>Cores</u>

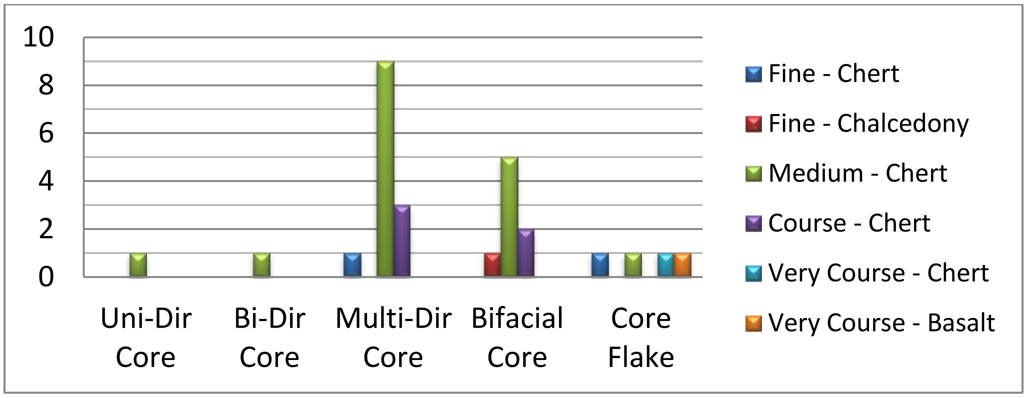


Figure 4.47. Core types by texture and raw material.

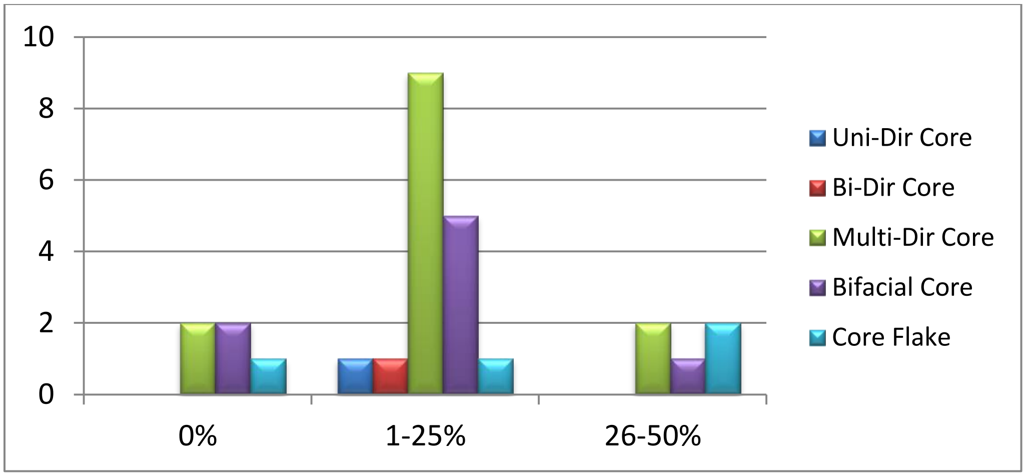


Figure 4.48. Percentage of cortex by core type.

Twenty-seven cores were recovered from this site and made up 6.7% of the analyzed sample. These cores included one unidirectional core (3.7%), one bidirectional core (3.7%), 13 multidirectional cores (48.1%), eight bifacial cores (29.6%), and four core flakes (14.8%). Of these cores, three were recovered from a subsurface context. These included one core flake from Feature 5 found within 0-10 cm of the surface, and two multidirectional cores, the first of which was recovered from feature 5 within 20-30 cm of the surface while the second was found in feature 6 within 10-20 cm of the surface. Medium-grained chert made up the majority of the raw material and texture types for cores at 63%. Other raw material and texture types included fine-grained chert and chalcedony, coarse-grained chert, and very coarse grained chert and basalt (Figure 4.47). Not surprisingly, heat treatment on cores was not a common occurrence with 4 multidirectional cores showing signs of heat treatment in addition to two bifacial cores. Many of the cores (81.5%) had less than 25% of their cortex (Figure 4.48).

Debitage

The debitage sample included 53 complete flakes (15.7%), 130 proximal fragments (38.5%), 29 distal fragments (8.6%), 25 lateral fragments (7.4%), 37 medial fragments (10.9%), 45 indeterminate fragments (13.3%), and 19 pieces of shatter (5.6%). Tables 4.38 displays the average size dimensions and weight ranges of all complete flakes and Table 4.39 displays the percentage of cortex on their dorsal face. For the size classes of complete flakes, Class 3 flakes (1/2" – 3/4") had a slight majority with 17 flakes (32.1%) over Class 2 flakes (1/4" – 1/2") which included 16 flakes (30.2%). This was followed by Class 5 (>1") with 10 flakes (18.9%), Class 4 (3/4" – 1") with 8 flakes (15.1%), and Class 1 (<1/4") with 2 flakes (3.8%).

Table 4.38. Size and weight summaries of complete flakes at Peter's Pocket.

Complete Flake (n=26)	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Average	2.8	2.05	0.63	3.94
Range	0.96 – 4.93	0.5 – 4.18	0.2 – 1.28	0.1 - 18

Table 4.39. Percentage of cortex on the dorsal face of complete flakes.

Amount of Cortex	0%	1-25%	26-50%	51-75%	76-99%	100%
Complete Flakes	32 (60.4%)	13 (24.5%)	3 (5.7%)	3 (5.7%)	-	2 (3.8%)

A majority of the debitage sample was composed of fine-grained materials which included 249 chert flakes (73.7%) and 6 chalcedony flakes (1.8%). This was followed by medium-grained chert with 68 flakes (20.1%). Coarse-grained chert was made up of four flakes (1.2%), and very coarse-grained materials included two chert flakes (0.6%) and eight basalt flakes (2.4%). One obsidian flake (0.3%) was analyzed from the sample; the obsidian and basalt flakes, in addition to a few of the fine and medium-grained chert and chalcedony flakes were recovered from the floor fill context in Feature 6. In terms of heat treatment, 219 flakes (64.8%) yielded signs of heat treatment, 112 flakes (33.1%) with no signs of heat treatment, and seven flakes (2.1%) which could not be determined.

One hundred and eighty-three flakes retained their platforms. Of these, 85 had single-facet platforms (46.5%), 31 had cortical platforms (16.9%), an additional 31 had multi-facet platforms (16.9%), and 36 had abraded platforms (19.7%). In addition, 32 (17.5%) had lipping, 150 flakes (82%) did not exhibit lipping, and one flake (0.5%) was indeterminate. Dorsal flake scaring on complete flakes included 2 with no dorsal scars (3.8%), 2 with one dorsal scar (3.8%), 9 with two dorsal scars (17%), while the remaining 40 had three or more dorsal scars (75.5%) (Figure 4.49). Debitage type was also

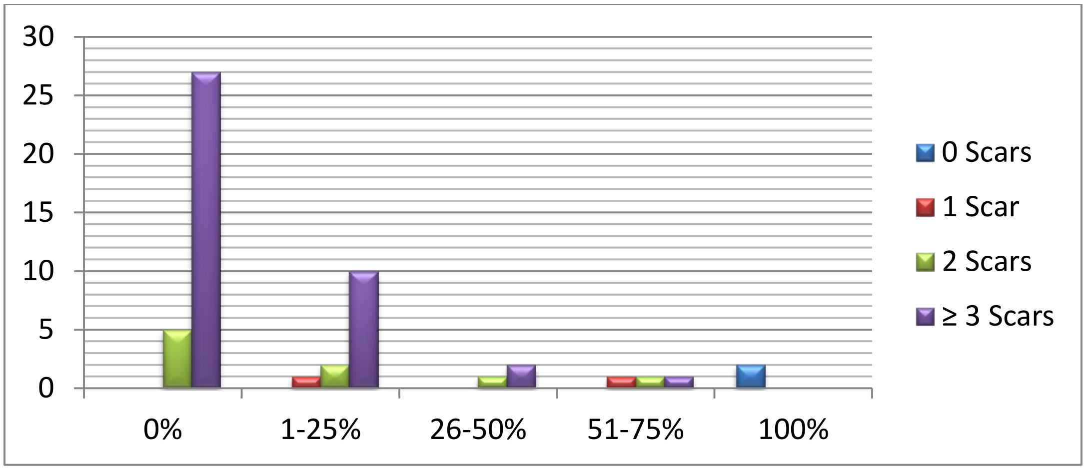


Figure 4.49. Percentage of cortex by number of dorsal scars for complete flakes.

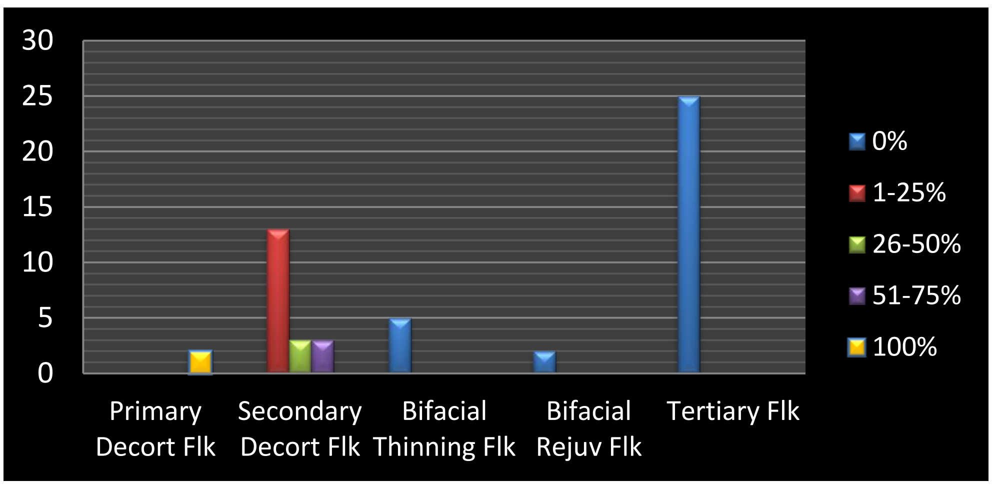


Figure 4.50. Complete flake debris type by percentage or cortex.

identified for complete flakes. These included 2 primary decortication flakes (3.8%), 19 secondary decortication flakes (35.9%), 5 bifacial thinning flakes (9.4%), 2 bifacial rejuvenation flakes (3.8%), and 25 tertiary flakes (47.2%) (Figure 4.50).

Tool and Raw Material Use Intensity

When comparing the proportion of bifacial tools to unifacial tools a majority of tools bore bifacial retouch with 63 items (56.8%) being bifacially retouched and 48 tools

(43.2%) being unifacially retouched. This may indicate that the production and use of bifacial technology may have been emphasized at Peter's Pocket, although unifacial technology was not under-represented. The number of retouched edges on unifacial tools ranged from one to five edges. Thirty-three of these tools (68.6%) bore one retouched edge, 10 tools (20.8%) bore two retouched edges, 2 tools (4.2%) bore three retouched edges, 2 tools (4.3%) bore four retouched edges, and 1 tool (2.1%) – a utilized flake recovered from the surface of Features 4 & 5 – bore five retouched edges. This indicates that tools were not extensively used at Peter's Pocket. However, this is suspect as many of these tools were recovered from the surface. The percentage of complete flakes larger than the smallest complete tool was 66%; this included 35 out of 53 flakes. This suggests that raw materials were not intensively used at this site. Many of the flakes larger than the smallest tool, included flakes composed of fine-grained chert which had been heat treated. This indicates that raw materials were abundant as these flakes could have been utilized as tools, but were not.

TO'TSA (AZ A: 14: 283 ASM)

To'tsa (AZ A: 14: 283 ASM) consists of a seven room C-shaped structure with a large dense artifact scatter. Seven of the rooms were totally or partially excavated, and two test units were excavated in the midden in front of the pueblo. An area of 32 m^2 was excavated. This site was excavated in the 2012 and 2013 field seasons, and is believed to date to the early Pueblo III period. Upon discovery, a looters trench and ATV tracks were found at the site. The back dirt from the looters pit was screened for artifacts. A total of 3,282 lithic artifacts were recovered during the 2013 field season.

The sample analyzed from To'tsa included 441 lithic artifacts. Of this sample, 93 were tools and cobbles (21.1%), 27 were cores (6.1%), and debitage included 321 flakes (72.8%). The debitage collected from the surface included 163 flakes collected from a sheet midden that was encompassed by Collection Unit 2. The subsurface lithics included 158 flakes which were collected from the floor fill contexts of Features 4 and 7.

Tools

Bifaces

Fifty-nine bifaces were recovered from To'tsa and made up 13.4% of the sample analyzed. A majority of these biface (n=46) came from a subsurface context, while the remaining 13 were recovered from the surface. Of the subsurface bifaces, 6 were recovered from a floor context; 1 from Feature 10 and 6 from Feature 4. Five bifaces were recovered from a sub-floor context; 1 from Feature 4 and 4 from Feature 5. Biface stages included 7 stage two bifaces (11.9%), 16 stage three bifaces (27.1%), 31 stage four

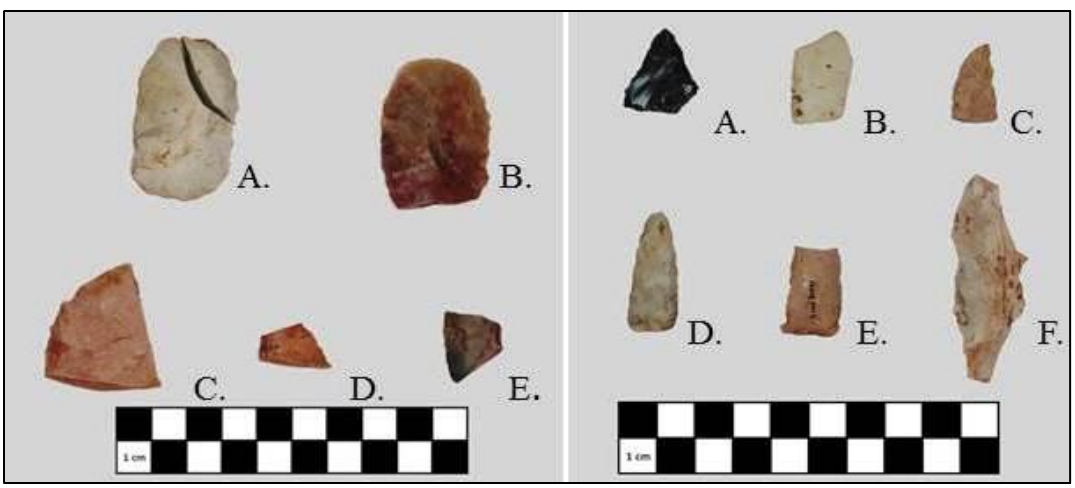
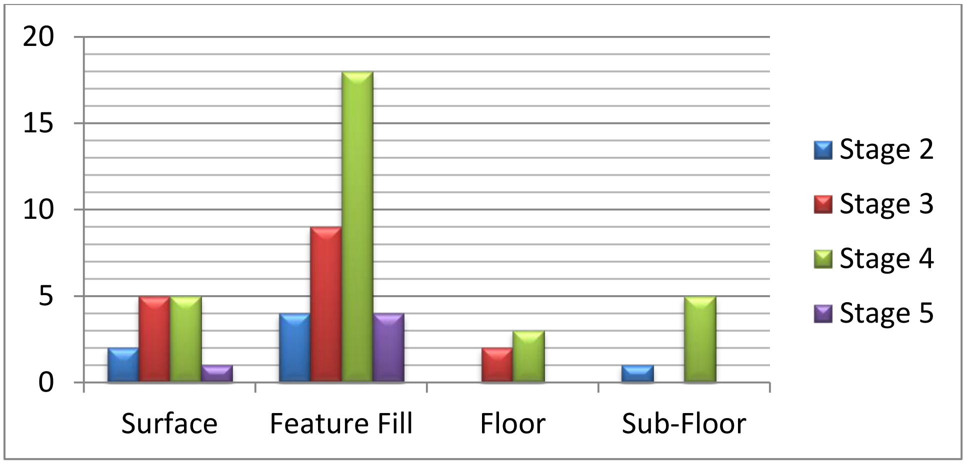


Figure 4.51. To'tsa floor (left) and subfloor (right) biface assemblage. LEFT: (A) Catalog # 21974, (B) Catalog # 21947, (C) Catalog # 21988, (D) Catalog # 21988, (E) Catalog # 21988. RIGHT: (A) Catalog # 21924, (B) Catalog # 21914, (C) Catalog # 21914, (D) Catalog # 21929, (E) Catalog # 21979, (F) Catalog # 22010.



Feature 4.52. Surface and subsurface context of bifaces by preform stage.

bifaces (52.5%), and 5 stage five bifaces (8.5%) (Figure 4.52). As seen in Figure 4.53, a majority of the biface were broken with most of them being medial and lateral portions. The portions of three bifaces could not be determined as these were too fragmented. Fine-grained and medium-grained cherts were found in equal amounts with 28 items (47.5% each). One biface (1.7%) was made of fine-grained chalcedony. One coarse grained chert biface (1.7%) was recovered along with one obsidian biface (1.7%); the obsidian biface was recovered from a sub-floor context in Feature 5. Thirty-one bifaces

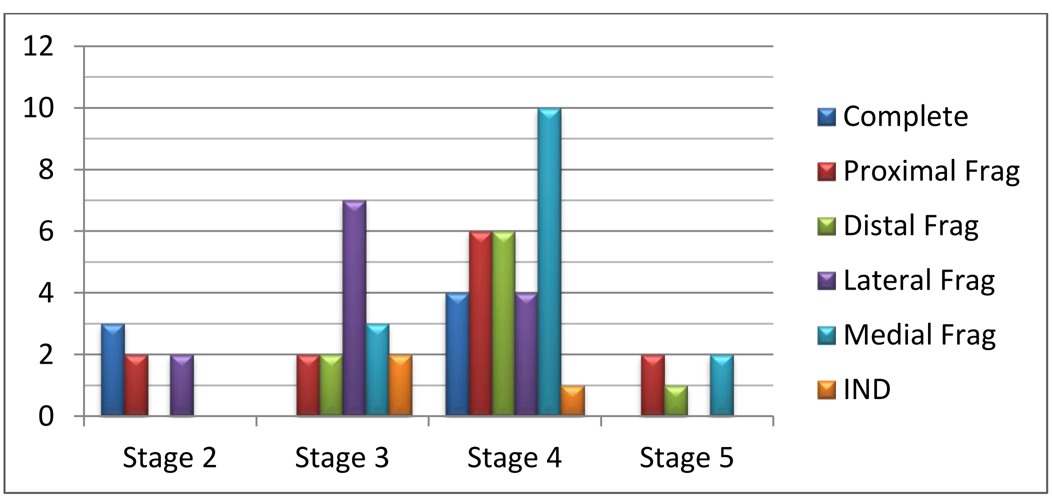


Figure 5.53. Bifaces preform stage by portion.

exhibited signs of heat treatment (52.5%), 20 showed no signs of heat treatment (33.9%), and eight (13.6%) could not be determined.

Projectile Points

Nineteen projectile points were recovered from To'tsa and make up 4.3% of the sample analyzed. Of these artifacts, 13 were recovered from a surface context while five were recovered from a subsurface context. Table 4.40 provides a description of each point and some of their associated attributes. The five subsurface projectile points included one Elko Side Notched point, a Parowan Basal Notch point, a Rosegate Corner Notched point, and two general Archaic points. One of the two General Archaic points was recovered from the floor context of feature 10. In addition to these 18 projectile points, another point was recovered from Feature 2. This feature had been disturbed by a looter's trench and its corresponding projectile point was recovered from the back dirt. This particular point was a proximal Rosegate Corner Notched point produced from fine-grained, heat treated chert.

While it was not an unusual occurrence on the Shivwits Plateau, a majority of the projectile points were not contemporaneous with the site's occupation. Twelve of the nineteen points date to the Archaic period, which includes the Elko series, Humboldt, and General Archaic points. Half of these points also had some form of retouch along their base and one or both lateral margins. Additionally, while six of the projectile points are contemporaneous with site occupation, only two points – a Parowan Basal Notch point from Feature 4 and a Rosegate Corner Notch point from Feature 6 – can actually be said to have come from the time of occupation, as the others were recovered from a surface

Table 4.40. Projectile points recovered from To'tsa.

