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Title: North Umpqua End Scrapers: Allometry, Discard, and Residual Utility.

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David R. Brauner

End scrapers were an "all purpose" tool that have been associated with processes such as planing or shaving vegetal resources, shaping bone or antler implements, and to render hide into usable fabric. Examining end scrapers from four different archaeological sites on the North Umpqua River of southwestern Oregon provided interesting data regarding the use of these tools over time. Each site consists of at least one, or several, occupational components providing an opportunity to compare similarities and differences between sites. Analyses rely in part on the comparison of multi-dimensional characteristics, or allometry, of the stone tools. Statistically, the relationship between the length of an end scraper and its thickest point has been previously suggested to be demonstrative of the original size of the tool. A similar conclusion was acquired during this analysis, which then sought to determine if a discard ratio for each site could be established based on the length and edge angle of the end scrapers. The discard ratio was originally thought to

represent a reflection of functional efficiency, differential resource processing, or material availability. A bulk analysis of material types from the overall assemblages and a comparison of end scraper composition suggested intensive use of obsidian, the non-local material. Overall, trends could not be demonstrated using the discard ratio to represent the degree of use as end scrapers size depends on lithic technology, material availability, and perhaps a specific need. Perhaps the most intriguing outcome of this study relates to the individual Middle Archaic component at the Meg's Keep site. Based on the large obsidian artifact assemblage, this site is thought to have been a task specific location and that the large number of end scrapers recovered were manufactured elsewhere and imported to the site. Comparing end scrapers at each site suggested that Type 1 scraper ($\geq$7.5 mm) may be an indicator of curation. The analyses indicate that Type 1 CCS end scrapers at Canton Creek, Dry Creek, and Boulder Confluence out-numbered Type 3 scrapers 20 to 4. In contrast, the large number of end scrapers at Meg's Keep had a total of 9 Type 1 end scrapers. From the above data, Type 1 and Type 3 end scrapers appear to be a direct result of the availability of raw material and potentially an indicator of curation.

North Umpqua End Scrapers: Allometry, Discard, and Residual Utility

by

Christopher J. Kelly

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CHAPTER 1.

INTRODUCTION

This study investigates the stone tool known as an end scraper and two hypothetical perspectives regarding the potential extent of this tool's use at prehistoric sites. An end scraper was made on a flake removed from a cobble or nodule of fine-grained material such as jasper, chert, or obsidian. By splitting a nodule to expose a flat surface, or "platform," resulted in a core and allowed flakes to be systematically removed from the perimeter of the core (Whittaker 1994). The flakes were then selected and manufactured into different types of tools. In the case of end scrapers, a flake was retouched through percussion flaking on one side, creating a "unifacial" tool. The majority of retouch on an end scraper appears on the distal, working edge of the tool and is where use wear on specimens will develop.

Found in many archaeological contexts, the end scraper was used by many different cultures around the world (Semenov 1964; Keeley 1980; Schick and Toth 1993; Andrefsky 1998; Blades 2003). End scrapers are a well-defined category of tools most often associated with a function related to the scraping or processing of animal hides. Yet, the end scraper has also been interpreted as an "all-purpose tool" (Keeley 1980; Schick and Toth 1993; Andrefsky 1998; Blades 2003).

Experimental archaeology, or the modern replication of stone tools, has been used with high-powered microscopes to identify edge wear damage on various types of stone tools. In many studies, experimental archaeologists have tested end scrapers on various types of material to identify how past cultures have used these tools, and what substances scrapers may have been used to process. Andrefsky (1998:193) states, "Many researchers have ascribed the function of animal skin working or scraping to the end scraper," an observation which has been substantiated by the ethnographic record. Several studies, however, conclude that scrapers were used for a variety of purposes, and it remains for experimental archaeology to determine specific end scraper uses.

Two recent approaches have attempted to link metric data from end scrapers at prehistoric sites to the amount of use they may have undergone. Seeking to provide another perspective on end scrapers, in addition to use wear analysis studies, one approach operates under the assumption that the length and edge angle of end scrapers may indicate the extent of use. Gray (2002: 43) has suggested a "discard ratio" formula dividing the length by the edge angle to examine the remaining functional efficiency of end scrapers. The implications of the discard ratio are that they may relate to intensity and duration of site use, material availability, or a technological difference in hide processing techniques between distant and local residential base camps (Gray 2002:43).

Under the hypothetical analogy that length and edge angles are an indication of use, will collecting metric data on end scrapers validate the discard ratio? Gray used the discard ratio in southwestern Oregon to compared two sites dividing the average length and edge angles from each site and was able to derive unique sums. The resulting figures suggested the difference between the Dry Creek (.366) and Meg's Keep (.489) sites is related to a scraper's size and edge angle.

This study will provide an independent examination of the same two sites used by Gray along with two additional sites to determine the validity of the discard ratio. While collecting metric data, the second method will be applied and includes an examination of all metric measurements. Using metric data from end scrapers recovered from a well-defined context, Blades (2003) attempted to link end scraper data to the duration of site use.