Projectile Point Type	Area/Level Recovered	Material	Texture	Heat Treatment	Portion	Retouch
Bull Creek	Gen Site; Surface	Chert	Fine	Present	Complete	1 lateral margin
Rose Spring Corner Notched	Gen Site; Surface	Chert	Fine	Present	Complete	-
Elko Corner Notched	Gen Site; Surface	Chert	Fine	Absent	Proximal	-
General Archaic	Gen Site; Surface	Chert	Fine	Present	Complete	Base & margins
General Archaic	Gen Site; Surface	Chert	Fine	Present	Proximal	-
General Archaic	Gen Site; Surface	Chert	Fine	Present	Proximal	1 lateral margin
Elko Eared	Gen Site; Surface	Chert	Fine	Absent	Proximal	-
Elko Eared	Gen Site; Surface	Chert	Medium	Present	Proximal	-
Humboldt	Gen Site; Surface	Chert	Fine	Present	Proximal	-
Elko Side Notched	Gen Site; Surface	Chert	Fine	Present	Proximal	Tang
Elko Side Notched	Gen Site; Surface	Chert	Medium	IND	Proximal	1 lateral margin
Parowan Basal Notch	Gen Site; Surface	Chert	Fine	Present	Nearly complete	1 lateral margin
Indeterminate	Gen Site; Surface	Chert	Medium	IND	Proximal	1 lateral margin
Parowan Basal Notch	Feature 4; 10-20 cm	Chert	Fine	Present	Complete	-
Elko Side Notched	Feature 6; 20-30 cm	Chalcedony	Fine	IND	Proximal	1 lateral margin
General Archaic	Feature 4; 0-10 cm	Chert	Fine	Absent	Proximal	-
Rosegate Corner Notched	Feature 6; 0-10 cm	Chert	Fine	Present	Complete	1 lateral margin
General Archaic*	Feature 10; 30-40 cm	Chert	Medium	Present	Proximal	Base & margins
Rosegate Corner Notched	Feature 2: Looter's Back Dirt	Chert	Fine	Present	Proximal	-

* - recovered from a floor context; IND – Indeterminate; Gen – General.

context. Nonetheless, many of these points also exhibited retouch along some of their margins. Nearly all of the projectile points recovered were flaked from fine-grained chert

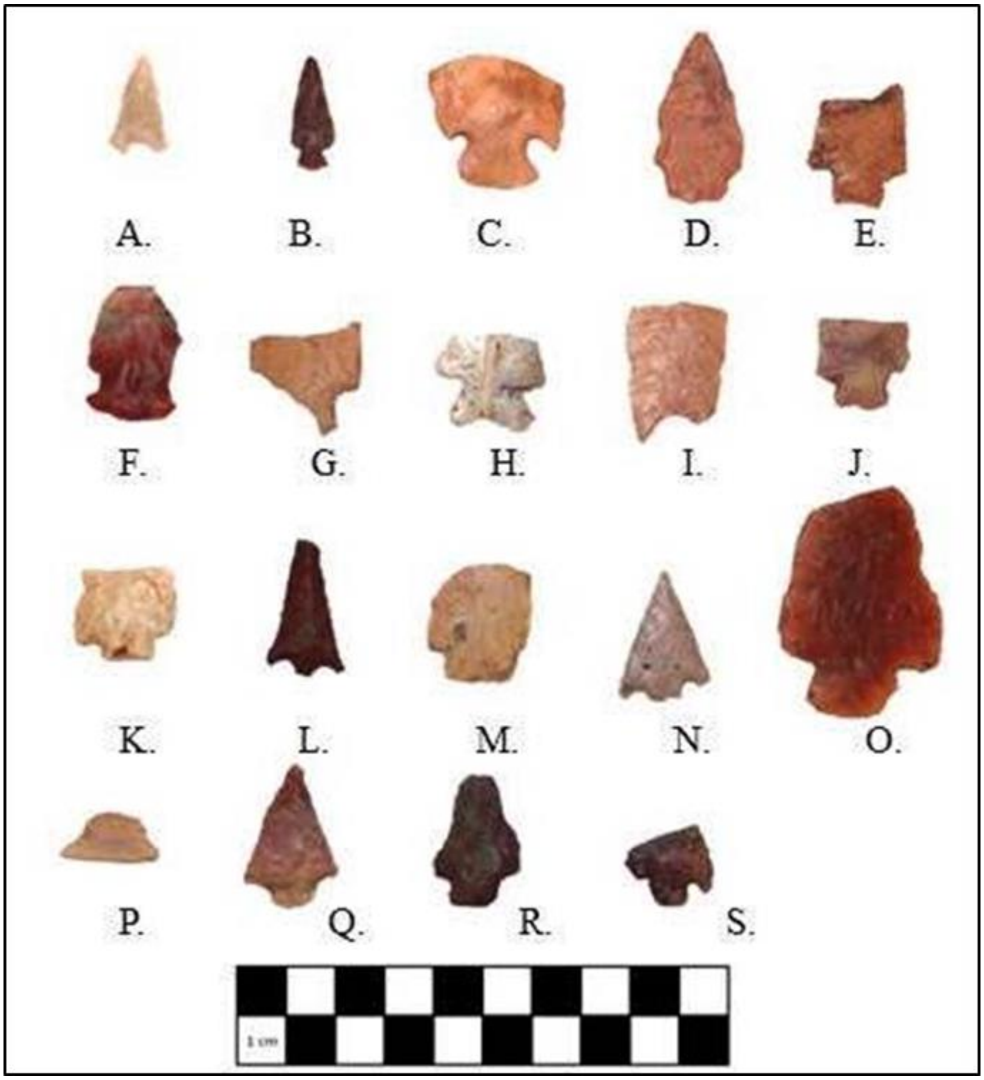


Figure 4.54. To'tsa projectile points. (A) Bull Creek (Catalog # 21728), (B) Rose Spring Corner Notched (#21652), (C) Elko Corner Notched (# 21654), (D) General Archaic (# 21678), (E) General Archaic (# 21683), (F) General Archaic (# 21694), (G) Elko Eared (# 21689), (H) Elko Eared (# 21715), (I) Humboldt (# 21709), (J) Elko Side Notched (# 21713), (K) Elko Side Notched (# 21735), (L) Parowan Basal Notch (# 21717), (M) Indeterminate (# 21676), (N) Parowan Basal Notch (# 21747), (O) Elko Corner Notched (# 21749), (P) General Archaic (# 21889), (Q) Rosegate Corner Notched (# 22026), (R) General Archaic (# 21946), (S) Rosegate Corner Notch (# 21780).

(n=14; 73.7%), with the exception of one fine-fine-grained chalcedony point and four medium-grained chert points. Likewise, a majority of the projectile points (n=13) showed signs of heat treatment, three showed no signs of heat treatment, and an additional 3 could not be determined.

Drills

One drill was recovered from To'tsa and makes up 0.2% of the sample analyzed. This drill was recovered from Feature 7 from 0-10 cm below the surface. It is a complete point composed of fine-grained, heat treated chert. Its dimensions are 3.89 cm in length, 1.8 cm in width, and 0.46 cm in thickness with a weight of 2.5 g.

Utilized Flakes and Informally Retouched Flakes

Six utilized flakes and one informally retouched flake were recovered and make up 1.4% and 0.2% of the analyzed sample respectively. Four of the utilized flakes were recovered from a subsurface context while the remaining two came from the general site surface and a surface midden respectively. Likewise the informally retouched flake came from a surface midden. Four of the utilized flakes were composed of fine-grained chert, while two were composed of medium-grained chert; the informally retouched flake was also composed of medium-grained chert. For the most part heat treatment was not present on ether tool type, with the exception of two fine-grained chert utilized flakes.

Both utilized flakes and informally retouched flakes had unifacial retouch. A majority of the utilized flakes (n=4) bore edge angles with 41° – 50° while one utilized flakes, as well as the informally retouched flake, bore an edge angle of 32° and 31° respectively. The final utilized flake bore a 30° edge angle. In addition to this, four of the utilized flakes displayed a convex edge shape, while the remaining two utilized flakes and informal retouch flake included a straight working edge.

Scrapers

Five scrapers were recovered from the site and make up 1.1% of the analyzed sample. Of these, four came from a subsurface context, while the fifth came from the general site surface. Table 4.41 describes the scrapers and some of their associated attributes. More scrapers were composed of medium-grained chert as opposed to fine-grained chert. Among the fine-grained chert scarpers, one exhibited signs of heat treatment while one did not. As for the medium-grained chert scrapers, two exhibited no signs of heat treatment while one did. All but one of the scrapers had a convex edge, with the fifth scraper having an asymmetrical edge shape. All five scrapers bore edge angles of 51° or more. All scrapers were found to have less than 25% of their original cortex. One scraper was also bifacially retouched.

Table 4.41. Scrapers recovered from To’tsa.

Area Recovered	**Texture**	**Heat Treatment**	**Cortex %**	**Uniface/ Biface**	**Edge Angle**	**Edge Shape**
General Site Surface	Fine	Present	0%	Unifacial	51°	Convex
Feature 4; 20-30 cm	Fine	Absent	0%	Bifacial	55°	Asymmetrical
Feature 6; 0-10 cm	Medium	Absent	1-25%	Unifacial	58°	Convex
Feature 6; 10-20 cm	Medium	Present	0%	Unifacial	57°	Convex
Feature 5; 10-20 cm	Medium	Absent	0%	Unifacial	52°	Convex

Cobble Tools

Two cobble tools were recovered from To’tsa and made up 0.6% of the sample analyzed. These tools included one core/hammer stone and one chopper/pecking stone. The former was recovered from a surface midden, while the later was recovered from the general site surface. Both tools were composed of very coarse-grained and coarse-grained chert respectively. In addition to this, the chopper/pecking stone had a single, straight, bifacially retouched worked edge with an angle of 70°. Flakes were only removed from the area in which the edge was formed and the item still bore 76-99% of its cortex. The chopper/pecking stone was 9.29 cm in length, 7.25 cm in width, 3.6 cm thick, and weighed 200.6 g. The core/hammer stone measured 8.81 cm in length, 8.18 cm in width, and 6.7 cm in thickness with a weight of 552 g.

Cores

Twenty-seven core artifacts were recovered from To'tsa and make up 6.1% of the sample analyzed. These cores included 22 multidirectional cores (81.5%), 3 bifacial cores (11.1%), 1 core flake (3.7%), and one tested cobble (3.7%). Twenty-one of the cores were recovered from a subsurface context, 5 from the surface, and one from the looter's back dirt (Figure 4.54). Two multidirectional core and one core flake came from the subfloor context of Feature 5. The majority of the cores were composed of medium-grained chert (n=14; 51.6%), followed by coarse-grained chert (n=9; 33.3%) (Figure

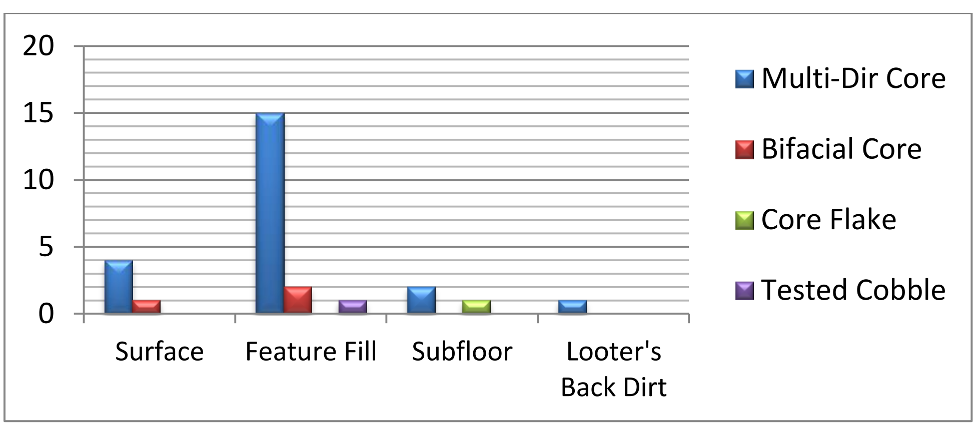


Figure 5.55. Surface and subsurface contexts of cores recovered from To'tsa.

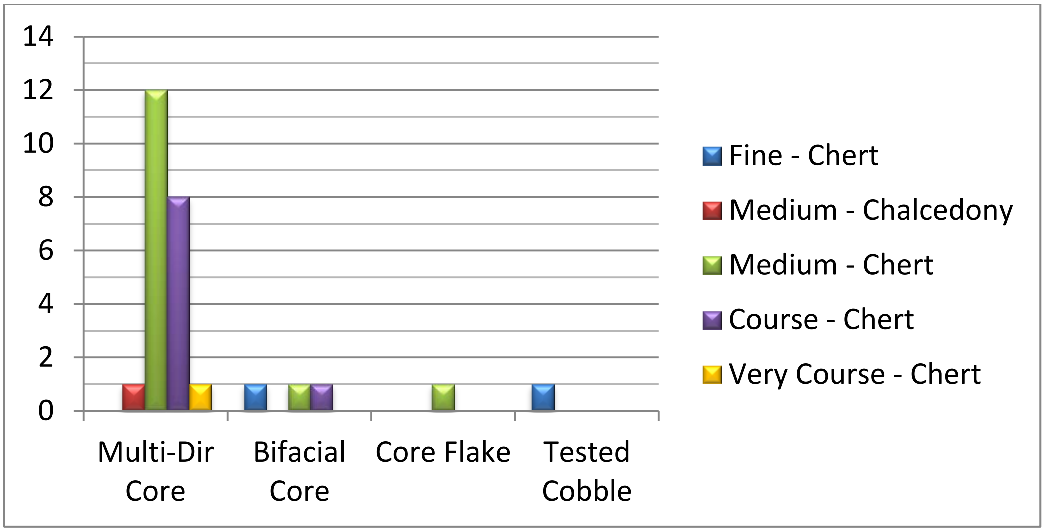


Figure 4.56. Core types by texture and raw material type.

4.56). Interestingly, none of the multidirectional cores at this site were composed of fine-grained chert, which is unusual given the proportion of tools composed of fine-grained materials. Most cores do not show signs of heat treatment. However, all of the bifacial cores as well as the tested cobble shows signs that they had been heat treated in addition to 6 multidirectional cores. Finally, 20 of the cores (74.1%) had less than 25% of cortex, while the remaining seven cores (25.9 %) retained 26-50% of their cortex.

Debitage

The debitage sample included 42 complete flakes (13.1%), 125 proximal fragments (38.9%), 18 distal fragments (5.6%), 39 lateral fragments (12.2%), 54 medial fragments (16.8%), 24 indeterminate fragments (7.5%), and 19 pieces of shatter (5.9%). Table 4.42 displays the average size dimensions and weight ranges of all complete flakes and Table 4.43 displays the percentage of cortex on the dorsal surface of these flakes. Many of the complete flakes fell within Class 2 (1/4" – 1/2") with 15 flakes (35.7%).

Table 4.42. Size and weight summaries of complete flakes at To'tsa.

Complete Flake (n=42)	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Average	2.67	1.89	0.56	3.61
Range	0.99 – 5.97	0.61 – 3.91	0.13 – 1.65	0.1 – 32.1

Table 4.43. Percentage of cortex on the dorsal face of complete flakes.

Amount of Cortex	0%	1-25%	26-50%	51-75%	76-99%	100%
Complete Flakes	32 (76.2%)	8 (19%)	1 (2.4%)	1 (2.4%)	-	-

This was followed by Class 3 with 11 flakes (26.2%). Seven flakes (16.7%) fell within Class 4 (3/4" – 1") while six flakes (14.3%) fell into Class 5 (>1"), leaving Class 1 with three flakes (7.1%). Fine-grained chert made up a majority of all debitage with 183 chert flakes (57%). This was followed by medium-grained chert with 125 flakes (39%). Other material and texture types included coarse-grained chert with seven flakes, coarse-grained quartzite with one flake, very-coarse grained basalt with one flake, and four fine-grained chalcedony flakes which collectedly make up 4% of the debitage sample. Two hundred and two flakes exhibited heat treatment (62.9%), 106 flakes (33%) lacked heat treatment, and 13 flakes (4.1%) could not be determined.

One hundred and sixty-seven flakes retained a platform. Of these, 76 flakes bore a single facet platform (45.5%), 14 flakes had cortical platforms (8.4%), 32 flakes bore multi-facet platforms (19.2%), and 44 flakes bore abraded platforms (26.6%), In addition to this, of the 167flakes, 53 flakes (31.7%) had lipping, while the remaining 114 flakes (68.3%) did not.

Like Coyote Site (AZ: A: 14: 82 ASM), To'tsa's complete flake sample lacked flakes with no dorsal scars; that is, the sample did not have primary decortication flakes.

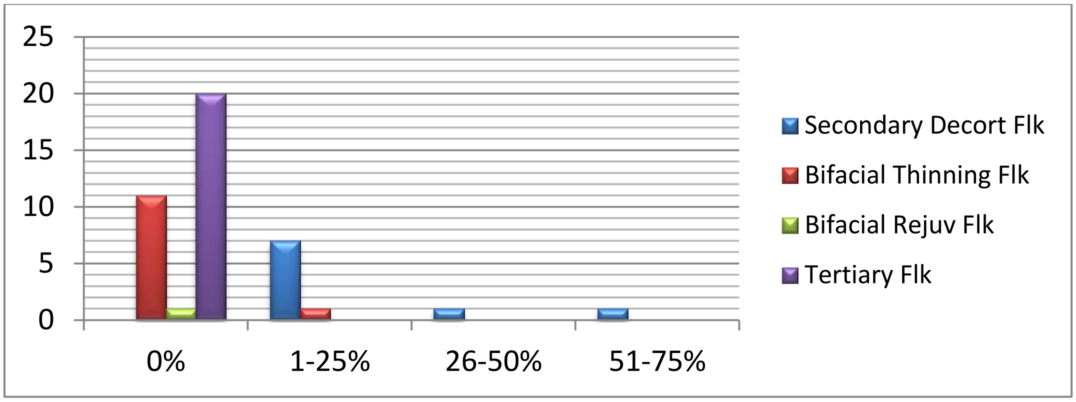


Figure 4.57. Complete flake percentage of cortex by debitage type.

Of the 42 complete flakes, 1 flake had a single flake scar (2.4%),9 flakes had two flake scars (21.4%), and 32 flakes had three of more flakes scars (76.2%). Furthermore, 9 flakes were classified as secondary decortication flakes (21.4%), 12 as bifacial thinning flakes (28.6%), 1 as a bifacial rejuvenation flake (2.4%), and 20 as tertiary flakes (47.6%).

Tool and Raw Material Use Intensity

Bifacially retouched tools outnumber those with unifacial retouch with 81 tools being bifacially retouched, 11 being unifacially retouched, and one which was not applicable (referencing the core/hammer stone). Although most bifacial tools were composed of fine-grained chert, medium-grained chert was used almost as often. Hence, there was a preference for creating bifacial tools from these materials. The number of retouched edges on unifacial tools ranged from one to five edges. Five of these tools (45.4%) included one retouched edge, 2 tools (18.2%) bore two retouched edges, 1 tool (9.1%) bore three retouched edges (scraper), 2 tools (18.2%) had four retouched edges (scraper and utilized flakes), and 1 tool (9.1%) contained five retouched edges (scraper).

Overall, it appears that tools were not intensively used at the site. The percentage of complete flakes larger than the smallest complete tool was 71.4% (n=30), while those smaller than the smallest tool was 28.6% (n=12). These larger flakes included an almost even number of fine-grained (15) and medium-grained (14) cherts, and one very-coarse grained basalt flake. This indicates that fine quality raw material was not used intensively and was probably abundant.

CHAPTER 5

RESULTS AND INTERPRETATIONS

In this chapter, the results of the lithic analyses for each site are reported and compared in order to answer this project's research questions. This chapter is broken down into two primary sections. This section provides a site-by-site overview based on the lithic analyses with the goal of determining site function as reflected through the tools and cobble tools recovered at each site and the attributes obtained for each (see Table 2.1). Table 5.1 below shows the counts of each tool recovered by site.

Table 5.1. Counts and percentage of tool/cobble tool types by site.

Site	Tool Types n (%)*						Cobble Tool Types n (%)*			Total Tools n (%)**
	UF	IRF	SCP	**BF**	PP	DRL	HMR	C/ HMR	CHP/ PCK	
Peter's Pocket	29 (25.7)	18 (15.9)	1 (0.9)	**55 (48.7)**	4 (3.5)	3 (2.7)	1 (0.9)	2 (1.8)		113 (23.6)
To'tsa	6 (6.5)	1 (1.1)	6 (5.4)	**59 (63.4)**	19 (20.4)	1 (1.1)		1 (1.1)	1 (1.1)	94 (21.3)
Coyote Site	18 (20.7)	5 (5.7)	10 (11.5)	**41 (47.1)**	10 (11.5)	2 (2.3)			1 (1.1)	87 (19)
Lava Ridge Ruin	30 (10.3)	33 (11.4)	21 (7.2)	**158 (54.5)**	38 (13.1)	4 (1.4)	3 (1)	2 (0.7)	1 (0.3)	**290 (37.6)**
Granary House	6 (16.2)	2 (5.4)		**21 (56.8)**	8 (21.6)					37 (9.6)
Site 232	**27 (42.2)**	7 (10.9)	4 (6.3)	13 (20.3)	8 (12.5)		1 (1.6)	3 (4.7)	1 (1.6)	64 (21.5)
Andrus Canyon			1 (11.1)	**4 (44.4)**	**4 (44.4)**					9 (4.1)
Corn Cob Site	5 (17.2)	**8 (27.6)**		**8 (27.6)**	7 (24.1)				1 (3.4)	29 (8.6)
Total	**119**	**74**	**45**	**358**	**98**	**10**	**5**	8	**5**	**722**

UF – utilized flake; IRF – informally retouched flake; SCP – scraper; BF – biface; PP – projectile point; DRL – drill; HMR – hammer stone; C/HMR – core/hammer stone; CHP/PCK – chopper/pecking stone.

* Represents the percentage of each tool within the tool/cobble tool assemblage.

** Represents the percentage of tools in each analyzed site assemblage.

Question 1: Site Function

Lava Ridge Ruin (AZ A: 14:50 ASM)

The diversity of tools from this site indicates that a variety of tasks were being performed. Having the largest sample of tools of any site under examination, Lava Ridge Ruin also yielded the most diverse tool assemblage of tools, not only in term of type, but in form as well. The presence of what appears to be a significant investment in architecture (see Chapter Four) indicates that the site was primarily a habitation and this is also reflected in the tool assemblage (see Table 5.1).

The preponderance of bifaces, which made up 54.5% of the tool assemblage, indicates that biface production and use was emphasized at Lava Ridge Ruin. Bifaces at different stages of production can be used for a variety of purposes; chopping and sawing can be performed with early stage bifaces with greater edge angles, while cutting and slicing can be performed with later stage bifaces which are thin and have acute angles. What is more, all of these uses can occur on the same item throughout its production and use-life (Andrefsky 2005: 31). Bifaces were recovered in various stages of production at Lava Ridge Ruin, with a majority concentrated around middle and later stages of reduction. This potential for a wide range of activities emphasizes the site's use as a habitation site. Additionally, as noted in Chapter Four, 21 bifaces (13.3%) were distal fragments. Of these distal fragments, six stage five bifaces, are believed to represent projectile point tips; they also cannot be refitted with any of the other bifaces. Keeley (1982), refers to Robertson 1980, in suggesting that distal portions of projectile points could be transported with the meat of a kill from one location to another. Thus, an argument can be made that these distal fragments indicate that resources are being brought into the site from another location.

Lava Ridge Ruin also contained the largest sample of projectile points of all eight sites under examination, having made up 5% of the site assemblage and 13% of the tool stone assemblage. A majority of the projectile points were proximal fragments (n=22; 57.9%). This preponderance of haft elements of projectile points and bifaces may indicate that retooling occurred on site. However, this cannot be said with absolute certainty with all proximal projectile points. Eight of the projectile points represent Archaic period artifacts, well outside date the general site occupation by Virgin Branch Puebloans. However, some of these points show signs of reworking, although this is limited to one general Archaic, one Pinto, and one indeterminate point.

The number of tools exhibiting unifacial retouch (n=79), while not as great as tools with bifacial retouch also provides some insight into site function. These tools included utilized flakes, informally retouched flakes, scrapers and a chopper. Utilized and informally retouched flakes had varying edge angle measures; however 58.7% (see Figure 4.9) fell under 41° indicating that they may have been used for cutting and slicing. This is also supported by the edge shape (see Figure 4.10) as these tools (as well as most tool types at Lava Ridge Ruin in general) bore convex edges, followed by straight edges. Keeley (1980: 111) suggested that tools with convex and straight edges are appropriate for cutting, butchering, hide cutting, and scraping. Most scrapers exhibiting edge angles falling within 51° and 70° had a convex working edge.

Granary House (AZ A: 14: 46 ASM)

The number of activities represented in the tool stone assemblage at Granary

House appears to be somewhat limited. This is emphasized by the lack of scrapers, drills, and cobble tools from this sites assemblage. With this low diversity and number of tools, combined with the site's limited architectural features, it is believed that this hamlet served as a specialized site for obtaining a specific set of resources. It is believed that this site was used by farmers who also utilized wild resources (Harry 2012). Although limited by sample size, the tool assemblage partially supports this interpretation, although more activities occurred here as well. And with at least one feature believed to be a habitation structure, this site served the dual purpose of at least temporary habituation and agricultural practices.

As with many of the other sites, bifaces remain the most common tool type recovered from this site, representing every stage of production with the exception of stage one bifaces. The presence of these stages indicates that biface production was also occurring at the site. Bifaces stages tended to concentrate around middle and late stages of reduction with stage three and four bifaces making up the majority with 16 items in total. Likewise, 66.7% of the edge angles of these items fell mostly within 31° and 50° indicating they may have been used in cutting and slicing activities, assuming they were used as tools during reduction. However, at least three bifaces had edge angles greater than 52° which would have made them useful for scraping activities.

While nearly all projectile points were found on the surface, one Elko Side Notched point was found in a subsurface context from Feature 2, which is believed to be a semi-circular storage room (Harry 2012). This point was heavily retouched along its base and both lateral margins. It can be surmised that this point was collected elsewhere and was in the process of being re-worked. In addition to this, four other points appear to have been in the process of being retouched as well (see Table 4.9). The fact these most of these points were being retouched indicates that they were viewed as valuable materials.

Although biface production and projectile point retooling may have been occurring at Granary House, the rest of the tool assemblage is made up of a small number of utilized flakes and an even smaller number of informally retouched flakes. However, a majority of these tools had edge angles less than 38° which indicate that they may have been used for cutting and slicing. The one informally retouched flake on the other had had an edge angle of 44° which does not exclude it from cutting activities. In addition to this, five of the six utilized flakes bore convex edge shapes, while the remaining utilized flake had an uneven edge shape. With the exception of this one utilized flake, they others are more suited for cutting. The informally retouched flakes both had asymmetrical edge shapes and bore two retouched margins, unlike the utilized flakes which all had one retouched margin.

As mentioned above, the tool types recovered from this site were somewhat limited, especially for other formals tools such as scrapers, drills, and cobble tools. This is suspect especially for cobble tools given that debitage was recovered from the site, thus indicating that stone was worked. With this in mind, it is possible that these tools may have been transported off site.

Site 232 (AZ A: 14: 232 ASM)

While not to the same extent as Lava Ridge Ruin, a number of different activities were occurring at this site. This is the only site under examination in which utilized flakes were the most common artifacts recovered. Additionally, unifacial technology was more common than bifacial technology; unifacial tools made up 60.9% of the tools while bifacial tools made up 32.8%. A majority of utilized flakes and informally retouched flakes also had edge angles less than 40° indicating they could have been used for cutting. A majority of the utilized flakes and informally retouched flakes exhibit convex edge shapes (n=17; 50%) and straight edges (n=9; 26.5%) emphasizing their role in cutting. However, the site also yielded scrapers as well as a few the utilized flakes and informally retouched flakes with steeper edge angles suggesting they were used as scrapers.

The bifaces that were recovered from Site 232 all represent late stage biface manufacture a majority of which (53.8, n = 7) were stage four bifaces and included the only complete biface recovered from the site. The rest of the bifaces were broken mostly into proximal and distal fragments which could indicate that they were broken during manufacture. However, the distal end of a stage five biface recovered from the subsurface in one of the rooms could have been a projectile point tip, which suggests that game may have been brought to the site. This is partially supported by the number of projectile points, with both complete and haft elements recovered at the site, which display signs of reworking (see Table 4.13).

Recycling and reuse of projectile points at this site also shows that formal tools were preserved for long term use. All but one projectile point showed signs of reworking, including the three Archaic period points recovered from the site. An Elko Side Notched point showed signs of use-wear on its point which has been ground down. It is believed that this point was reused as a drill, which makes sense given the skill required to make such a tool and the lack of drills from this site, although it is possible that drills were taken from the site during its abandonment. Projectile point hafts were also recovered on the site, two of which were in the process of being reworked. This behavior indicates that projectile points were treated as valuable material and may have been in the process of retooling.

The cobble tools at this site also aid in assessing site function. All four cobble tools had a battered surface and, with the exception of the dolostone hammer stone, all had flakes removed beforehand. The dolostone hammer stone (see Figure 4.21) is the smallest of the cobble tools in both linear dimension and weight. Dolostone is also not locally available at sites on the Shivwits Plateau and due to its soft texture, its intended use as a hammer stone is unusual.

In addition to these, a few basalt artifacts in the form of manos, hand stones, netherstones, and metates were also recovered on site. Fifty-eight pieces of sandstone artifacts were recovered, however they were weathered down and as a result their use-wear and function could not be determined. Botanical evidence in the form of maize pollen obtained from two floor contexts at the site, one of which is believed to be a storage room, indicate that corn was being stored at the site; evidence of wild plant resources was not recovered. This evidence supports the original interpretation that this site served as a small farming hamlet. The lithic tools support this as well. Likewise, the presence of abundant architectural rubble, as stated in Chapter Four, indicates that a number of rooms may have been present at this site, a few of which were probably habitations.

Corn Cob Site (AZ A: 14: 56 ASM)

Corn Cob Site, as well as Andrus Canyon, was subject to very limited testing during UNLV'S summer 2008 field season. This pueblo contains at least fifteen rooms, indicating that the site's main function was habitation. As excavation and surface collecting was limited at this site, the lithic assemblage analyzed represents a preliminary interpretation of the activities performed at this site. The tool and cobble tool assemblage reflects only a few of the activities that occurred at Corn Cob Site. Bifacial tools outnumber the unifacial tools, with bifacial tools composing 58.6% (n=17) of the tools, while unifacial made up 41.4% (n=12) of the tools.

Biface production appears to have occurred at the site and seems limited to middle and late stages with stage three bifaces in the majority (50%, n = 4) (see Table 4.18); although one stage two biface was also recovered. All of these were broken with distal fragments in the majority, two of which may be from projectile points. If this is the case, then is it likely that they were retrieved from kills brought into the site.

Projectile points recovered from the site indicate that proximal fragments were returned to the site for retooling, although only two points show signs of reworking; both were proximal fragments (see Table 4.21). Unlike the other sites under examination, every projectile point recovered was contemporaneous with the site's occupation during the early Pueblo III period.

The edge angles of informally retouched flakes and utilized flakes indicate that activities related to both cutting and scraping were occurring at the site. The edge shape of these tools were mostly convex and included items with edge angles less and greater than 41° indicating that materials were both sliced and scraped at this site. Cutting and chopping is also supported by the single chopper/pecking stone recovered at the site. This chopper had heavy bifacial retouch, as if to maintain it, in addition to having a heavily worn edge.

Andrus Canyon (AZ A: 14: 151 ASM)

As with Corn Cob Site, Andrus Canyon was also subject to very limited testing during UNLV's summer 2008 field season. The site is associated with two room blocks, which together contain seventeen rooms, and a dense artifact scatter. As excavation only took place within this artifact scatter, the interpretation of site function based on the tool assemblage of this site is also very limited. However, the size of the site as well as its multiple rooms indicates that was probably a habitation site. Sterile soil was reached within 15 cm of the surface within the artifact scatter.

All but one tool (a biface from found within 10-15 cm of the surface) was recovered from the surface of the site. In total, one scraper, four bifaces, and four projectile points were recovered during the 2008 field season. The bifaces represent stage two through four of production, with stage two bifaces in the majority, and could indicate that biface production occurred at the site; this is supported more through the debitage assemblage (which will be discussed in the next section). Also while a single scraper is not enough to infer the full range of activities that were occurring on site, is does support the idea that resource processing was occurring at the site. Finally, the four projectile points recovered from the site indicate that hunting was practiced by the site inhabitants, and points were collected and reused, as evidenced by the Elko Corner Notch point found within the vicinity of the site (see Table 4.26). It is also believed that projectile point retooling was occurring at the site. This is supported by the fact that a half of the points recovered were broken (proximal fragments), with at least two of them showing signs of retouch (even though one could not be examined directly).

Coyote Site (AZ A: 14: 82)

The site was associated with at least eight features, six of which were rooms. The architecture at the site includes a few features that likely had been used for storage, in addition to a roofed ramada, and at least five features that may have been used for habitation. In addition to grass and maize seeds, agave remains were found in almost every feature excavated. An equal proportion of agave and maize was recovered from the flotation samples analyzed from this site. This indicates that agave was processed extensively at this site, in addition to other wild and cultivated resources (Harry 2012: 20). Ground stone artifacts, which included a great amount made from sandstone and basalt, in the form of manos, hand stones, and netherstones support that plant processing was occurring at the site.

The tool and cobble tool assemblage at Coyote Site indicate that a wide range of activities were occurring on site. 68.3% (n = 28) of bifaces included stage three and four bifaces indicating that later stage biface reduction was emphasized. However, the presence of stage two bifaces in an almost equal amount to stage four bifaces indicates that all levels of biface production were occurring at the site. Although a majority of these bifaces were made up of distal fragments, many of these came from surface deposits, so it is not known if these fragments are the result of human action or non-cultural formation processes. However, a majority of the subsurface bifaces were proximal fragments. While most of the stage three and four bifaces featured edge angles less than 45°, thus suggesting they were used for slicing, at least six had edge angles greater than 50° which would have been useful in scraping activities. Additionally, seven stage two bifaces could have been used for scraping activities.

The projectile points are problematic as 60% (n = 6) of them predate the occupation period of the site, while only two points (recovered from the surface) are contemporaneous. The proximal ends of projectile points were recovered more often than complete points. Moreover, a few of the projectile points exhibit signs of retouch. It is believed that the inhabitants may have been retooling used projectile points as well as those that predate the site. However, this cannot be said with certainty as many of these came from a surface context.

All informally retouched flakes had edge angles greater than 45° indicating that they were used for scraping. Utilized flakes had an almost equal amount of items with edge angles less and greater than 45° indicating that they were used in both scraping and cutting activities. Their use as such is supported by the greater presence of convex to concave edge shapes on these tools. This site also featured the most utilized and informally retouched flakes with bifacial retouch at any other site; for both tools, flakes with bifacial retouch are observed almost as often as unifacial retouch. The presence of scrapers at this site supports that processing activities were occurring as well, although this could have been for both plant and animal remains. Likewise nine scrapers had convex edges while one had a straight edge.

Although broken, the presence of drills at this site supplies evidence that more than plant processing was occurring at the site. In addition to this, one chopper/pecking stone was recovered that featured bifacial retouch. Its primary use can only be speculated as it came from the general site surface, although it is possible that it could have been used for chopping plant resources, especially given the high presence of agave at the site. The information presented above indicates that wild and cultivated resources were being processed at this site, with an emphasis on agave and maize. However, the number of bifaces and projectile points (and to a lesser degree drills and certain utilized and informally retouched flakes) indicate that more than plant processing was occurring here. It is possible that this site served as both a habitation site as well as a specialized site for processing agave, cultivates, and gathered botanical resources.

Peter's Pocket (12–034)

In terms of biface production, the greater number of stage two, three, and four bifaces indicates that early and middle biface reduction was emphasized at this site. Most bifaces were found broken, but because most bifaces came from a surface context it cannot be determined if this is the result of human action or non-cultural formation processes. However, the bifaces recovered from a floor and subsurface (also stage two through stage four) support the notion that biface reduction was occurring on site.

It is not clear if any of the projectile points are diagnostic of the period of occupation, although one Parowan Basal Notch point was recovered from Feature 1 (which made up part of two contiguous rooms with a dense artifact scatter). Although one point was not accounted for, it was a proximal fragment as were two other points. This, combined with the retouch found on two of these points indicates that retooling was occurring at this site. This is supported by the point recovered from the floor context of Feature 6 which had retouch along its base.

The drills at this site indicate that boring activities were occurring on site. Although the material being drilled in unknown, one drill was recovered from the general site surface while the other two were recovered from Feature 6; a semi-subterranean room located near the eastern edge of the site (Harry 2013: 4). One of the drills recovered from Feature 6 was actually a unifacial graver chipped from a single flake, as opposed to the other drills from the Shivwits Plateau which were the result of bifacial reduction.

After Lava Ridge Ruin, Peter's Pocket contained the greatest number of utilized flakes and informally retouched flakes, by count. Most of these bore edge angles less than 46° indicting that they were used for cutting and slicing. Although most utilized flakes had convex and straight edge shapes, the informally retouched flakes had more asymmetrical and straight edges. Additionally, three utilized edges had edge angles suitable for scraping (greater than 50°). Two of these exhibited concave edges, which according to Keeley 1980, would make them suited for wood scraping.

The cobble tools appears to have been used intensively, especially in the case of the one composed of quartzite, which featured battering and was found broken; the rest was not recovered. Although one of the chert core/hammer stones appears to have had some usable flakes removed from it, it also appears to have had flakes removed to shape the stone for grasping.

The site's true nature is still in question due to its dispersed architecture; as a result, it is not known if every structure at the site was occupied at the same time (see Chapter Four). However, many of the structures are associated with dense wall fall and rubble indicating that significant investment was put into them. Assuming the structures are contemporaneous, and given the wide range of tools recovered, it is possible that this site served primarily as a habitation site.

To'tsa (AZ A: 14: 283)

The presence of a great variety of tools from Peter's Pocket (see Table 5.1) suggests that a number of activities were occurring at this site as well. In terms of the bifaces, most were recovered in middle to late stages of reduction, with a majority being stage four bifaces; those found in a floor and sub-floor contexts were stage three and four bifaces with one stage two biface; this indicates that the inhabitants were mostly involved in middle to later stages of biface production. The sheer preponderance of bifaces could imply that they were also used as tools during reduction. Most edge angles at nearly all stages of reduction were less than 40°, which would make them suitable for cutting and slicing, although a few could have been used for scraping activities as their edge angles greater than 40°. As with most tools edges shapes mostly were convex which would make them suitable for the tasks previously mentioned. Finally a vast majority of the bifaces were found broken with medial and lateral fragments making up a majority. The few distal ends of stage four and five bifaces could have been from projectile points which could indicate that game was being brought back to the site, or that these bifaces were broken during reduction.

Projectile points, while more numerous at To'tsa, are somewhat typical of the patterns seen on the Shivwits Plateau. Most of these items were found on the surface, making those diagnostic of the period somewhat difficult to place within the context of site activities. Second, a majority of these items predate the site's occupation as they date to the Archaic period (see Table 4.35). One Archaic point was even recovered from the floor of Feature 10 and exhibited retouch. As most of the projectile points were proximal fragments it is believed that most the projectile points recovered were being retooled at

To’tsa. The preponderance of Archaic period points is discussed in Chapter 6.

The utilized flakes and informally retouched flakes were not as numerous at To’tsa compared to the others sites; however, nearly half could have been used for scraping and cutting activities based on their edge angle and edge shape (mostly convex and straight edges). The cobble tools indicate that resource processing was occurring on site with one chopper/pecking stone recovered, although with a straight edge of 70° edge and with significant weight it could have been used to chop a dense objects such as bone. As for the core/hammer stone, it appeared to have flakes removed from it for the purpose of shaping rather than to get at raw material.

The lithic assemblage of the site shows that a wide range of activities were occurring here based on the diversity of different artifacts as well as their forms. In addition to this, the architecture of the site featured a c-shaped structure of seven rooms, and a large artifact scatter. It is suggested that this site functioned as a habitation site.

Question 2: Lithic Reduction Strategies

This section cross-compares the results of lithic attribute analysis from all lithic artifacts with the goal of determining differences in reduction strategy with reference to proximity to the Kaibab Formation. For the second research question, the sites are listed in order of least to greatest distance to an outcropping of the Kaibab Formation (see Table 3.1). In tables, the greatest counts and percentages are marked in red.

Core Types

A total of 223 cores were recorded from all the sites. The core types identified at each site are illustrated in Table 5.2. Full dimensions of each core are listed by site in Appendix C. The differences in the proportions of cores at each site are probably due to differences in sample size rather than distance to the Kaibab Formation. For instance, Coyote Site, Lava Ridge Ruin, Granary House and Site 232 are in close proximity to one another and are all within 3.65 to 3.85 km of Kaibab Formation.

At seven of the eight sites, multidirectional cores made up a vast majority of the core types. The exception to this was Lava Ridge Ruin which featured an equal proportion of unidirectional cores and multidirectional cores. Furthermore,

Table 5.2. Count and percentage of core types identified by site.

Site	UNI n (%)	BI n (%)	**MUL** n (%)	BFC n (%)	BP n (%)	CF n (%)	TC n (%)	Total Cores n (%)*
Peter's Pocket	1 (3.7)	1 (3.7)	**13 (48.1)**	8 (29.6)		4 (14.8)		**27 (5.6)**
To'tsa			**22 (81.5)**	3 (11.1)		1 (3.7)	1 (3.7)	**27 (6.1)**
Coyote Site	4 (11.4)	1 (2.9)	**24 (68.6)**	2 (5.7)		4 (11.4)		**35 (7.7)**
Lava Ridge Ruin	**40 (37.4)**	16 (15)	30 (28)	14 (13.1)	1 (0.9)	5 (4.7)	1 (0.9)	**107 (13.9)**
Granary House	1 (9.1)	2 (18.2)	**7 (63.6)**			1 (9.1)		**11 (2.9)**
Site 232		1 (10)	**7 (70)**	1 (10)		1 (10)		**10 (2.4)**
Andrus Canyon	1 (33.3)		**2 (66.7)**					**3 (1.4)**
Corn Cob Site			**2 (66.7)**			1 (33.3)		**3 (0.9)**
Total	**47 (21.1)**	**21 (9.4)**	**107 (48)**	**28 (12.6)**	**1 (0.4)**	**17 (7.6)**	**2 (0.9)**	**223**

UNI – unidirectional core; BI – bidirectional core; MUL – multi-directional core; BFC – bifacial core; BP – bipolar core; CF – core flake; TC – tested cobble.

* - Represents the percentage cores in each site's analyzed lithic assemblage. Percentages listed under the individual types represent the percentage of each core type within the core assemblage of each site.

multidirectional cores are often associated with informal core reduction, as well as with a high or low abundance of poor-quality raw material (Andrefsky 2005: 158). On the other hand, unidirectional, bidirectional, and bifacial core reduction indicate that controlled flake removal, formal core reduction, was taking place and act as a sign of a low abundance of high quality material. At Lava Ridge Ruin, the amount of cores that represent formal core reduction represent 65.4% of the sample, with multidirectional (informal) cores representing 28% of that sample.

Every site was made up of different percentages of informal and formal cores, with the exception of Corn Cob Site which had two multidirectional cores and a core flake. Andrefsky (1994: 30) argued that a mix of formal and informal core reduction in an assemblage, made up primarily of the latter, is an indication that poor quality material was in great abundance. There does not appear to be a trend with regards to distance from the Kaibab Formation as of informal and formal core types are of varying proportions with nearly all of the sites yielding a majority of informal types (Table 5.3). Peter's Pocket's proximity to the Kaibab Formation would indicate that less formal core reduction was taking place. Additionally the bifacial cores were composed of medium

Table 5.3. Formal, informal, and other core types by site and distance.

Site	Distance to Kaibab Formation	Formal Cores (unidirectional, bidirectional, bifacial) n (%)	Informal Cores (multidirectional) n (%)	Other cores (bipolar, core flakes, tested cobbles) n (%)
Peter's Pocket	0.60 km	10 (37.7%)	**13 (48.2%)**	4 (14.8%)
To'tsa	2.67 km	3 (11.1%)	**22 (81.5%)**	2 (7.4%)
Coyote Site	3.65 km	7 (20%)	**24 (68.6%)**	4 (11.4)
Lava Ridge Ruin	3.69 km	**70 (65.4)**	30 (28%)	7 (6.5%)
Granary House	3.80 km	3 (27.3%)	**7 (63.6%)**	1 (9.1%)
Site 232	3.85 km	2 (20%)	**7 (70%)**	1 (10%)
Andrus Canyon	4.53 km	1 (33.3)	**2 (66.7%)**	-
Corn Cob Site	5.04 km	-	**2 (66.7%)**	1 (33.3%)

and coarse-grained materials with only one core composed of fine-grained material. It could be possible that the close proximity to the Kaibab Formation allowed the inhabitants at Peter's Pocket to perform multiple core reduction strategies given a readily accessible and abundant raw material source.

Raw Material

The raw material types identified at each site during this study are listed in Table 5.4. Chert made up the majority at every site under examination comprising 93.4% of all materials analyzed. This was followed by the second cryptocrystalline, chalcedony, with 5.62%. Although chalcedony is a type of chert, it was listed separately due the material's tendency to have a fine texture and a distinct semi- translucent appearance. In total cryptocrystallines made up 99.02% of all the materials examined. By site,

Table 5.4. Raw material count by site and percentage by type.

Site	**Chert**	Chalcedony	Obsidian	Quartzite	Dolostone	Basalt	Total
Peter's Pocket	**456**	11	1	1		9	478
To'tsa	**431**	7	1	1		1	441
Coyote	**440**	16	1	-			457
Lava Ridge Ruin	**719**	48	3	2			772
Granary House	**349**	28		1			378
Site 232	**283**	11		-	1	2	297
Andrus Canyon	**187**	30	1	2			220
Corn Cob Site	**292**	39		4		2	337
Total	**3157**	**190**	**7**	**11**	**1**	**14**	**3380**
Percentage	**93.4%**	**5.62%**	**0.21%**	**0.33%**	**0.03%**	**0.41%**	

cryptocrystallines made up more than 97% of each site's sample. To be specific, the lowest proportion of cryptocrystallines came from Peter's Pocket with 97.7%, Corn Cob with 98.2%, and Andrus Canyon with 98.6%. The highest proportion of cryptocrystallines came from Coyote Site with cryptocrystallines making up 99.8% of the sample analyzed.

All other materials identified in the samples made up less than 1% collectively, although at Peter's Pocket, basalt made up 1.88% of the sample, but this is still small. Basalt was identified more often in the debitage samples, with one basalt core flake found at Peter's Pocket and one basalt chopper/pecking stone found at Site 232. When obsidian was encountered it was usually as a biface or projectile point with the exception of one complete tertiary flake from Peter's Pocket. Lava Ridge Ruin yielded the most obsidian sampled in this project. When quartzite was encountered it was found in the form of incomplete debitage flakes. The few exceptions to this included one core/hammer stone from Peter's Pocket, one hammer stone from Lava Ridge Ruin, and one utilized flake from Granary House.

Although raw material texture, discussed below, is of great importance in selecting material to be used for stone tools, the great preponderance of cryptocrystallines at all of the sites confirms its accessibility and presence on the southern portion of the Shivwits Plateau. That cryptocrystallines make up a tremendous proportion of the materials at each site indicates very little difference in raw material preference or selection. This same presence was observed when examining tools/cobble tools, cores, and debitage separately between sites. Hence, it is believed that inhabitants at these sites were selecting cryptocrystallines due to their vast availability.

Material Texture

The texture categories for all artifacts are listed in Table 5.5. Fine-grained materials made up the majority with 67.1%. By site, fine-grained materials, mostly chert, made up the majority at every site. This was followed by medium-grained materials with 29.6% of the total lithic artifacts. Coarse-grained materials made up 2.2% of the entire assemblage. The remaining texture types, very coarse-grained and very fine-grained (obsidian) made up less than 1% of the sample respectively. The fine-grained materials were made up of chert and chalcedony with chert making up 92.6% of these materials. With the exception of the very-fine and very-coarse grained materials, chert made up a vast majority of these texture types. For very-coarse grained materials the majority material type was basalt.

Table 5.5. Material texture count and percentage by site.

Site	Very Fine n (%)	Fine n (%)	Medium n (%)	Coarse n (%)	Very Coarse n (%)	UNK n (%)	Total
Peter's Pocket	1 (0.2)	**310 (64.9)**	139 (29.1)	15 (3.1)	12 (2.5)	1 (0.2)	478
To'tsa	1 (0.2)	**240 (54.4)**	178 (40.4)	19 (4.3)	3 (0.7)		441
Coyote Site	1 (0.2)	**337 (73.7)**	111 (24.3)	8 (1.8)			457
Lava Ridge Ruin	3 (0.4)	**534 (69.2)**	212 (27.5)	15 (1.9)	1 (0.1)	7 (0.9)	772
Granary House		**267 (70.6)**	111 (29.4)				378
Site 232		**214 (72)**	73 (24.6)	7 (2.4)	3 (1)		297
Andrus Canyon	1 (0.5)	**127 (57.7)**	87 (39.5)	4 (1.8)		1 (0.5)	220
Corn Cob Site		**238 (70.6)**	92 (27.3)	5 (1.5)	2 (0.6)		337
Total	**7 (0.2)**	**2267 (67.1)**	**1003 (29.6)**	**73 (2.2)**	**21 (0.6)**	**9 (0.3)**	**3380**

UNK – Unknown

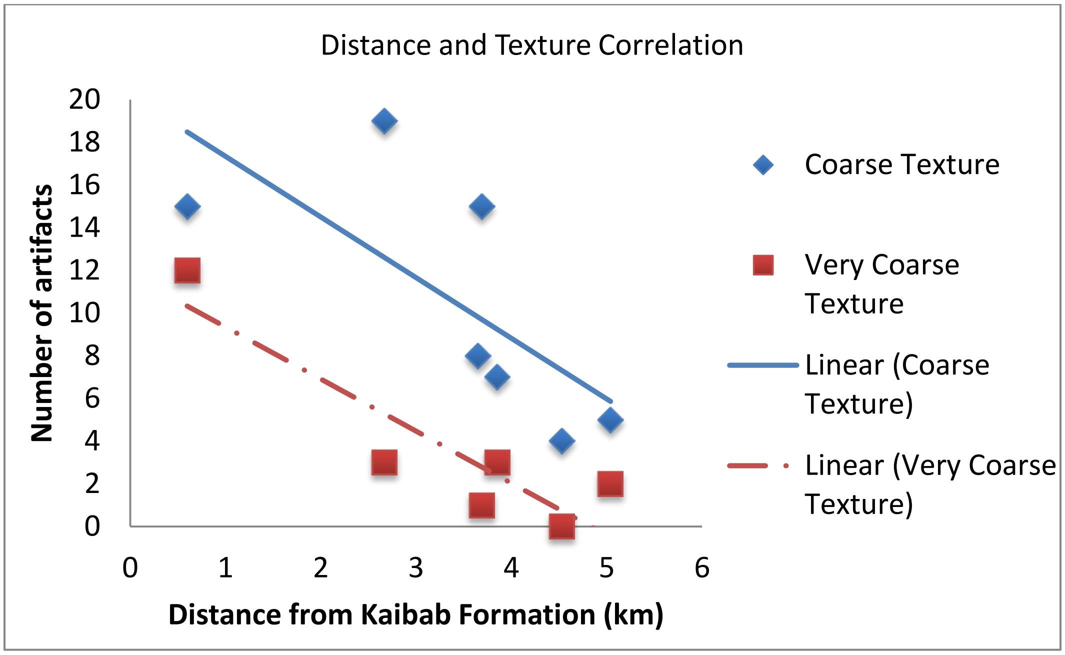


Figure 5.1. Correlation between distance to the Kaibab Formation and Coarse and Very-Coarse raw material texture. Coarse Texture: $r = -0.709$; $r^2 = 0.503$. Very-Coarse: $r = -0.896$; $r^2 = 0.804$.

It is in material texture that we begin to see a pattern as distance to the Kaibab Formation increases (Figure 5.1). Correlation analysis revealed that while very-fine, fine, and medium-grained texture categories showed weak correlations between distance to the Kaibab Formation and texture type, coarse and very coarse-grained materials deviated from these. Coarse and very coarse-grained materials while few in number revealed that there is a strong, negative correlation between these two variables; that is, as distance from the Kaibab Formation increased, the number of artifacts composed of coarse and very coarse materials decreases. Causes for these trends are discussed in Chapter 6.

When focusing on tools (excluding cobble tools), as distance from the Kaibab Formation increases, a somewhat steady increase in the proportion of fine-grained materials for tools is observed. This is coupled with a steady decrease in the proportion of medium-grained raw materials. Similar trends in material textures are observed when examining specific tools, especially bifaces, utilized flakes, and informally retouched flakes. Peter's Pocket is fascinating, in that fine and medium-grained materials are almost equal, with medium-grained materials holding a slight majority (see Table 5.6). This could be due to the inhabitants' close proximity to the Kaibab Formation; being a short distance from an accessible raw material source may have made the need to obtain high-quality material less urgent. Likewise, the inhabitants of Peter's Pocket also appeared to utilize a greater range of materials of different textures, although this same trend is observed to a greater degree at Lava Ridge Ruin. The steady decrease in coarse-grained materials as distance from the Kaibab Formation increase is more noticeable here. Finally, at no site were tools composed of very-coarse grained materials.

Table 5.6. Material texture for tools by site.

Site	Very Fine n (%)	Fine n (%)	Medium n (%)	Coarse n (%)	(blank) n (%)	Total
Peter's Pocket		52 (47.3)	**53 (48.2)**	4 (3.6)	1 (0.9)	110
To'tsa	1 (1.1)	**51 (56)**	38 (41.8)	1 (1.1)		91
Coyote Site	1 (1.2)	**60 (69.8)**	24 (27.9)	1 (1.2)		86
Lava Ridge Ruin	3 (1.1)	**204 (71.7)**	69 (24.3)	1 (0.35)	7 (2.5)	284
Granary House		**25 (67.6)**	12 (32.4)			37
Site 232		**39 (66.1)**	20 (33.9)			59
Andrus Canyon	1 (11.1)	**7 (77.8)**			1 (11.1)	9
Corn Cob Site		**22 (78.6)**	6 (21.4)			28
Total	**6 (0.9)**	**460 (65.3)**	**222 (31.5)**	**7 (1)**	**9 (1.3)**	**704**

Cobble tools are different from the other tools identified because of the tasks in which they are believed to have been used; in this case, cobble tools were used for battering, chopping, and pecking. As can be observed in Table 5.7, no trend is observed

Table 5.7. Material texture for cobble tools by site.

Site	Fine n (%)	Medium n (%)	Coarse n (%)	Very Coarse n (%)	Total
Peter's Pocket		1 (33.3)	**2 (66.7)**		3
To'tsa			**1 (50)**	**1 (50)**	2
Coyote Site	**1 (100)**				1
Lava Ridge Ruin		**3 (50)**	**3 (50)**		6
Site 232		**2 (40)**	**2 (40)**	1 (20)	5
Corn Cob Site		**1 (100)**			1
Total	**1 (5.6)**	**7 (38.9)**	**8 (44.4)**	**2 (11.1)**	**18**

in texture with reference to distance from the Kaibab Formation. However, with the exception of one chopper/pecking stone from Coyote Site, most of the cobble tools are composed of medium and coarse grained materials. While the samples for cobble tools are low in the site assemblages, the use of poorer quality material for these tools makes sense given the nature in which these tools were used. Coarse-grained materials such as quartzite, basalt, and chert with other rock inclusions also tend to be denser than those of fine-grained texture. Hence, coarse-grained stone may have been selected due to its durability.

Table 5.8. Material texture for debitage by site.

Site	Very Fine n (%)	Fine n (%)	Medium n (%)	Coarse n (%)	Very Coarse n (%)	Total
Peter's Pocket	1 (0.3)	**255 (75.4)**	68 (20.1)	4 (1.2)	10 (3)	338
To'tsa		**187 (58.3)**	125 (38.9)	8 (2.5)	1 (0.3)	321
Coyote Site		**259 (77.3)**	71 (21.2)	5 (1.5)		335
Lava Ridge Ruin		**293 (78.1)**	79 (21.1)	2 (0.5)	1 (0.3)	375
Granary House		**237 (71.8)**	93 (28.2)			330
Site 232		**175 (78.5)**	44 (19.7)	3 (1.4)	1 (0.5)	223
Andrus Canyon		**119 (57.2)**	85 (40.9)	4 (1.9)		208
Corn Cob Site		**214 (70.2)**	85 (27.9)	4 (1.3)	2 (0.7)	305
Total	**1 (0.04)**	**1739 (71.4)**	**650 (26.7)**	**30 (1.2)**	**15 (0.6)**	**2435**

For debitage, fine-grained materials made up the greatest proportion at every site under examination, followed by medium-grained materials (Table 5.8). There does not appear to be a pattern in terms of distance to a Kaibab Formation outcropping. However, the data does indicate that while multiple texture types were in use on the Shivwits Plateau, the inhabitants were using material that were mostly fine-grain in texture, which aligns closely with the material textures observed on stone tools.

Cores differed from the other artifact types as most were composed of medium-grained materials at six of the sites (Table 5.9). However, cores from Coyote Site were composed of fine-grained materials and made up only a slight majority over medium-grained materials, while at Corn Cob Site fine-grained materials made a majority over coarse-grained (although the sample of cores at Corn Cob Site is small). What is unusual is that a majority of the tools and debitage were not composed of medium-grained raw material, but from fine-grained materials. This could indicate that many of the tools and debitage were not produced using flakes obtained from these cores; rather, most of the tools and debitage may have been created using blank flakes of higher quality material.

Table 5.9. Material texture for cores by site.

Site	Fine n (%)	Medium n (%)	Coarse n (%)	Very Coarse n (%)	Total
Peter's Pocket	3 (11.1)	**17 (63)**	5 (18.5)	2 (7.4)	27
To'tsa	2 (7.4)	**15 (55.6)**	9 (33,3)	1 (3.7)	27
Coyote Site	**17 (48.6)**	16 (45.7)	2 (5.7)		35
Lava Ridge Ruin	37 (34.6)	**61 (57)**	9 (8.4)		107
Granary House	5 (45.5)	**6 (54.6)**			11
Site 232		**7 (70)**	2 (20)	1 (10)	10
Andrus Canyon	1 (33.3)	**2 (66.7)**			3
Corn Cob Site	**2 (66.7)**		1 (33.3)		3
Total	**67 (30)**	**124 (55.6)**	**28 (12.6)**	**4 (1.8)**	**223**

Heat Treatment

The presence of heat treatment was recorded for every lithic artifact analyzed. With the exception of Peter's Pocket, a majority of the tools examined showed signs of heat treatment. At Peter's Pocket 38.2% of the tool assemblage exhibited heat treatment, while 42.7% of its assemblage did not have heat treatment. Coyote Site had the highest incidence of heat treatment present on tools with 75.5%, 10.5% did not have heat treatment, and 14% could not be determined. Overall, heat treatment appears to have been a common method of improving the flaking qualities of tool stone. Heat treatment on tools accounts for approximately 51.8% of the total tool assemblage, with 33.1% exhibiting no heat treatment, and 13.6% as indeterminate. Proportions similar to this were recorded at six of the eight sites (with the exception of Peter's Pocket and Coyote Site) . The presence of heat treatment was observed more often on certain types of tools. For instance, bifacial tools, especially bifaces and projectile points, tended to exhibit heat treatment; as a point in fact at every site a majority of bifaces were heat treated. Also, some unifacial technology showed signs of heat treatment as well. However, with the exception of Coyote Site, there was never a majority of unifacial technology that exhibited heat treatment. No trends between the presence or absence of heat treatment and the distance of a site to the Kaibab Formation were observed.

Heat treatment on cores was very rare at most of the sites, with the exception of Coyote Site, where 62.9% of cores showed signs of heat treatment and 34.3% did not. Overall, heat treatment was not present on 60.5% of the core assemblage. The presence of heat treatment on a majority of tools but not cores indicates the steps in which raw material were treated. It is possible that instead of heat treating an entire core, which may not become completely heat treated due to its thickness, blank flakes or flakes knapped from these cores were heat treated. The resulting flake would then have a better chance of being completely converted by the heat due to its smaller size and thickness. As a result, the tools, and the debitage knapped from them, would exhibit heat treatment. At every site, a majority of debitage was heat treated; overall, 57.6% exhibited heat treatment, 33.9% did not include heat treatment, and 8.5% were could not be determined. Once, again Coyote Site had the most heat treated debitage with 77.3% of its assemblage, 19.4% with no heat treatment, and 4.3% which could not be determined.

Cortex

In terms of tools (excluding cobble tools), 672 items (95.5%) retained 1-25% of their cortex, of which 596 tools (84.7%) bore no cortex. Similar trends in proportion were found at every site under examination, with the exception of Andrus Canyon. Although Andrus Canyon yielded a majority of tools with 0% cortex, in this case 66.7%, the remaining tools included one scraper with 26-50% of its cortex and two which were not accounted for; however, as the unaccounted artifacts were projectile points it likely that they did not have any cortex. In addition to this, Andrus Canyon's small tool sample may have skewed the proportions. In reality, with the exception of projectile points, all tools included a few that bore varying amounts of cortex. However, utilized flakes, informally retouched flakes, and scrapers had a tendency to retain some cortex. This low percentage of tools bearing no cortex could indicate that cortex removal was viewed as an important step in the creation of stone tools, or that these tools were flaked from material that bore a little to no cortex. No discernable trends were observed between sites in terms of their distances to the Kaibab Formation. Likewise, no trends in the percentage of cortex were observed in cobble tools in terms of distance to a Kaibab Formation outcropping. Of the 18 cobble tools examined for this thesis, 12 (66.7%) had greater than 50% cortex, five of which (27.8%) had more than 75% cortex. It is likely that cortex removal on cobble tools was not emphasized as removing cortex from them would not have helped to improve their performance, with the exception of a few cobble tools that exhibited flake removals to create grooves for improving their handling.

Cores did not have any great trends in terms of differences in percentage of cortex as distance to the Kaibab Formation increases (Table 5.10). A majority of cores at most of the sites retained 25% or less cortex with 173 items (77.6%), 133 (50.7%) of which had between 1-25% cortex. The only exceptions to these were To'tsa and Site 232; the former had more cores with 0% cortex while the latter had more cores with 26-50% cortex**.** However it must be noted that the core samples for Site 232, as well as Granary House, Andrus Canyon, and Corn Cob Site, were small. With the exception of Lava Ridge Ruin, which has the largest proportion of cores within its sample, the proportion of

Table 5.10. Percentage of cortex on cores by site.

Site	0% n (%)	1-25% n (%)	26-50% n (%)	51-75% n (%)	76-99% n (%)	**Count (% of sample)**
Peter's Pocket	5 (18.5)	**17 (63)**	5 (18.5)			**27 (7.4)**
To'tsa	**11 (40.7)**	9 (33.3)	7 (26)			**27 (7.9)**
Coyote Site	8 (22.9)	**19 (54.2)**	5 (14.3)	3 (8.6)		**35 (9)**
Lava Ridge Ruin	30 (28)	**57 (53.3)**	17 (15.9)	2 (1.9)	1 (0.9)	**107 (15.1)**
Granary House	1 (9.1)	**6 (54.5)**	4 (36.4)			**11 (3.4)**
Site 232	3 (30)	1 (10)	**6 (60)**			**10 (4.3)**
Andrus Canyon	1 (33.3)	**2 (66.7)**				**3 (1.6)**
Corn Cob Site	1 (33.3)	**2 (66.7)**				**3 (1)**
Total	**60 (26.9)**	**113 (50.7)**	**44 (19.7)**	**5 (2.2)**	**1 (0.5)**	**223**

cores within each sample begins to decrease with distance from the Kaibab Formation. However, this is likely due to sample size, especially in the case of Andrus Canyon and Corn Cob Site.

The percentage of cortex recorded for debitage was recorded only on the dorsal surface of complete flakes from each sample and are displayed in Table 5.11. Complete flakes bearing no cortex made up the majority at every site which was then followed by flakes bearing 1-25% cortex. The site that contained the lowest percentage of flakes bearing 25% or less cortex was Site 232 with 78.8%, while the highest was To'tsa with95.2%. This low percentage of dorsal cortex on complete flakes may indicate that late stage lithic reduction was emphasized at these sites.

Table 5.11. Counts and percentages of complete flakes and percentages of cortex.

Site	0% n (%)	1-25% n (%)	26-50% n (%)	51-75% n (%)	76-99% n (%)	100% n (%)	Total
Peter's Pocket	**32 (60.4)**	13 (24.5)	3 (5.7)	3 (5.7)		2 (3.8)	53
To'tsa	**32 (76.2)**	8 (19)	1 (2.4)	1 (2.4)			42
Coyote Site	**21 (80.8)**	3 (11.5)	1 (3.8)	1 (3.8)			26
Lava Ridge Ruin	**34 (75.6)**	5 (11.1)	2 (4.4)	2 (4.4)	1 (2.2)	1 (2.2)	45
Granary House	**34 (58.6)**	19 (32.8)	1 (1.7)	3 (5.2)		1 (1.7)	58
Site 232	**17 (51.5)**	9 (27.3)	3 (9.1)	2 (6.1)	1 (3)	1 (3)	33
Andrus Canyon	**24 (61.5)**	10 (25.6)	3 (7.7)	1 (2.6)		1 (2.6)	39
Corn Cob Site	**30 (56.6)**	18 (34)	1 (1.9)	2 (3.8)	1 (1.9)	1 (1.9)	53
Total	**224 (64.2)**	**85 (24.4)**	**15 (4.3)**	**15 (4.3)**	**3 (0.9)**	**7 (2)**	**349**

Dorsal Flake Scars

The number of dorsal scars was recorded on complete flakes and is reported in Table 5.12. Flakes bearing three or more negative flakes scars made up the greatest

Table 5.12. Number of dorsal flake scars on complete flakes.

Sites	No Scars n (%)	1 Scar n (%)	2 Scars n (%)	≥ 3 Scars n (%)	Total
Peter's Pocket	2 (3.8)	2 (3.8)	9 (17)	**40 (75.5)**	53
To'tsa		1 (2.4)	9 (21.4)	**32 (76.2)**	42
Coyote Site			5 (19.2)	**21 (80.8)**	26
Lava Ridge Ruin	1 (2.2)	1 (2.2)	9 (20)	**34 (75.6)**	45
Granary House	1 (1.7)	2 (3.4)	14 (24.1)	**41 (70.7)**	58
Site 232	1 (3)	1 (3)	7 (21.2)	**24 (72.2)**	33
Andrus Canyon	1 (2.6)	3 (7.7)	7 (17.9)	**28 (71.8)**	39
Corn Cob Site	1 (1.9)	1 (1.9)	7 (13.2)	**44 (83)**	53
Total	**7 (2)**	**11 (3.2)**	**67 (19.2)**	**264 (75.6)**	**349**

proportion of flakes at every site. Corn Cob Site yielded the greatest proportion of flakes bearing three or more flakes scars making up 83% of its sample, while Granary House had the lowest proportion of flakes with the same amount of flake scars making up 70.7% of its sample. This majority of complete flakes bearing three or more flakes scars could support the idea that late stage lithic reduction was emphasized at these sites.

Debitage Size Class

While size class was recorded for all flakes, size class for complete flakes bore more weight for determining reduction strategy. Table 5.13 displays the different size classes of complete flakes from each site. For complete flakes, a majority fell within Class 2, with Andrus Canyon having the greatest proportion of flakes in this size class with 51.3%, and Site 232 having the lowest proportion of this size with 24.2. Complete flakes within Class 3 made up the second greatest size class overall, with Lava Ridge Ruin yielding the greatest proportion with 42.2%. In summary, with the exception of Coyote Site and Andrus Canyon, a majority of the complete flakes recovered fell within

Class 2 and Class 3; the two aforementioned sites had Class 4 flakes as their second greatest size category for complete flakes. Class 1 flakes made up the smallest proportion of flakes at every site with the exception of Coyote Site whose smallest proportion for size class was in Class 5. At Lava Ridge Ruin, Class 1 flakes were not present. Falvey (2007: 2) noted that at Lava Ridge Ruin screens with sieves smaller than ¼”, in this case $^{1}/_{8}$” sieves, were only used occasionally. While these flakes were not excluded from this this study, they do represent a bias in the collection methods. The information listed above suggests that late stage reduction, and to a lesser degree middle stage reduction, was emphasized over early stage reduction. However, the fact that flakes smaller than ¼” were not collected that often indicates that late stage reduction, or even tool reduction and reshaping, is underrepresented in this samples; bifacial rejuvenation flakes (See Appendix B) had a tendency to be smaller than ¼”.

Table 5.13. Complete flake size classes.

Sites	Class 1 < 1/4" n (%)	Class 2 1/4"-1/2" n (%)	Class 3 1/2"-3/4" n (%)	Class 4 3/4"-1" n (%)	Class 5 > 1" n (%)	Total
Peter's Pocket	2 (3.8)	16 (30.2)	**17 (32.1)**	8 (15.1)	10 (18.9)	53
To'tsa	3 (7.1)	**15 (35.7)**	11 (26.2)	7 (16.7)	6 (14.3)	42
Coyote Site	3 (11.5)	**9 (34.6)**	5 (19.2)	8 (30.8)	1 (3.8)	26
Lava Ridge Ruin		14 (31.1)	**19 (42.2)**	7 (15.6)	5 (11.1)	45
Granary House	3 (5.2)	**19 (32.8)**	**19 (32.8)**	11 (19)	6 (10.3)	58
Site 232	2 (6.1)	8 (24.2)	**11 (33.3)**	6 (18.2)	6 (18.2)	33
Andrus Canyon	2 (5.1)	**20 (51.3)**	7 (17.9)	8 (20.5)	2 (5.1)	39
Corn Cob Site	3 (5.7)	**23 (43.4)**	15 (28.3)	7 (13.2)	5 (9.4)	53
Total	**18 (5.2)**	**124 (35.5)**	**104 (29.8)**	**62 (17.8)**	**41 (11.7)**	**349**

Debitage Type

Debitage type was recorded on all complete flakes; their counts and percentages are listed in Table 5.14. Overall tertiary flakes, those that did not have any cortex or the physical traits of distinguish bifacial thinning and bifacial rejuvenation flakes from other flakes, made up the majority of complete flakes with 131 flakes (37.5%). This was followed by secondary decortication flakes with 103 (29.5%), bifacial thinning flakes with 95 (27.2%), bifacial rejuvenation flakes with 12 (3.4%), and primary decortication flakes with eight (2.3%). The greater presence of tertiary flakes followed by secondary decortication at Peter's Pocket could indicate that middle and late stage lithic reduction occurred at this site. Unusually, Peter's Pocket also had the smallest proportion of bifacial thinning flakes of at any site with 9.4%; this shall be discussed more in Chapter 6. To'tsa, Coyote Site, and Lava Ridge Ruin had a greater proportion of tertiary flakes, as well as bifacial thinning flakes. This could indicate that late stage reduction was emphasized at these sites. This is in slight contrast to Granary House, Site 232, and Corn

Table 5.14. Counts and percentages of complete flake debitage type.

Site	PRM n (%)	SEC n (%)	BIF n (%)	BRJ n (%)	TER n (%)	Total
Peter's Pocket	2 (3.8)	19 (35.8)	5 (9.4)	2 (3.8)	**25 (47.2)**	53
To'tsa		9 (21.4)	12 (28.6)	1 (2.4)	**20 (47.6)**	42
Coyote Site		4 (15.4)	5 (19.2)	3 (11.5)	**14 (53.8)**	26
Lava Ridge Ruin	1 (2.2)	8 (17.9)	17 (37.8)		**19 (42.2)**	45
Granary House	1 (1.7)	**21 (36.2)**	15 (25.9)	3 (5.2)	18 (31)	58
Site 232	1 (3)	**13 (39.4)**	10 (30.3)	1 (3)	8 (24.2)	33
Andrus Canyon	2 (5.1)	10 (25.6)	**14 (35.9)**		13 (33.3)	39
Corn Cob Site	1 (1.9)	**19 (35.8)**	17 (32.1)	2 (3.8)	14 (26.4)	53
Total	**8 (2.3)**	**103 (29.5)**	**95 (27.2)**	**12 (3.4)**	**131 (37.5)**	**349**

PRM – Primary Decortication Flakes; SEC – Secondary Decortication Flakes; BIF – Bifacial Thinning Flakes; BRJ – Bifacial Rejuvenation Flakes; TER – Tertiary Flakes.

Cob Site which had a greater proportion of secondary flakes, although in all cases these were followed closely by tertiary or bifacial thinning flakes. Andrus Canyon was the only site in which bifacial thinning flakes made up the greatest proportion of flakes types, however the difference between these and tertiary flakes was one flake.

Debitage Portion

The portions of each piece of debitage recovered are listed in Table 5.15. With the exception of Peter's Pocket which contains a greater percentage of complete flakes within its debitage sample, proximal fragments made up the majority recovered from each site. The difference in the number of complete flakes compared to all others portions are vast in both count and percentages. However, of great interest is the amount of shatter

Table 5.15. Counts and percentages of all debitage portions at each site.

	Comp n (%)	Prox n (%)	Dist n (%)	Med n (%)	Lat n (%)	Unk n (%)	Shatter n (%)	Total
Peter's Pocket	**53 (15.7)**	130 (5.9)	29 (8.6)	37 (10.9)	25 (7.4)	45 (13.3)	19 (5.6)	338
To'tsa	42 (13.1)	**125 (38.9)**	18 (5.6)	54 (16.8)	39 (12.1)	24 (7.5)	19 (5.9)	321
Coyote Site	26 (7.8)	**145 (43.3)**	19 (5.7)	39 (11.6)	29 (8.7)	55 (16.4)	22 (6.6)	335
Lava Ridge Ruin	45 (12)	**158 (42.1)**	21 (5.6)	15 (4)	33 (8.8)	67 (17.9)	36 (9.6)	375
Granary House	58 (17.6)	**113 (34.2)**	23 (7)	31 (9.4)	8 (2.4)	70 (21.2)	27 (8.2)	330
Site 232	33 (14.8)	**107 (48)**	14 (6.3)	12 (5.4)	9 (4)	33 (14.8)	15 (6.7)	223
Andrus Canyon	39 (18.8)	**99 (47.6)**	7 (3.4)	5 (2.4)	2 (1)	31 (14.9)	25 (12)	208
Corn Cob Site	53 (17.4)	**146 (47.9)**	20 (6.6)	21 (6.9)	3 (1)	43 (14.1)	19 (6.2)	305
Total	**349 (17.4)**	**1023 (42)**	**151 (6.2)**	**214 (8.8)**	**148 (6.1)**	**368 (15.1)**	**182 (7.5)**	**2435**

Comp – Complete Flake; Prox – Proximal Fragment; Dist – Distal Fragment; Med – Medial Fragment; Lat – Lateral Fragment; Unk – Unknown Fragment.

recovered from each site. The occurrence of shatter has been associated with the occurrence of core reduction (Carr and Bradbury 2001). In all cases the amount of shatter present in each debitage assemblages is no greater than 12%, as seen at Andrus Canyon. Hence, the above information suggests that core reduction was not emphasized at any of the sites examined. This is also supported by the data obtained from the cores as most of them to not exhibit signs of heavy reduction.

Platform and Lip Presence

Both platform type and the presence of lipping were recorded for all flakes bearing a proximal end which included 1,372 pieces of debitage. The platform type counts and percentages are listed in Table 5.16. At all sites, single-facet platforms were the most numerous; Corn Cob Site had the lowest percentage of this platform type with

Table 5.16. Platform types identified on debitage.

Site	Single-Facet n (%)	Cortical n (%)	Multi-Facet n (%)	Abraded n (%)	Split n (%)	UNK n (%)	Total
Peter's Pocket	**83 (45.4)**	30 (16.4)	31 (16.9)	35 (19.1)		4 (2.2)	183
To'tsa	**75 (44.9)**	14 (8.4)	32 (19.2)	44 (26.3)	1 (0.6)	1 (0.6)	167
Coyote Site	**71 (41.5)**	16 (9.4)	28 (16.4)	53 (31)	3 (1.8)		171
Lava Ridge Ruin	**89 (43.8)**	22 (10.8)	45 (22.2)	44 (21.7)	3 (1.5)		203
Granary House	**90 (52.6)**	34 (19.9)	14 (8.2)	32 (18.7)	1 (0.6)		171
Site 232	**82 (58.6)**	22 (15.7)	13 (9.3)	23 (16.4)			140
Andrus Canyon	**68 (49.3)**	35 (25.3)	20 (14.5)	15 (10.9)			138
Corn Cob Site	**82 (41.2)**	40 (20.1)	28 (14.1)	42 (21.1)	7 (3.5)		199
Total	**640 (46.6)**	**213 (15.5)**	**211 (15.4)**	**288 (21)**	**15 (1.1)**	**5 (0.4)**	**1372**

Table 5.17. Counts and percentages of lipping presence.

Site	Present n (%)	Absent n (%)	Unknown n (%)	Total
Peter's Pocket	32 (17.5)	**150 (82)**	1 (0.5)	183
To'tsa	53 (31.7)	**114 (68.3)**		167
Coyote Site	36 (21.1)	**130 (76)**	5 (2.9)	171
Lava Ridge Ruin	25 (12.3)	**178 (87.7)**		203
Granary House	26 (15.2)	**144 (84.2)**	1 (0.6)	171
Site 232	21 (15)	**117 (83.6)**	2 (1.4)	140
Andrus Canyon	18 (13)	**119 (86.2)**	1 (0.7)	138
Corn Cob Site	25 (12)	**174 (87.4)**		199
Total	**236 (17.2)**	**1126 (82.1)**	**10 (0.7)**	**1372**

41.2% and Site 232 had the greatest percentage of this type with 58.6%. Overall, single-facet platforms accounted for 46.6% of the platforms identified. This was followed by abraded platforms with 21%. With the exception of Lava Ridge Ruin, Granary House, and Andrus Canyon, abraded platforms made up the second greatest percentage after single-facet platforms. This indicates that the platforms of these flakes were being prepared for the purpose of removing flakes in a controlled manner. After single-facet platforms Lava Ridge Ruin had a greater percentage of multi-facet platforms. Granary House and Corn Cob Site had a greater percentage of cortical platforms after single-facet platforms, which may indicate that more secondary reduction occurred at these sites.

The presence of lipping on the flakes listed above is displayed in Table 5.17. A majority of platform bearing flakes (82.1%) did not include lips. To’tsa featured the lowest percentage of flakes with absent lips with 68.3% while Lava Ridge Ruin featured the highest percentage with 87.7%; this was followed closely by Corn Cob Site with 87.4%. In combination with the higher proportion of single-facet platforms flakes, this general lack of lipping could indicate that more secondary reduction occurred at these sites.

The greater proportion of single-facet platforms seemingly indicates that early and middle stage core reduction was occurring on site. In fact, the platform type data indicates that all levels of lithic reduction were occurring at each site in varying degrees. The data from complete flakes suggests that middle stage reduction, late stage reduction, and tool manufacture were emphasized at most of these sites. Likewise, the overwhelming lack of lipping on these same flakes suggests that earlier stages of reduction were occurring on site in the form of hard hammer percussion as opposed to soft hammer percussion. In addition to this, the presence of abraded platforms, as the second most common platform type in addition to multi-facet platforms, indicates that bifacial and late stage reduction occurred at each site.

Biface Stage

The reduction stages of each biface were identified for 358 items and included only non-hafted bifaces (Table 5.18). As explained previously, bifaces were the most prominent tool recorded at most of the sites. The exceptions to this was Site 232 in which expedient flakes outnumbered bifaces, and Andrus Canyon and Corn Cob Site in which projectile points and informally retouched flakes respectively matched bifaces in number. Stage 1 bifaces are not included here as it proved impossible to determine if a flake blank, with no evidence of retouch, was actually part of the biface reduction process. Assuming such would be an a priori logical fallacy. Likewise, the characteristics of core flakes (n=17) matched those of Stage 1 bifaces in that very little modification exists in

Table 5.18. Biface stage counts identified at each site.

Sites	Stage 2	Stage 3	Stage 4	Stage 5	UNK	IND	Total
Peter's Pocket	17	**20**	15	2		1	55
To'tsa	7	16	**31**	5			59
Coyote Site	12	**17**	11		1		41
Lava Ridge Ruin	21	**55**	43	22		17	158
Granary House	4	**9**	6	1		1	21
Site 232		4	**7**	2			13
Andrus Canyon	**2**	1	1				4
Corn Cob Site	1	**4**	2			1	8
Total	**64**	**126**	**116**	**32**	**1**	**20**	**358**

UNK – Unknown; IND – Indeterminate.

both. Thus, while it is possible that core flakes and stage 1 bifaces are one in the same, such an assumption cannot be made. Lava Ridge Ruin had the greatest count of each preform stage compared to the other sites. With exception of To'tsa, Site 232, and Andrus Canyon, stage 3 bifaces made up the majority of bifaces at each site.

Summary of Results

The tool and cobble tool types as well as all attributes related to tool and cobble tool morphology observed at each site indicate a variety of tasks occurred on the Shivwits Plateau. The first section of this chapter indicated that at all functioned as habitations, especially Lava Ridge Ruin, Peter's Pocket, To'tsa, Corn Cob Site and Andrus Canyon, in which habitation is emphasized by the degree of variability in the tool assemblages and site architecture. However, some sites, such as Coyote Site, Granary House and Site 232 also had evidence of more specialized activities taking place.

The second section of this chapter indicated that the acquisition of suitable raw material stone was not limited by distance from the site to the Kaibab Formation. Access and availability to fine -grained materials appears to have been open, given the higher percentage of tools and debitage made up of these materials (see Tables 5.6 and 5.8). Furthermore, the above evidence indicates that core reduction was informal and that middle and late stage lithic reduction were emphasized by the inhabitants at most of these sites. The lower percentage of primary decortication, as well as little evidence of early stage reduction occurring at the sites could indicate that these processes were occurring off site, possibly at quarry sites. The results presented in this chapter are reviewed and discussed in more detail in the following final chapter.

CHAPTER 6

CONCLUSIONS AND DISCUSSION

The attributes selected and described for this thesis were chosen to help interpret site function in addition to understanding how raw material was used at each site. The following conclusions are organized by research question to discuss the overall lithic assemblages at these sites. This is followed by a discussion of these conclusions and subjects for future research.

Conclusion

1. What do the tool assemblages at these sites reveal about site function?

Even with the technological attributes selected to address this question, identifying site function based on tool attributes proved difficult. While possible tool use activities were suggested in Chapters Four and Five, even at sites where a specialized function may have occurred, these sites had tools which did not entirely fit with these interpretations. In addition to this, many artifacts were recovered from surface contexts. As a result, non-cultural site formation processes may have acted on these artifacts changing their original form or position of recovery. This is further confounded by the fact that a tool may be used for different activities during its use-life. This was briefly discussed in Chapter Five as it pertained to bifaces, which during different stages of reduction could have been used for a variety of different tasks. Similarly, while certain attributes such as edge angle and edge shape can provide possible indications of use, they are insufficient in indicating what specific material was being processed without use-wear studies. However, keeping these details in mind can help provide some insight into the general activities being performed at these sites. By understanding the variety of tasks that occurred, it is possible to arrive at a rough understanding of site function.

Based on the evidence reviewed in Chapter Five, it is believed that all of the sites functioned completely or partially as habitations. Five of these sites, including Lava Ridge Ruin, Peter's Pocket, To'tsa, Corn Cob Site, Coyote Site, and Andrus Canyon, were used extensively for habitation. This is supported by the variety of lithic tool types identified in addition to the architecture of each site. The tool assemblages at each site reveal that multiple activities were performed which is further supported by tool morphology as seen through the lithic attributes recorded. However, of these sites Corn Cob Site appears to have less variation in terms of potential activities. Nevertheless, the site's features, which included at least thirteen rooms, indicate that the site functioned as a habitation. Excavation of the other rooms at this site would reveal more about the site's full range of activities to arrive at a more comprehensive conclusion with regards to its functions.

The lithic tool assemblage from Andrus Canyon was limited by the size of the sample obtained during its investigation; the smallest sample of lithic tools was from this site. Although Andrus Canyon had evidence of hunting, retooling, and processing activities, there was very little evidence for other activities that may have occurred there. In addition to this, 50% of the tools recovered from Andrus Canyon, which included three bifaces and three projectile points, were recovered from the general site surface, which impacts interpretations of this site as they were not collected from a specific context. However, similar to the previous sites, Andrus Canyon had evidence of extensive occupation through the architectural rubble recorded, which was noted to have at least seventeen rooms. With this in mind, this site was probably used for habitation. Yet, without more lithic tools it cannot be determined what else occurred here or if specialized activities were conducted by its inhabitants. Further field investigations at Andrus Canyon would likely help to clarify this.

Site 232, Granary House, and Coyote Site were separated from the aforementioned sites as there was evidence to suggest that these three sites were not only used for habitation but for processing cultivates and wild resources. For example, Site 232 is the only site at which expedient technology was greater than that of formal technology in the form of scrapers, projectile points, and bifaces (which usually made up the greatest proportion of tools) (see Table 5.1). These expedient tools are believed to have been used predominantly for cutting activities, although some of them were used for scraping as well. Furthermore, the site's extensive ground stone assemblage, in addition to maize and squash samples (but no wild resources), emphasizes the site's function in agriculture. However, the site contains great quantities of architectural rubble suggesting that a number of rooms once existed there (Harry 2012: 30) including storage and habitation rooms. The lithic evidence indicates that a wider range of activities were taking place other than agricultural activities, as evidenced by projectile points and late stage bifaces (stage 4), which is indicative of a habitation.

Granary House's architecture, though limited in number when compared to those at the other sites, is believed to have been used for habitation in addition to agricultural practices. The site includes at least one large structure suitable for habitation (Feature 4), and a smaller structure possibly used for storage (Feature 2). However, the lithic tools recovered from Granary House indicate a more limited range of activities occurring at the site. Many of the tools, including bifaces, utilized flakes, and informally retouched flakes, appear to indicate that cutting activities were emphasized at this site, with very little evidence of scraping activities. However, it is possible that these same tools could have functioned as multi-purpose tools, thus confounding their use. Furthermore, the greater number of bifaces at Granary House indicates that a more diverse set of activities may have occurred at the site. Likewise, the inhabitants of this site were retouching and retooling projectile points. Nevertheless, Granary House's limited architecture, and its greater botanical evidence, shows that maize and wild resources were stored here. This helps to supports the site's use for farming activities over others. The smaller sample of tools may also indicate that usable tools were transported offsite.

Coyote Site, as with Site 232 and Granary House, had architecture that was suitable for habitation (Harry 2012). Furthermore, the site's lithic tool assemblage suggests that a wide range of activities were performed here, indicative of a habitation site. However, unique for this site is that in addition to wild resources, agave was found in equal proportions to maize which is unusual as agave was not recovered from any of the other sites outlined in this thesis. In fact, agave remains were recovered in every excavated feature/structure at this site. This information, in combination with the ground stone recovered, suggests that the inhabitants of this site may have specialized in agave processing as well as processing wild and cultivated resources. This is further supported by the high number of tools featuring attributes suitable for scraping activities and some cutting/slicing. Further study in the form of microscopic use-wear analysis on these items, especially on the bifaces, would be more illuminating with regards to discerning more specific activities. This is also suggested for the other sites under investigation.

Another trend observed at almost every site, with the exception of Peter's Pocket and Corn Cob Site (see Table 4.21 and Table 4.35), was the presence of Archaic period projectile points. To'tsa had the most with a total of 12 Archaic period points (see Table 4.40), while Granary House and Andrus Canyon each had 1 Archaic period point (see Table 4.9 and Table 4.26). In total, 31 Archaic period projectile points were classified. The concentration of these points at every site is also greater than that of the surrounding area (Karen Harry, personal communication 2014). While there is an Archaic period occupation of the Shivwits Plateau, there presence at the sites is not fully understood, at least 15 of these points exhibited signs of retouch along various margins suggesting the Shivwits Plateau VBP were collecting them for the purpose of retooling; that is, they were scavenging them (Amick 2007). Another possibility is that the VBP were collecting Archaic period points as fetishes (Karen Harry, personal communication 2014). Additionally, the presence of the points at six of the sites may indicate that at one point these areas were occupied during Archaic period. However, upon the arrival of the VBP in the region, evidence of an earlier occupation may have been obliterated. Further study at these sites may provide more information on this.

2. **Did the inhabitants of settlements in close proximity to the Kaibab Formation utilize different lithic reduction strategies than those whose settlements were more distant?**

For most of the attributes recorded in this thesis, there were few significant differences observed with the lithic artifacts as distance to the Kaibab Formation increased or decreased with each site. However, the exceptions to this were the proportion of specific flake types, specifically bifacial thinning flakes at Peter's Pocket, and material textures as distance from the Kaibab Formation increased which is discussed below.

Although some variation between sites was observed, the sites shared more trends. For example, in terms of the core types identified from each site, the assemblages of seven sites were dominated by multidirectional cores which indicate that their inhabitants were for the most part emphasizing informal core reduction, as seen with the greater proportion of multidirectional cores. The exception to this was Lava Ridge Ruin which had more cores representing formal core reduction; these included unidirectional, bidirectional, and bifacial cores (see Tables 5.2 and 5.3). Additionally, there was a high proportion of bifacial cores from Peter's Pocket, which was also the second most common core type found at this site (see Table 5.2). This makes sense, as the site's close proximity to the Kaibab Formation would allow its inhabitants to perform both formal and informal core reduction strategies. At all of the sites, most cores had 25% or less of their cortex (see Table 5.10) which would indicate that cores may have been used extensively. However, this can be misleading as the amount of cortex observed on cores is dependent on the size and surface area to volume ration of the parent material. A small core can have a greater surface are to volume ration than that of a larger core, and as result it will produce a greater frequency of cortical flakes than a large core (Douglass et al. 2008: 514; McCall 2006: 119). Appendix C shows that with the exception of ten cores, most cores do not exceed 7 cm in maximum linear dimension, and none exceeded 11 cm. Hence, all of these cores can be considered relatively small (Barbara Roth, personal communication 2014). As a result it may be possible that early and middle stage reductions are underrepresented due to the size of the core nodules being brought into the site. However, without knowing the number of flakes removals from each core, the full extent to how cores were used at each site cannot be discerned in this study. Recording the number of flake removals from cores in addition to platform preparation would help elucidate this issue.

All sites had a great preponderance of cryptocrystallines in the form of chert and chalcedony as their main raw material stones (see Table 5.4). This is important as it indicates that these materials were less difficult to obtain in terms of access by the inhabitants at all of the sites. Material texture presented some fascinating trends when all artifacts were examined as a whole, and when examined by their general type (tools, cobble tools, cores, and debitage). As shown in Chapter 5 (see Figure 5.1) there was a strong, negative correlation between distance from the Kaibab Formation and the occurrence of artifacts composed of coarse and very coarse-grained materials. I submit that the reason for this trend is due to the nature in which raw material stone was gathered by the site inhabitants in different locations. It is expected that for the inhabitants of Peter's Pocket there would not have been an urgent need to obtain the highest quality material stone to make suitable stone tools as raw material stone is located approximately 0.6 km from the site. This helps to account for the presence of more coarse and very coarse-grained lithic artifacts at Peter's Pocket. However, the same cannot be said for the inhabitants of sites further from the Kaibab Formation. While a maximum distance of 3.85 – 5.04 km could be traveled in a relatively short time, as is the case for Site 232, Andrus Canyon, and Corn Cob Site, it is believed that those further from the formation may have selected finer raw material stone to transport. Unlike the inhabitants Peter's Pocket who were situated next to the source, the inhabitants at others sites would have had to allocate the time to obtain raw material stone with other tasks. This suggests that in spite of having access to adequate raw material stone, the inhabitants of sites at increased distances from the Kaibab Formation were using finer quality stone to produce stone tools, which may support the idea that raw material stone was conserved. This is further supported by the increase in the proportion of tools composed of finer quality stone as distance from the Kaibab Formation increases (see Table 5.6) and by the presence of almost equal proportions of fine and medium-grained tools at Peter's Pocket.

Cobble tools, although rare, were primarily composed of medium and coarse-grained materials. I suggest that this was probably the result of the inhabitant's preference for harder, more durable, material stone for heavy striking and pounding tasks. Cores recovered from the sites were mostly made up of medium-grained materials; with the exception of one basalt core and eight chalcedony cores, the remaining 214 cores were composed of chert. As stated in Chapter 5, this is unusual as most debitage and tools were composed of fine-grained materials. However, it is also possible that flakes removed from medium-grained textured cores were improved, in terms of knapping, via heat treatment. This may account for the greater presence of heat treatment on debitage and tools observed at all of these sites; with the exception of tools from Peter's Pocket in which heat treatment was not as prevalent on tools. It could also indicate that tools or flake blanks were being transported to the sites from another location.

In addition to the information obtained from cores, debitage also provided evidence on the reduction activities that were emphasized at each site. In their study, Sullivan and Rozen (1985: 796) suggested that of shatter[3] encompassing 23% of an assemblage represents a significant amount and also acts as an indication that intensive

[3] Sullivan and Rozen refer to shatter as "debris" within their study.

core reduction was taking place. They also report that shatter making up 7.9% of a sample signifies a low percentage, thus representing a sample in which core reduction occurred less. The low percentages of shatter among the debitage from each site in this study (see Table 5.15), when compared to the entire assemblage at each site overall (see Table 6.1), indicates that core reduction was not intensive at any of the sites. Related to this is the low percentage of primary decortication flakes noted among the complete flake assemblages which suggests that cortex removal may have occurred offsite.

Table 6.1. Percentage of shatter within each site lithic assemblage.

Site	Peter's Pocket	To'tsa	Coyote Site	Lava Ridge Ruin	Granary House	Site 232	Andrus Canyon	Corn Cob Site
% of shatter	3.97	4.31	4.81	4.66	7.14	5.05	11.39	5.94

Most of the attributes recorded for debitage indicate that all stages of lithic reduction occurred at each site. However, most of the attributes indicate that middle and late stage reduction, in addition to bifacial reduction, were occurring more often; the exception to this being Peter's Pocket which had the lowest percentage of bifacial thinning flakes of any site. The percentage of cortex (see Table 5.11) and number of dorsal flake scars (see Table 5.12) on complete flakes at all of the sites indicate that early stage reduction was not as emphasized at these sites. While some have argued that the use of dorsal cortex alone is not reliable in identifying reduction stage (Mauldin and Amick 1989; Bradbury and Carr 1995), the use of dorsal cortex to identify early stage reduction was supported by Odell (1989). The overall lack of cortex bearing flakes at every site would indicate that early stage reduction was not emphasized at many of the sites.

Furthermore, dorsal scar counts on these same flakes indicate that late stage reduction, and to a lesser degree middle stage reduction, was performed more often than early stage reduction. This is supported by Magne (1985: 122) who found that a high proportion of flakes with three or more flakes scars indicate that late stage reduction was more prevalent at a site. The same could be said of middle and early stage reduction if less flake scars (middle stage = 2 flake scars and early stage = 0-1 flakes scars) (Magne 1985: 120) were observed on debitage. Additionally, the flake size of most complete flakes falling with ¼" - ½" also indicates that most sites were engaged in late stage reduction, followed by middle stage reduction with the second most common flakes sizes falling between ½" - ¾". However, as noted in Chapter 5, with reference to flake size, late stage reduction was underrepresented in the samples as flakes smaller than ¼" were somewhat scarce or, in some case of Lava Ridge Ruin's sample, not present, due to the collection methods of the excavation.

Debitage type recorded for all complete flakes also indicates that at most sites late stage lithic reduction and bifacial reduction were emphasized more than other stages (see Table 5.14). Peter's Pocket was unusual because although late stage reduction and middle stage reduction were emphasized, as evidenced through the presence of tertiary flakes and a greater proportion of secondary decortication flakes, it also yielded the smallest proportion of bifacial thinning flakes of all the debitage samples analyzed. This muted presence of bifacial thinning flakes at Peter's Pocket could indicate that formal tool production, in the form of bifacial tools, was not emphasized at this site. This would make sense as Peter's Pocket's close proximity to the Kaibab Formation would suggest that formal tool production would also be emphasized less. Bifacial technology made up the greatest proportion of tools types from Peter's Pocket with 55 (48.7%) bifaces and 4 (3.5%) projectile points (see Table 5.1). This could represent a bias in collection strategy as most of the tools were obtained from a surface context, and as detailed in Chapter 4 and in Table 3.1, excavation at Peter's Pocket was limited to a few features with greater emphasis on surface collection.

Platform type and lipping, recorded on all flakes bearing a platform, deviate slightly from the above interpretations. Single-facet platforms made up the majority in every debitage sample. This could indicate that the inhabitants of these sites were not preparing the platforms of their cores. It is also possible that the greater percentage of single-facet platforms reflects core reduction or early/middle stage lithic reduction. However, if this were the case it would be expected that the percentage of cortical platform flakes would also be high, and they are not (see Table 5.16). Although, if the inhabitants at these sites were removing all cortex beforehand, it is possible that cortical flakes would not be as abundant when compared to others. While Granary House and Andrus Canyon had cortical flakes as their second most common platform type, cortical platforms only account for 19.9% and 25.3% of the debitage samples at these sites respectively. The other sites examined had abraded platforms as their second most frequent platform type, with the exception of Lava Ridge Ruin which had a greater percentage of multi-facet platforms. The presence of lipping also reveals that hard hammer reduction was emphasized at all sites, suggesting that early stage lithic reduction was taking place at these sites (see Table 5.17). However, the use of lipping as an indication for the type of reduction that occurred at a site has received mixed criticisms. Replication experiments by Patterson and Sollberger (1978: 108) have shown that lipping can occur with both hard hammer and soft hammer reduction and as a result it is not a good indicator of reduction strategy. Alternatively, Andrefsky (2005) suggested that the differences between hard hammer and soft hammer reduction may be discerned by measuring the bulb of force in addition to the occurrence of lipping. Future studies would likely benefit from the inclusion of these data.

Discussion

The goal of this thesis research was to help discern and in many ways strengthen interpretations of VBP site function and raw material use on the Shivwits Plateau through the analysis of lithic data. In terms of site function, the tool and cobble tool assemblages, along with their corresponding attributes, ground stone, botanical, and site architecture were examined. This combination of evidence suggests that the VBP at most of these sites were involved in a variety of tasks which help support the identification of most of the sites as habitations. Additionally, this evidence also indicates that other sites were involved in more specialized activities with equal emphasis on habitation.

While some minor differences existed between sites, the lithic assemblages reveal that the VBP had access to readily available and abundant fine and medium grained textured raw material stone. In only one way did distance to the Kaibab Formation cause a pattern in one of the attributes recorded. This was seen principally in material texture for which there was a preference to create tools from fine-grained materials as distance to the Kaibab Formation increased. Furthermore, little difference was observed between sites in terms of lithic reduction strategy. The data suggest that while all stages of lithic reduction were occurring at the sites, middle and late stage reduction appears to have been emphasized, thus indicating that most early stage lithic reduction occurred off site, possibly at the source. While differences in lithic reduction strategies by the VBP were not the result of distance to the Kaibab Formation, ultimately the similarities observed between them may have been the result of the VBP's close proximity to the formation.

Future research on the VBP's stone tool use at these sites, or at sites investigated in the future, would benefit from a more intensive examination through microscopic use-wear analysis. Of particular interest would be use-wear patterns observed on bifaces recovered from the sites, which would aid in determining the extent to which bifaces of different stages of production were utilized at each site. Additionally, interpretations on site function would benefit from more field research at Corn Cob Site and Andrus Canyon, especially at the latter. Doing so would increase the tool samples from these sites and allow a greater understanding of the activities that occurred. Further research on lithic reduction strategies would also benefit from an examination of flake removals and platform preparation from cores which would help reconstruct core reduction strategies. Also, since evidence of primary decoration and early stage lithic reduction were limited in the samples, future research would benefit from a 100% sampling of the lithic debitage at each site using the attributes recorded in this thesis. Similarly, comparing the results of this thesis to those of quarrying sites within the vicinity of the study area would help provide insight into raw material use on the Shivwits Plateau.

APPENDIX A

Flaked Stone Artifact Coding System used for this Study

1. Feature
2. Horizontal Unit
3. PD
4. FS
5. Stratum
6. Level

7. Screen size
   1. ¼ inch
   2. $^{1}/_{8}$ inch
   3. Not screened

8. Artifact Type- General
   1. Debitage
   2. Tools
   3. Cores/Cobble Tools

9. Artifact Type- Specific (1-7 were recorded for all, but reported for complete flakes)
   1. Debitage- Primary decortication flake
   2. Debitage- Secondary decortication flake
   3. Debitage- Bifacial thinning flake
   4. Debitage- Bipolar flake
   5. Debitage- Retouch/Rejuvenation flake
   6. Debitage- Tertiary flake
   7. Debitage- shatter

   8. Tool- expedient-- utilized flake
   9. Tool- expedient-- informally retouched flake
   10. Tool- formal -scraper
   11. Tool- formal- biface
   12. Tool- formal- projectile point[4]
   13. Tool- formal- drill

   14. Cores - Unidirectional
   15. Cores - Bi-directional
   16. Cores - Multidirectional
   17. Cores - Bifacial
   18. Cores - Bipolar
   19. Cores - Core Flake
   20. Cores - Tested cobble
   21. Cores/Cobble tools- hammer stone

[4] Indicate projectile point type in the comments column.

22. Cores/Cobble tools- core/hammer stone
23. Cores/Cobble tools- chopper/pecking stone/battering stone

10. Material
1. Chert
2. Chalcedony
3. Petrified wood
4. Obsidian
5. Quartzite
6. Sandstone
7. Mudstone
8. Rhyolite
9. Basalt
10. Vesicular Basalt
11. Andesite
12. Dolostone

11. Texture
1. Very Fine (used for obsidian)
2. Fine (used for cryptocrystallines with no mineral inclusions)
3. Medium (used for cryptocrystallines with little grit inclusions)
4. Coarse (used for quartzite and cryptocrystallines with grit)
5. Very Coarse (used for basalt, sandstone, and cryptocrystallines with a lot of grit)

12. Size class (measured for debitage only)
1. <1/4” (less than 6.3 mm)
2. ¼” to ½” (6.3 mm)
3. ½” to ¾” (12.5 mm)
4. ¾” to 1” (19 mm)
5. > 1” (25 mm)

13. Flake Portion (For Debitage)
1. Complete – includes platform, termination, and both edges
2. Proximal fragment – included platform and bulb of percussion
3. Distal fragment – includes flake termination
4. Lateral fragment – includes side edge, not no proximal or distal portions
5. Medial fragment – includes side edges, but neither proximal or distal portions
6. Fragment – unknown fragment
7. Shatter – angular, blocky fragment lacking discernable interior surface, platform, or termination

14. Portion (Record for tools if broken)

1. Complete – includes platform, termination, and both edges
2. Proximal Fragment – includes striking platform and hafts of projectile points and drills.
3. Distal fragment – includes termination and the tips of projectile points and drills.
4. Lateral fragment – includes side edge, not no proximal or distal portions
5. Medial fragment – includes side edges, but neither proximal or distal portions.
6. Indeterminate
7. Nearly complete – has a defined distal and proximal end, but is missing a port of the distal end.

15. Lip Presence (recorded for complete flakes and platform flakes)
    1. Presence
    2. Absence

16. Platform (recorded for debitage only)
    1. Plain- single facet
    2. Cortical
    3. Multiple facet
    4. Abraded
    5. Split
    6. Unknown
    7. Absent
    99. Indeterminate

17. Number of Dorsal Flakes Scars (recorded for complete flakes only)

18. Dorsal Category
    1. No Scars
    2. 1 Scar
    3. 2 Scars
    4. ≥ 3 Scars

19. Amount of Cortex Present (recorded in percentages for tools, cores/cobble tools and complete flakes only; do not record for debris).
    1. 0%
    2. 1-25%
    3. 26-50%
    4. 51-75%
    5. 76 – 99%
    6. 100%
    99. Indeterminate (Example: Sandstone)

20. Condition or Use-phase (recorded for tools only)
1. Unmodified (blanks, preforms)
2. Complete
3. Broken
99. Indeterminate

21. Unifacial or Bifacial Retouch (recorded for tools only)
1. Unifacial
2. Bifacial

22. Edge Angle (recorded for tools cobble tools only)
Calculated from average edge angle measured with a goniometer

23. Edge Shape (recorded for tools only)
1. Convex
2. Concave
3. Straight
4. Recurved
5. Angular
6. Asymmetrical
99. Indeterminate

24. Number of Retouch edges (recorded for tools/cobble tools only; not projectile points or bifaces, as all edges will be modified.)
Number of modified edges

25. Heat Treatment
1. Present
2. Absence
99. Indeterminate

26. Biface (Preform) Stage
1. Stage One: Blank
2. Stage Two: Edged Biface
3. Stage Three: Thinned Biface
4. Stage Four: Preform
5. Stage Five: Finished Biface

27. Length (measured for complete flakes, tools and cores/core/cobble tools only; measured to nearest 0.1 cm)

28. Width (measured for complete flakes, tools and cores/core/cobble tools only; measured to nearest 0.1 cm)

29. Thickness (measured for complete flakes, tools and cores/core/cobble tools only; measured to nearest 0.1 cm)

30. Weight (recorded for complete flakes, tools and cores/cobble tools only; measured to the nearest 0.1 g)

31. Comments

APPENDIX B
Flaked Stone Definitions

Debitage

1. Debitage – Primary Decortication Flake: flakes (not produced by bipolar percussion or bifacial thinning) which have cortex covering the entire exterior surface; these flakes are produced during primary reduction of raw material.

2. Debitage – Secondary Decortication Flake: flakes (not produced by bipolar percussion or bifacial thinning) which have cortex coving some of the exterior surface; these flakes are produced during secondary reduction of raw material.

3. Debitage – Bifacial Thinning Flake: flakes that contain most or all of the following characteristics: a thin, curving longitudinal cross-section; small lateral or distal edge angles; multiple flake scars on dorsal surfaces which originate from several directions; a multifaceted striking platform; little or no cortex; an expanding shape in plain view; and a diffuse bulb of force. This type of flake may result from either percussion or pressure flaking during operations designed to thin a core or biface for artifact manufacture.

4. Debitage – Bipolar Flake: flakes which exhibit evidence that force has been applied to both ends of the flake. These flakes usually exhibit crushing on both ends, shattered or pointed platforms, pronounced ripple marks, no definite bulbs of force, and generally have a parallel sided form. Bipolar flakes are usually produced during a bipolar reduction process, in which a core is rested on an anvil and then struck to remove a flake. Other reduction techniques, however, may occasionally produce flakes that exhibit bipolar characteristics.

5. Debitage – Retouch Flake: small flakes removed from bifacial tools as a result of direct pressure being applied to the tool edge. These flakes are a particular type of bifacial thinning flake, produced during the retouching of tool edges during tool manufacture or the reshaping of existing tool edges. Flakes measures less than 0.5 cm in length from the bulb of applied force to a successful termination on the distal edge were coded as bifacial rejuvenation flakes.

6. Debitage – Tertiary Flake: flakes that do not have any of the above attributes of the flake types listed above and do not have cortex. They may be complete or fragmented.

7. Debitage – Shatter: debris from the reduction process that does not contain a bulb, platform, or discernible interior surface. Usually blocky and angular in form.

Tools

8. Tool – Expedient—Utilized Flake: a flake that exhibits regular edge damage (flake scars of less than 2 mm) on one or more edges

9. Tool – Expedient—Informally Retouched Flake: a flake that exhibits consecutive flake scars that cover at least 1 cm; they may be unifacial or bifacial.

10. Tool – Formal—Scrapper: a tool that exhibits steep, even, unifacial retouch along one or more edges; the shape and retouch are more formalized than retouched pieces.

11. Tool – Formal—Biface: flakes have been removed from both sides of the artifact and flake removal is evidenced along all sides of the artifact.

12. Tool –Formal—Projectile Point[5]: bifacially worked artifact with a probable haft element.

13. Tool –Formal—Drill: artifact with a projection that shows some sign of utilization.

[5] Indicate projectile point type in the comments column.

Cores/Cobble Tools

14. Cores – Unidirectional: a *core* (defined as a lithic that exhibits two or more negative flake scars at least 20 mm in length and does not contain a bulb of percussion) that contains no bulb, platform, or interior flake surface, and from which flakes were removed from one platform surface and in one direction only.

15. Core – Bidirectional: a *core* that contains no bulb, platform, or interior flake surface, and which bears scars indicating that flakes have been detached from two directions and from two different platforms.

16. Cores – Multidirectional: a *core* that contains no bulb, platform, or interior flake surface, and which bears scars which indicate that flakes were removed in more than one direction.

17. Cores – Bifacial: a *core* that contains no bulb, platform, or interior flake surface, and which contains scars on at least two faces that were removed from a single margin. Although technically a biface, a bifacial core is distinguished here because it is assumed to have been used primarily to produce flakes for further reduction rather than as a tool. A bifacial core can be distinguished from a biface by the greater thickness of the artifact, the nature of the edges (the flake scars need not form a working edge), and the type of flake scars present (the scars indicate that usable flakes were removed).

18. Cores – Bipolar: a *core* that contains a bulb, platform, or interior flake surface, and which bears scars emanating from opposite ends of the cobble or lithic, indicating that flakes were detached through a technique of resting the core on an anvil and striking the core with a hammer stone or other type of object.

19. Cores – Flake: a *core* that is also a flake. The flake bears two or more negative flake scars with originate from the interior surface of the flake, and which do not form a working edge.

20. Cores – Tested Cobble: a cobble from which one flake has been removed.

21. Cobble Tools – Hammer Stone: an artifact that exhibits battering on one or more edges or surfaces, but does not exhibit attributes of a core or pecking stone.

22. Cobble Tools – Core/Hammer Stone: a *core* that exhibits battering on one or more edges or surfaces.
23. Cobble Tools – Chopper/Pecking Stone: a cobble that exhibits step-like battering along a relatively sharp edge; it may be unmodified except for the battering, or it may have flakes removed to form an edge that is then battered.

APPENDIX C

Core Artifact Assemblage Data

Cat # - Catalog Number; Horiz. Unit – Horizontal Unit; ST – Stratum; LVL – Level; % Cortex – Percentage of Cortex; MLD. – Maximum Linear Dimension; UNI – unidirectional core; BI – bidirectional core; MUL – multi-directional core; BFC – bifacial core; BP – bipolar core; CF – core flake; TC – tested cobble.

	SITE	Cat. #	Feature	Horiz. Unit	PD	FS	ST	LVL	Core Type	Raw Material	Texture	Heat Treat	% Cortex	MLD (cm)	Weight (g)
1	Peter's Pocket		1	CU G	13	2	0	0	MUL	Chert	Medium	Absent	1-25%	5.25	78.30
2	Peter's Pocket		1	CU G	13	2	0	0	MUL	Chert	Medium	Absent	1-25%	3.65	18.90
3	Peter's Pocket		1	CU G	13	2	0	0	BFC	Chert	Medium	IND	1-25%	6.16	60.00
4	Peter's Pocket		1	CU G	13	2	0	0	BI	Chert	Medium	Absent	1-25%	5.17	34.90
5	Peter's Pocket		1	CU G	13	2	0	0		Chert	Medium	Absent	0%	5.68	51.60
6	Peter's Pocket		2	CU H	15	2	0	0	MUL	Chert	Medium	Present	0%	4.79	34.80
7	Peter's Pocket		2	CU H	15	2	0	0	MUL	Chert	Course	Absent	1-25%	4.31	37.60
8	Peter's Pocket		2	CU H	15	2	0	0	MUL	Chert	Fine	Present	1-25%	4.45	58.20
9	Peter's Pocket		2	CU H	15	2	0	0	BFC	Chert	Course	Absent	26-50%	6.34	69.20
10	Peter's Pocket		2	CU H	15	2	0	0	BFC	Chert	Medium	Present	0%	3.97	17.80
11	Peter's Pocket		3	CU F	12	2	0	0	MUL	Chert	Medium	Present	26-50%	7.07	134.90

12	Peter's Pocket		5	TU 2	5	9	1	3	MUL	Chert	Medium	Absent	1-25%	5.34	51.50
13	Peter's Pocket		5	TU 2	2	9	1	1	CF	Chert	Very Course	Absent	26-50%	5.65	68.10
14	Peter's Pocket		6	CU B	7	2	0	0	BFC	Chert	Course	Absent	1-25%	7.05	73.50
15	Peter's Pocket		6	CU B	7	2	0	0	MUL	Chert	Medium	Present	26-50%	4.19	39.70
16	Peter's Pocket		6	CU B	7	2	0	0	BFC	Chert	Medium	Absent	1-25%	3.89	19.10
17	Peter's Pocket		6	TU 1	3	2	1	2	MUL	Chert	Medium	Absent	0%	4.62	25.50
18	Peter's Pocket		7	CU C	8	2	0	0	MUL	Chert	Medium	Absent	1-25%	3.18	24.40
19	Peter's Pocket		7	CU C	8	2	0	0	MUL	Chert	Medium	Absent	1-25%	5.15	58.20
20	Peter's Pocket		7	CU C	8	2	0	0	MUL	Chert	Course	Absent	1-25%	6.07	70.40
21	Peter's Pocket		7	CU C	8	2	0	0	BFC	Chert	Medium	Present	1-25%	3.67	12.20
22	Peter's Pocket		8	CU D	10	2	0	0	CF	Basalt	Very Course	Absent	26-50%	7.76	82.80
23	Peter's Pocket		9	CU A	6	2	0	0	UNI	Chert	Medium	Absent	1-25%	4.45	30.40
24	Peter's Pocket		4 & 5	CU E	11	2	0	0	MUL	Chert	Course	Absent	1-25%	5.70	76.60
25	Peter's Pocket		4 & 5	CU E	11	2	0	0	CF	Chert	Medium	Absent	1-25%	5.47	56.30
26	Peter's Pocket	20348	7	CU C	8	2	0	0	BFC	Chalced ony	Fine	IND	1-25%	4.34	19.60
27	Peter's	20348	7	CU C	8	2	0	0	CF	Chert	Fine	Absent	0%	5.26	37.40

	Pocket															
28	To'tsa	21806	Feature 7		34	-	1	1	TC	Chert	Fine	Present	0%	3.22	13.60
29	To'tsa	21858	Feature 6	TU 5 B	45	-	1	1	BFC	Chert	Fine	Present	0%	6.74	39.30
30	To'tsa	21627		CU 4	8	-	0	0	MUL	Chert	Medium	Absent	0%	5.94	46.20
31	To'tsa	21627		CU 4	8	-	0	0	BFC	Chert	Medium	Present	0%	5.97	35.60
32	To'tsa	21752	Feature 6		23	-	2	2	MUL	Chert	Medium	Absent	0%	3.35	79.60
33	To'tsa	21771	Feature 6	Unit A	27	-	2	3	MUL	Chert	Medium	Absent	1-25%	4.74	32.30
34	To'tsa	21779	Feature 6	Unit A	30	-	2	4	MUL	Chert	Medium	Present	1-25%	10.36	486.60
35	To'tsa	21780	Feature 2		16	-	N/A	N/A	MUL	Chert	Medium	Present	1-25%	5.03	58.00
36	To'tsa	21795	Feature 6	Unit A	30	-	2	4	MUL	Chert	Medium	Absent	0%	3.28	12.80
37	To'tsa	21809	Feature 6	Unit B	35	-	1	1	MUL	Chert	Medium	Absent	0%	4.46	34.60
38	To'tsa	21815	Feature 6	Unit B	29	-	2	1	MUL	Chert	Medium	Absent	0%	6.20	85.00
39	To'tsa	21826	Midden		41	-	0	0	MUL	Chert	Medium	Absent	26-50%	5.38	37.30
40	To'tsa	21857	Feature 6	TU 15 A	40	-	1	1	MUL	Chert	Medium	Present	1-25%	5.44	28.30
41	To'tsa	21901	Feature 2		32	-	1	1	MUL	Chert	Medium	Absent	1-25%	5.47	52.90
42	To'tsa	21923	5		66	-	N/A	N/A	MUL	Chert	Medium	Absent	26-50%	6.97	72.80
43	To'tsa	21938	5		66	-	2	2	CF	Chert	Medium	IND	26-50%	5.22	31.70
44	To'tsa	21704		N/A	0	-	0	0	MUL	Chert	Course	Absent	26-50%	6.10	132.60
45	To'tsa	21839	Feature 6	Unit B	39	-	2	1	MUL	Chert	Course	Absent	0%	4.66	39.90
46	To'tsa	21891	Feature 6	Unit C One	57	-	2	1	BFC	Chert	Course	Present	0%	4.45	24.60
47	To'tsa	21918			66	-	2	2	MUL	Chert	Course	Absent	26-50%	5.54	113.10
48	To'tsa	21963			46	-	3	1	MUL	Chert	Course	Absent	1-25%	5.63	84.50
49	To'tsa	21963			46	-	3	1	MUL	Chert	Course	Absent	1-25%	6.59	66.40
50	To'tsa	21972			46	-	3	1	MUL	Chert	Course	Absent	1-25%	7.08	298.90
51	To'tsa	22002		Unit A	61	-	2	1	MUL	Chert	Course	Present	26-50%	4.40	33.50

52	To'tsa	22024		Unit. I	81	-	1	1	MUL	Chert	Course	Present	1-25%	4.94	65.30
53	To'tsa	21789	Feature 1		33	-	2	2	MUL	Chert	Very Course	Absent	0%	6.48	52.60
54	To'tsa	21624		CU 3	5	-	0	0	MUL	Chalced ony	Medium	Present	26-50%	2.18	3.80
55	Coyote Site	11286	3		102	2	2	1	CF	Chert	Fine	Present	0%	3.99	11.10
56	Coyote Site	10998	4		46	2	3	1	CF	Chert	Fine	Present	26-50%	4.36	16.40
57	Coyote Site	10903		CU 4	32	2	0	0	BFC	Chert	Medium	Present	0%	4.12	25.10
58	Coyote Site	17388	N/A		0	11 0	0	0	MUL	Chert	Fine	Present	0%	4.21	36.18
59	Coyote Site	11101	3		50	10	1	2	MUL	Chert	Fine	Present	1-25%	6.48	242.66
60	Coyote Site	11023	N/A		0	66	0	0	UNI	Chert	Medium	Absent	26-50%	5.58	65.66
61	Coyote Site	11256	N/A		0	94	0	0	MUL	Chert	Course	Absent	26-50%	6.50	205.90
62	Coyote Site	11115	N/A		0	57	0	0	UNI	Chert	Fine	Present	51-75%	3.26	28.74
63	Coyote Site	11095	N/A		0	90	0	0	MUL	Chert	Fine	Present	1-25%	3.82	40.86
64	Coyote Site	11177		TU 18	91	2	1	1	MUL	Chert	Medium	Absent	0%	4.19	29.63
65	Coyote Site	11120	N/A		0	79	0	0	MUL	Chert	Fine	Present	1-25%	5.60	48.22
66	Coyote Site	11002	1		20	2	1	1	MUL	Chert	Medium	Present	26-50%	3.83	37.65
67	Coyote Site	11054	6	TU 6	35	2	1	1	BI	Chert	Fine	Present	1-25%	2.09	8.87

68	Coyote Site	17333	2	SEC E	89	2	3	1	CF	Chert	Fine	Present	1-25%	4.03	23.21
69	Coyote Site	11233	N/A		0	91	0	0	MUL	Chert	Course	Absent	1-25%	6.64	122.14
70	Coyote Site	11056	6	TU 7	16	2	1	1	UNI	Chert	Fine	Present	51-75%	3.97	17.17
71	Coyote Site	10824	4		8	2	2	1	MUL	Chert	Fine	Present	1-25%	2.70	15.58
72	Coyote Site	11262	N/A		0	97	0	0	MUL	Chert	Medium	Absent	0%	6.95	128.67
73	Coyote Site	11262	N/A		0	97	0	0	UNI	Chert	Medium	Present	1-25%	4.08	62.76
74	Coyote Site	10905	5		12	2	1	1	MUL	Chert	Medium	Present	1-25%	5.95	59.44
75	Coyote Site	10903	CU4		32	2	0	0	MUL	Chert	Medium	Absent	1-25%	3.06	11.45
76	Coyote Site	10904	CU2		30	2	0	0	MUL	Chert	Medium	Absent	1-25%	2.49	9.28
77	Coyote Site	11257	TU2		99	2	1	2	MUL	Chert	Medium	Present	1-25%	2.47	9.30
78	Coyote Site	10815	3		6	2	1	1	MUL	Chert	Medium	Absent	1-25%	3.64	16.10
79	Coyote Site	11194	Feature SC	TU 16	82	2	2	1	MUL	Chert	Fine	Present	0%	3.01	25.14
80	Coyote Site	11194	Feature SC	TU 16	82	2	2	1	MUL	Chert	Medium	Absent	1-25%	3.99	95.10
81	Coyote Site	11194	Feature SC	TU 16	82	2	2	1	MUL	Chert	Medium	Absent	1-25%	2.63	19.20
82	Coyote Site	11234		TU 9	47	2	2	1	CF	Chert	Fine	Present	51-75%	6.06	37.43
83	Coyote	11234		TU 9	47	2	2	1	MUL	Chert	Fine	Present	0%	3.19	21.32

	Site														
84	Coyote Site	11121	2	TU 5	54	2	3	2	MUL	Chert	Fine	Present	1-25%	3.12	15.32
85	Coyote Site	10838	N/A		0	14	0	0	MUL	Chert	Fine	Present	1-25%	6.75	191.52
86	Coyote Site	11194	2		83	2	2	1	MUL	Chert	Medium	Absent	1-25%	6.33	95.33
87	Coyote Site	10877	N/A		0	21	0	0	BFC	Chert	Medium	Absent	0%	8.22	53.29
88	Coyote Site	10970	N/A		0	54	0	0	MUL	Chert	Medium	Present	1-25%	4.50	49.29
89	Coyote Site	20797			0	13 0	0	0	MUL	Chert	Fine	IND	26-50%	9.07	376.80
90	Lava Ridge Ruin		0	0	0	33	0	0	MUL	Chalced ony	Medium	IND	1-25%	3.76	66.00
91	Lava Ridge Ruin			CU 1 (Whole)	1	11	0	0	MUL	Chert	Fine	Absent	0%	2.86	8.30
92	Lava Ridge Ruin			CU 1 (Whole)	1	9	0	0	BFC	Chert	Fine	Absent	0%	6.25	45.30
93	Lava Ridge Ruin			CU 5 (Whole)	5	12	0	0	BI	Chert	Medium	Absent	1-25%	3.90	10.30
94	Lava Ridge Ruin			CU 5 (Whole)	5	9	0	0	UNI	Chert	Medium	Absent	26-50%	5.40	53.70
95	Lava Ridge Ruin			CU 6 (Whole)	6	11	0	0	UNI	Chert	Fine	Present	1-25%	3.78	20.90
96	Lava Ridge Ruin			CU 7 (Whole)	7	10	0	0	UNI	Chert	Course	Absent	51-75%	4.02	21.10
97	Lava Ridge Ruin			CU 11 (Whole)	11	11	0	0	UNI	Chert	Medium	Absent	26-50%	4.74	18.90
98	Lava Ridge Ruin			CU 13 (Whole)	13	12	0	0	UNI	Chert	Fine	Absent	1-25%	2.06	3.10

99	Lava Ridge Ruin			CU 13 (Whole)	13	11	0	0	UNI	Chalcedony	Medium	IND	26-50%	2.34	4.20
100	Lava Ridge Ruin			CU 22 (Whole)	22	11	0	0	MUL	Chert	Course	Present	26-50%	4.15	28.20
101	Lava Ridge Ruin			CU 24 (Whole)	24	9	0	0	MUL	Chert	Fine	Present	1-25%	3.40	11.80
102	Lava Ridge Ruin			CU 25 (Whole)	25	13	0	0	MUL	Chert	Fine	Present	1-25%	3.80	36.50
103	Lava Ridge Ruin		26	(Whole)	26	12	0	0	UNI	Chert	Medium	Absent	26-50%	3.74	34.20
104	Lava Ridge Ruin			CH 26 (Whole)	26	13	0	0	UNI	Chert	Course	Present	1-25%	4.05	12.40
105	Lava Ridge Ruin			CU 27 (Whole)	27	9	0	0	BI	Chert	Medium	Absent	0%	3.73	33.60
106	Lava Ridge Ruin			CU 28 (Whole)	28	10	0	0	BFC	Chert	Medium	Absent	0%	5.62	21.10
107	Lava Ridge Ruin			CU 33 (Whole)	33	10	0	0	BI	Chert	Medium	Absent	26-50%	5.47	69.60
108	Lava Ridge Ruin		39	(Whole)	35	11	0	0	BI	Chert	Medium	IND	0%	3.70	13.80
109	Lava Ridge Ruin			CU 36 (Whole)	36	11	0	0	MUL	Chert	Fine	Present	0%	4.12	30.20
110	Lava Ridge Ruin		35	(Whole)	39	11	0	0	UNI	Chert	Fine	Present	1-25%	4.16	33.80
111	Lava Ridge Ruin			CU 39 (Whole)	39	12	0	0	BFC	Chert	Medium	Absent	0%	3.09	17.80
112	Lava Ridge Ruin		8	SW1/4	40	9	0	0	UNI	Chert	Fine	Present	26-50%	3.99	60.40
113	Lava Ridge Ruin		8	SW1/4	40	14	0	0	MUL	Chert	Medium	Absent	0%	4.24	9.90
114	Lava Ridge		40	Whole	42	12	0	0	UNI	Chert	Medium	Absent	0%	4.49	17.10

	Ruin														
115	Lava Ridge Ruin			CU 40 (Whole)	42	14	0	0	MUL	Chert	Fine	Present	0%	3.15	8.00
116	Lava Ridge Ruin			CU 41 (Whole)	43	12	0	0	BI	Chert	Fine	Absent	1-25%	4.07	19.30
117	Lava Ridge Ruin			CU 42 (Whole)	44	16	0	0	CF	Chert	Fine	Absent	0%	4.32	18.20
118	Lava Ridge Ruin			CU 42 (Whole)	44	15	0	0	UNI	Chert	Medium	Absent	26-50%	3.05	20.60
119	Lava Ridge Ruin			CU 42 (Whole)	44	14	0	0	MUL	Chert	Medium	Absent	1-25%	5.00	28.20
120	Lava Ridge Ruin			CU 42 (Whole)	44	13	0	0	UNI	Chert	Medium	Absent	1-25%	4.08	14.80
121	Lava Ridge Ruin			CU 44 (Whole)	46	10	0	0	BFC	Chert	Medium	Present	1-25%	2.86	7.40
122	Lava Ridge Ruin			CU 44 (Whole)	46	9	0	0	MUL	Chalced ony	Medium	IND	26-50%	4.09	55.50
123	Lava Ridge Ruin		5	NW 1/4	49	10	0	0	MUL	Chert	Medium	Absent	1-25%	3.46	6.60
124	Lava Ridge Ruin		5	SE 1/4	52	11	0	0	MUL	Chert	Medium	Present	1-25%	3.62	13.20
125	Lava Ridge Ruin			CU 33 (Whole)	54	14	1	1	MUL	Chert	Medium	Absent	0%	4.91	34.80
126	Lava Ridge Ruin		5	SE 1/4	56	13	1	1	UNI	Chert	Medium	Absent	26-50%	3.74	10.80
127	Lava Ridge Ruin		5	SE 1/4	56	10	1	1	BFC	Chert	Medium	Absent	1-25%	6.00	64.40
128	Lava Ridge Ruin		8	SE 1/4	62	10	2	1	UNI	Chert	Course	Absent	0%	3.19	12.90
129	Lava Ridge Ruin		17	Whole	66	14	0	0	UNI	Chert	Medium	Absent	1-25%	4.36	20.40

130	Lava Ridge Ruin		17	Whole	66	15	0	0	UNI	Chert	Fine	Present	26-50%	3.25	9.90
131	Lava Ridge Ruin		17	Whole	66	13	0	0	UNI	Chert	Fine	Absent	1-25%	4.40	39.70
132	Lava Ridge Ruin			CU 34 (Whole)	68	11	1	1	UNI	Chert	Medium	Absent	1-25%	5.19	26.00
133	Lava Ridge Ruin			CU 34 (Whole)	68	10	1	1	UNI	Chalced ony	Medium	IND	0%	3.66	18.30
134	Lava Ridge Ruin			CU 45 (Whole)	72	9	0	0	UNI	Chert	Fine	Absent	51-75%	4.23	15.60
135	Lava Ridge Ruin			CU 45 (E 1/3)	81	12	2	1	UNI	Chert	Medium	Absent	1-25%	5.75	75.40
136	Lava Ridge Ruin		18	NW 1/2	82	11	1	1	BI	Chert	Fine	Present	1-25%	3.62	9.10
137	Lava Ridge Ruin		18	NW 1/2	82	12	1	1	CF	Chert	Course	Absent	1-25%	5.82	53.20
138	Lava Ridge Ruin		11	E 1/2	84	10	2	2	CF	Chert	Fine	Present	1-25%	5.58	56.10
139	Lava Ridge Ruin		11	E 1/2	84	18	2	2	BI	Chert	Fine	Present	1-25%	5.35	40.60
140	Lava Ridge Ruin		8	SE 1/4	86	12	2	3	UNI	Chert	Medium	Absent	1-25%	5.49	90.60
141	Lava Ridge Ruin		11		92	11	1	1	UNI	Chert	Course	Absent	0%	5.01	42.30
142	Lava Ridge Ruin		8	SE 1/4	94	14	2	4	UNI	Chert	Medium	Absent	1-25%	5.06	20.70
143	Lava Ridge Ruin		8	SE 1/4	94	15	2	4	UNI	Chert	Fine	Present	1-25%	4.08	14.00
144	Lava Ridge Ruin		19	Whole	103	9	0	0	MUL	Chert	Medium	Present	0%	3.36	18.20
145	Lava Ridge		5	SW 1/4	105	16	2	1	BFC	Chert	Fine	Present	1-25%	4.11	19.50

	Ruin														
146	Lava Ridge Ruin		5	SW 1/4	105	15	2	1	MUL	Chert	Medium	Absent	1-25%	4.02	46.40
147	Lava Ridge Ruin		20	S 1/2	107	9	0	0	BI	Chert	Medium	Absent	1-25%	5.26	80.90
148	Lava Ridge Ruin		5	SW 1/4	111	19	2	2	UNI	Chert	Fine	Absent	0%	3.98	7.70
149	Lava Ridge Ruin			CU 41 (Whole)	113	12	1	1	BI	Chert	Medium	Absent	0%	4.54	17.80
150	Lava Ridge Ruin			CU 41 (Whole)	113	14	1	1	UNI	Chert	Fine	Present	1-25%	2.92	12.40
151	Lava Ridge Ruin		8	SW 1/4	120	13	2	1	MUL	Chert	Medium	Present	1-25%	6.27	96.70
152	Lava Ridge Ruin		8	SW 1/4	120	11	2	1	BI	Chert	Medium	Absent	0%	4.62	20.10
153	Lava Ridge Ruin		8	SW 1/4	125	13	2	3	BFC	Chert	Medium	Present	1-25%	4.58	22.40
154	Lava Ridge Ruin		8	SW 1/4	125	15	2	3	CF	Chert	Fine	Absent	26-50%	5.99	72.20
155	Lava Ridge Ruin		8	SW 1/4	129	11	3	1	BFC	Chert	Medium	Absent	1-25%	4.32	22.90
156	Lava Ridge Ruin		8	SW 1/4	129	10	3	1	BI	Chert	Fine	Absent	26-50%	5.57	116.20
157	Lava Ridge Ruin		3	Whole	143	9	0	0	MUL	Chalced ony	Fine	IND	1-25%	4.77	32.90
158	Lava Ridge Ruin		3	Whole	143	10	0	0	MUL	Chert	Fine	Absent	1-25%	3.53	18.80
159	Lava Ridge Ruin		3	Whole	143	11	0	0	BFC	Chert	Fine	Present	1-25%	3.89	12.60
160	Lava Ridge Ruin			CU 49 (Whole)	146	10	1	1	MUL	Chert	Fine	Absent	0%	3.32	10.40

161	Lava Ridge Ruin			CU 50 Whole)	158	9	2	2	MUL	Chert	Course	Absent	26-50%	5.42	115.30
162	Lava Ridge Ruin		21	W 1/2	173	10	1	1	MUL	Chert	Medium	Present	1-25%	4.06	21.20
163	Lava Ridge Ruin		8	NE 1/4	178	20	2	4	BFC	Chert	Fine	Present	0%	2.94	12.90
164	Lava Ridge Ruin		21	W 1/2	180	15	2	1	BI	Chert	Course	Absent	0%	4.31	46.40
165	Lava Ridge Ruin		21	W 1/2	180	16	2	1	MUL	Chert	Medium	Absent	1-25%	5.97	50.80
166	Lava Ridge Ruin		21	W 1/2	180	17	2	1	BFC	Chert	Medium	Absent	0%	4.62	22.80
167	Lava Ridge Ruin		21	W 1/2 of S Wall	185	10	1-2	All	UNI	Chert	Medium	Absent	1-25%	3.20	40.40
168	Lava Ridge Ruin		8	NE 1/4	187	14	2	5	BI	Chert	Medium	Absent	0%	4.37	57.90
169	Lava Ridge Ruin		3	SW 1/4	188	11	1	1	MUL	Chert	Medium	Absent	1-25%	3.60	24.00
170	Lava Ridge Ruin			CU 50 (Whole)	190	9	2	4	MUL	Chert	Medium	Absent	26-50%	4.97	47.20
171	Lava Ridge Ruin		4	SW 1/4	192	12	1	1	MUL	Chert	Medium	Absent	1-25%	5.03	45.80
172	Lava Ridge Ruin		4	SW 1/4	192	11	1	1	UNI	Chert	Medium	Absent	1-25%	4.29	49.90
173	Lava Ridge Ruin		21	E 1/2	197	10	2	2	TC	Chert	Medium	Absent	76-99%	5.80	137.90
174	Lava Ridge Ruin		21	E 1/2	197	15	2	2	MUL	Chert	Fine	Present	1-25%	3.74	20.30
175	Lava Ridge Ruin		21	E 1/2	197	16	2	2	UNI	Chert	Medium	Absent	1-25%	4.23	22.50

176	Lava Ridge Ruin		8	NW 1/4	200	9	2	2	MUL	Chert	Medium	Absent	1-25%	5.60	46.60
177	Lava Ridge Ruin		8	NW 1/4	205	13	2	3	BI	Chalced ony	Fine	IND	1-25%	4.35	26.60
178	Lava Ridge Ruin		8	NW 1/4	205	12	2	3	UNI	Chert	Fine	Absent	1-25%	4.18	34.50
179	Lava Ridge Ruin			CU 55 (Whole)	209	14	0	0	UNI	Chert	Medium	Present	1-25%	4.63	33.90
180	Lava Ridge Ruin			CU 55 (Whole)	209	29	1	1	MUL	Chert	Medium	Absent	26-50%	3.04	23.50
181	Lava Ridge Ruin			CU 55 (Whole)	209	23	0	0	BFC	Chert	Fine	Present	1-25%	4.02	45.80
182	Lava Ridge Ruin			CU 55 (Whole)	209	24	0	0	BFC	Chert	Medium	Absent	0%	3.83	21.10
183	Lava Ridge Ruin			CU 55 (Whole)	209	26	0	0	UNI	Chert	Fine	IND	0%	3.57	13.80
184	Lava Ridge Ruin			CU 55 (Whole)	209	28	0	0	UNI	Chert	Medium	Absent	1-25%	4.39	32.70
185	Lava Ridge Ruin			CU 55 (Whole)	209	25	0	0	UNI	Chert	Medium	Absent	1-25%	3.87	16.90
186	Lava Ridge Ruin			CU 55 (Whole)	209	27	0	0	BI	Chert	Course	Absent	26-50%	5.44	78.10
187	Lava Ridge Ruin			CU 55 (Whole)	215	9	1	3	BI	Chert	Medium	Absent	1-25%	4.79	65.00
188	Lava Ridge Ruin			CU 55 (Whole)	218	11	1	4	BFC	Chert	Medium	Absent	0%	3.42	27.60
189	Lava Ridge Ruin		8	NE 1/4	222	9	2	2	UNI	Chert	Medium	Present	0%	2.81	8.30
190	Lava Ridge Ruin		8	NW 1/4	223	13	2	4	UNI	Chert	Medium	Absent	1-25%	7.02	65.80
191	Lava Ridge			CU 55	225	10	1	5	MUL	Chert	Fine	Present	0%	3.85	25.80

	Ruin			(Whole)											
192	Lava Ridge Ruin			CU 55 (Whole)	225	18	1	5	UNI	Chert	Medium	Absent	0%	4.13	56.80
193	Lava Ridge Ruin		24	E 1/2	227	11	2	2	BP	Chert	Fine	Present	1-25%	4.47	31.10
194	Lava Ridge Ruin		23	N 1/2	232	9	2	1	UNI	Chert	Medium	Present	1-25%	4.98	87.20
195	Lava Ridge Ruin		8	NE 1/4	235	10	2	6	CF	Chert	Medium	Absent	1-25%	4.25	22.90
196	Lava Ridge Ruin		8	NW 1/4	236	10	2	6	MUL	Chert	Fine	Absent	1-25%	6.50	222.50
197	Granary House			CU4	4	11	0	0	UNI	Chert	Fine	IND	1-25%	4.03	12.60
198	Granary House			CU2	2	9	0	0	MUL	Chert	Medium	Absent	26-50%	4.79	13.00
199	Granary House			CU2	2	17	0	0	MUL	Chert	Fine	Present	1-25%	4.38	55.60
200	Granary House			CU1	1	10	0	0	BI	Chert	Medium	Absent	1-25%	3.65	20.20
201	Granary House			CU2	2	18	0	0	BI	Chert	Medium	Absent	1-25%	4.54	38.90
202	Granary House		4		14	11	2	3	MUL	Chert	Medium	Absent	26-50%	5.22	100.10
203	Granary House			CU3	3	9	0	0	MUL	Chert	Medium	Absent	26-50%	5.54	45.40
204	Granary House	10836	2		19	2	1	3	MUL	Chert	Medium	Absent	1-25%	3.29	18.72
205	Granary House	10876	2		16	2	1	1	CF	Chert	Fine	Present	1-25%	5.35	16.42
206	Granary House	10891	2		18	11	1	2	MUL	Chert	Fine	Absent	0%	4.96	39.89

207	Granary House	10843	2		21	2	1	1	MUL	Chert	Fine	Absent	26-50%	3.84	22.45
208	Site 232		General Site		0	20	0	0	MUL	Chert	Medium	Absent	26-50%	3.93	75.10
209	Site 232		General Site		0	25	0	0	CF	Chert	Medium	Absent	0%	5.48	32.64
210	Site 232		General Site		0	58	0	0	MUL	Chert	Medium	Absent	0%	5.14	43.57
211	Site 232		General Site		0	14	0	0	BFC	Chert	Medium	Present	0%	5.95	53.65
212	Site 232			CU 1	1	2	0	0	MUL	Chert	Course	Absent	26-50%	5.62	148.10
213	Site 232			CU 1	1	2	0	0	MUL	Chert	Very Course	Present	26-50%	6.24	98.40
214	Site 232			CU 2	2	2	0	0	MUL	Chert	Medium	Present	26-50%	5.91	71.85
215	Site 232			CU 3	3	2	0	0	MUL	Chert	Course	Absent	26-50%	5.94	69.93
216	Site 232		General Site		0	37	0	0	MUL	Chert	Medium	Absent	26-50%	7.20	222.99
217	Site 232			TU 5	9	2	1	1	BI	Chert	Medium	Absent	1-25%	7.13	109.52
218	Andrus Canyon			CU 4 (1 X 1)	1	9	1	1	MUL	Chert	Medium	Absent	1-25%	3.96	30.20
219	Andrus Canyon			CU 4 (1 X 1)	1	10	1	1	MUL	Chert	Fine	Present	0%	3.23	14.60
220	Andrus Canyon			CU 2 (2 X 2)	6	9	0	0	UNI	Chert	Medium	Absent	1-25%	3.53	22.70
221	Corn Cob Site		Ft/Rm 10	TU 5 (2 X 1)	11	11	3	1	MUL	Chert	Fine	Absent	1-25%	2.69	27.60
222	Corn Cob Site		CU7	CU 7 (1 X 1)	23	9	0	0	CF	Chert	Fine	Absent	0%	4.11	22.90
223	Corn Cob Site		Ft/Rm 4	TU 6 (2 X 2)	22	2	0	0	MUL	Chert	Course	Absent	1-25%	4.28	32.70

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CURRICULUM VITAE

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Education

August 2011-present

M.A. Archaeology, Department of Anthropology, University of Nevada Las Vegas, Department of Anthropology. Thesis title: *Analysis of Lithics Assemblages from Virgin Branch Puebloan sites on the Shivwits Plateau*.

August 2007- May 2011

B.A. Anthropology/Archaeology, Robert E. Cook Honors College, Indiana University of Pennsylvania. Graduated Summa Cum Laude with Departmental Honors. Undergraduate thesis completed 05/2011.

Research Interests

Topical: Prehistoric Ceramic Analysis, Lithic Analysis, Experimental Archaeology, Archaeological Field Excavation Techniques, Prehistoric Arts and Culture, Artifact Technology Life and Use, Ethno-archaeology, Museum Curation.

Areal: American Southwest, Great Basin, and Northeast.

Employment History

June 2, 2013 – July 13, 2013

Shivwits Research Project Field School Laboratory Director: The position involved mentoring students in processing (washing, labeling, and analyzing) all artifacts recovered during the course of excavation in the field. Also responsible for the maintaining site accession logs, analysis forms, site forms, photographic records of the excavation, and monitoring field cabin energy and water use levels. Directed by Dr. Karen Harry, Dept. of Anthropology, UNLV.

August 2011 – May 2013

Graduate Research Assistant – Southwestern Ceramics Laboratory Manager: As a Graduate Assistant my primary tasks involve managing the processing and organization for the Southwestern Ceramic Laboratory collections, artifact analysis, creating and updating electronic records within the laboratory, and preparing sections of reports on analyzed artifacts. Supervised by Dr. Karen Harry. Dept. of Anthropology, UNLV

May – July 2010

Undergraduate Research Assistant/Photographer, Indiana University of Pennsylvania: The position involved aiding Indiana University of Pennsylvania professors Beverly Chiarulli (PhD) and Sarah Neusius (PhD) in supervising and teaching basic field excavation techniques and note taking to undergraduate students during the Summer 2010 Archaeological Field School at the Johnstown Site (36IN2), Pennsylvania. As site photographer I maintained and recording all photo-logs for the site. Directed by Dr. Sarah Neusius and Dr. Beverly Chiarulli, Dept. of Anthropology, IUP.

May – August 2009

Laboratory and Curator Assistant at The State Museum of Pennsylvania and Archives in Harrisburg, Pennsylvania: Interned in the Section of Archaeology, Pennsylvania Historical Museums Commission under Janet Johnson, Curator. Responsibilities included recreated an electronic database for prehistoric artifacts recovered from the West Water Street Site (36CN175), and preparing artifacts to museum curation standards. Also participated in field excavations in Millersville, PA, public outreach, and museum exhibit maintenance. Supervised by Janet Johnson, Museum Curator, The Pennsylvania State Museum – Section of Archaeology.

May – August 2007

Museum Floor Hand and Monitor - Whitaker Center for Science and the Arts: Employed with hands one, non-profit science museum. Responsible for maintaining and monitoring museum exhibits, leading tours, and directing visitors.

Field, Laboratory, and Internship Experience

September & October 10, 2014

Fort Hunter Field Investigations (PHMC): Participated in the field excavation/investigations conducted by The State Museum of Pennsylvania's

Section of Archaeology (PHMC). Conducted artifact identification, field excavation, and feature mapping. Directed by Dr. Kurt Carr, The Pennsylvania State Museum, Section of Archaeology.

June 2011 & June 2012

Shivwits Plateau Field Excavation and Survey: I was involved in archaeological surveys and excavations as part of a long-term research project concerning Puebloan occupation of the Mt. Dellenbaugh area of the Shivwits Plateau located within Parashant National Monument. Directed by Dr. Karen Harry, Dept. of Anthropology, UNLV.

July-August 2010

Field School Participant at Gila National Forest Department of Historical Preservation, Truth or Consequences, New Mexico: I participated in battlefield archaeological surveys and excavations of the Buffalo Soldier Calvary Unit and Apache soldier camps on the Palomas Battleground site, receiving education on in-site surveying techniques using Ground Penetrating Radar and metal detecting. Directed by Dr. Beverly Chiarulli, Dept. of Anthropology, IUP, Dr. Eleanor King, Dept. of Sociology and Anthropology, Howard University, and Chris Adams, Archaeologist, Black Range Ranger District, Gila National Forest.

May-July 2008

Field School Participant at the Johnston Site at the Indiana University of Pennsylvania: Student participant in the Summer 2008 Archaeological Field School, at the Johnstown Site (36IN2) Blairsville, Pennsylvania, trained in basic field excavation and note taking. Directed by Dr. Sarah Neusius and Dr. Beverly Chiarulli, Dept. of Anthropology, IUP.

Thesis/Dissertations

2014

Title: *Analysis of Lithics Assemblages from Virgin Branch Puebloan sites on the Shivwits Plateau*. M.A. Thesis submitted in partial fulfilment of the Requirements for the Masters of Arts Degree for the Department of Anthropology, UNLV.

2011

Title: *Firing Techniques and their Effects on Susquehannock Ceramic Vessels*.

B.A. Thesis Dissertation, Indiana University of Pennsylvania, Indiana, PA.

Technical and Specialized Skills

Archaeological Methods

Field Methods: GPS technologies including Garmin handheld devices.

Metal Detection.

Total Station. Model: Civil Surveying Instruments PVT. LTD - South Total Station NTS-350/350R Series.

Analytical Methods: Ceramic Analysis, Lithic Analysis, Ground Stone Analysis, Flotation, C-14 Sampling, Pollen Sampling.

Computer Skills

Microsoft Word 2010, Microsoft Power Point 2010, Microsoft Excel 2010, and Microsoft Access.

Adobe Photoshop CS5 and Adobe Illustrator CS6.

Other

Ceramic reconstruction, ceramic hand-building/wheel throwing techniques, and prehistoric (non-kiln) firing techniques.

Artifact illustration, technical drawing, and hand drawing techniques.

Professional/Academic Honors and Awards

2011

Valedictorian, graduating *Summa cum laude* with High Honors from the Robert E. Cook Honors College, Indiana University of Pennsylvania, class of 2011.

2011

Best Poster Presentation in the College of Humanities and Social Sciences, Indiana University of Pennsylvania Research Conference.

2009 – 2011

Provost Scholar Award for Outstanding Educational Achievement at the Indiana University of Pennsylvania.

2007 – 2011

Dean's List for 8 semesters at the Indiana University of Pennsylvania.

Professional Presentations

2013

Thomas C. Wambach. Bent Out of Shape: Warping in Virgin Branch Ancestral Puebloan Ceramics.

Presented at the Nevada Archaeological Association Annual Meeting in Las Vegas, NV (April 21, 2013).

Presented at the Society for American Archaeology 78th Annual Meeting (April 6, 2013).

Graduate and Professional Student Association Research Forum (March 16, 2013).

2011

Thomas C. Wambach. Firing Techniques and their Effects on Susquehannock Ceramic Vessels. Presented as an undergraduate poster presentation at the Society for American Archaeology 76th Annual Meeting.

Scholarships and Grants

Spring 2014
UNLV Access Grant: $1,000.00

Spring 2013
UNLV Access Grant: $2,000.00

Fall 2012
Graduate and Professional Student Association Conference Travel Grant: $510.00

Spring 2012
UNLV Access Grant: $1,000.00

Spring 2011
Indiana University of Pennsylvania, Department of Anthropology Travel Grant: $500.00

2007-2011

Board of Governors Honors Scholarship: $2,777.00

Spring 2008

Robert E. Cook Achievement Fund Grant: $1,500.00

Fundraising, Projects, and Volunteer Services

March – April 2014

Ceramic Firing Project: Assisted in firing prehistoric ceramic replicas as part of a study on prehistoric pottery. Tasks involved operating a pick-up truck to gather materials needed for ceramic vessel construction and firing. Performed with Professor Sally Billings, College of Southern Nevada's (CSN).

August 2012 – May 2013

UNLV Anthropology Society. Newsletter Writer, Officer: Officer in the Dept. of Anthropology UNLV's student run organization. Also acted as Newsletter Writer and Editor for this organization.

March 2013

Nevada Site Stewardship Program Presentation – Prehistoric Pottery Construction Techniques: Presentation organized by the College of Southern Nevada (CSN) for the Nevada Site Stewardship program. Assisted in teaching participants the basics of prehistoric hand building techniques, material processing, and firing. Directed by Professor Sally Billings, College of Southern Nevada's (CSN).

November 2010 – February 2011

Bedtime Hugs Fundraiser: Organized a separate fundraiser titled "A Rose for a Hug," raising more than $600.00 within 24 hours for the Bedtime Hugs Organization, a local organization which provides books and toys to underprivileged children in Indiana, Pennsylvania.

August 2008 – April 2010

Johnston Site Ceramics Analysis Project: Assisted in re-analyzing and cataloging ceramic artifacts recovered from field work performed in 2008 at the Johnston Archaeological Site (36IN2). Contributed 200 + hours of volunteer service.

August 2007 – May 2011

Honors Connection Residence Hall Council: As a member, I participated in organizing events and activities designed to increase active participation in residence hall life, Open House activities, and student outreach to local area high schools and recruiting to the Robert E. Cook Honors College. Contributed 200 + hours of volunteer service.

August 2001 – March 2007

Stars Program Youth Volunteers at the Whitaker Center for Science and the Arts: Volunteered at the Whitaker Center for Science and the Arts. Presented topic in physics, chemistry, and biology to museum guests. Also responsible for monitoring guests and museum exhibits. Contributed 1,000+ hours of volunteer service.

Professional Associations

March 2013 – Present

Society for American Archaeology, (SAA) Active Member.

2011 – Present

Nevada Archaeological Association, (NAA) Active Member.

References

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