It is hypothesized that by using both Blades and Gray's method of examining end scrapers, that another way of interpreting these tools can perhaps be introduced. The difference between short end scrapers with steep angles and long scrapers with acute angles could potentially be an indication of site "type," the extent to which end scrapers were used, or the availability of raw material. Experimental archaeology and edge wear analyses has concluded that end scrapers were used as all-purpose tools. Using the raw metric data from end scrapers, do these all-purpose tools have the ability to define the extent of use at a site, or are end scrapers just an indication of scraping activities?

S. A. Semenov

Initial archaeological interpretations regarding the function of end scrapers tended to be conservative or entirely incorrect (Semenov 1964). Semenov described the original confusion over function as being attributed to an overly formal approach to the interpretation of end scrapers in archaeological contexts. Pioneers such as S.A. Semenov (1964), instead sought to interpret the function of stone tools based on manufacturing and wear characteristics. Semenov (1964:87) determined that scrapers were a tool created with the intention of scraping and processing hides.

Archaeologists, however, have challenged the interpretation of end scrapers being used solely for hide processing (cf., Hayden 1979a; Siegel 1984 cited in Andrefsky 1989:73). Despite these challenges concerning function, the end scraper is still widely accepted as having served a hide scraping function (Semenov 1964; Keeley 1980; Schick and Toth 1993; Andrefsky 1998; Blades 2003). One archaeologist, de Mortillet (1903 cited in Semenov 1964: 85), working in a European setting was unable to ascribe a functional definition to the end scraper. Based on their widespread occurrence, however, de Mortillet conceded that the tools were vital to the people using them.

Although de Mortillet did not recognize the function of the end scraper, he did note that, "End scrapers are tools whose general use it is difficult for us to understand [but] from their first appearance in Solutrean times their numbers grew vastly, and they occur abundantly in Magdalenian and Neolithic times alike. They are found in large quantities in the obsidian industries of Mexico and in the stone industries of Greenland, where they continue to the present day" (Semenov 1964:85). Other perspectives on end scraper function include using this "round-ended tool" to cut like a saw through hard material like wood and bone (Pfeiffer cited in Semenov 1964: 85). This interpretation of the end scraper added additional functions to this tool such as a chisel, chopper, or scraper, thus suggesting an "all-purpose tool" (Semenov 1964).

Investigations conducted with end scrapers began to look empirically at function by examining use-wear traces left on the working edge of these tools. When the use-wear analysis approach was used to examine whether Pfeiffer's interpretation was correct, the examination of trace wear on end scrapers did not substantiate Pfeiffer's views (Semenov 1964:85). The traces left by tool use include a polish and were attributed to chiseling and chopping of varying materials, but as Semenov concluded: such traces do not occur on end scrapers (Semenov 1964:85). Rather, the presence of edge-wear on end scrapers is identified on the sharp edge of the tool extending upward along the distal edge of the upward-facing portion. This led

Semenov to conclude that the tool was designed to move "frontally" with the ventral face forward, thus suggesting use in a scraping motion.

Based on his study, Semenov (1964: 87) concluded "in reality an end scraper was used for treating skin, for scraping and softening skins after they had been taken off the animal." Andrefsky (1998:193) substantiates this claim citing both archaeologists and ethnographic accounts in asserting, "end scrapers are intended for use in working hides. Working the hide was only an initial step in rendering a hide into an article of clothing." Semenov (1964:87) states: "After scraping, deer hide becomes pliable like chamois leather; in contemporary furriery this process is called currying. The blade of the scraping tool needs to be sharp, but not so sharp that it cuts the pelt." Andrefsky (1998:193) provides additional support that the end scraper was used in working hides; suggesting that the edge angle of the end scraper must have an effective scraping edge, but not one that is sharp enough to cut or slice the hide.

The manner in which scraping occurred has also been brought into question. Semenov questioned whether end scrapers were used with bone or wooden handles to facilitate the use of the tool in hide scraping. Semenov was able to reach two conclusions on this subject: 1) end scrapers were predominantly manufactured on elongated blades that would permit direct use from hand to hide and 2) the end scrapers used in Semenov's study were visibly worn on the right-hand side of the tool indicating that pressure was applied without a handle which would have caused even wear across the edge of the tool. The research conducted by Semenov was compared to data on scrapers from Europe with similar results and conclusions being reached. It should be pointed out, however, that Semenov thought end scrapers may have been hafted on occasion when the tool, originally made on a small blade, became too small for holding with the fingers.

Edge wear analyses on end scrapers have shown evidence of their use in processing hides. In terms of scraper morphology, the utilized edge is never straight; as a rule it is semi-circular or convex (Semenov 1964). The round working edge of the end scraper is necessary for working on interior portions of the hide, but also serves as a measure to avoid cutting the hide as a straight-edged end scraper would have the potential to do (Semenov 1964:88).

Examining wear located on the edge of end scrapers, Semenov (1964:88) concluded that: "… wear is confined to the edge of the flint which is blunted more or less uniformly by friction, because it was held with its axis at an angle of 75-80 degrees to the skin surface. Sometimes it was less, sometimes as much as 90 degrees, depending on the thickness of the blade and the kind of retouch on its working edge."

Semenov then examined an assemblage of end scraper specimens under magnification. When examining use-wear patterns at ten times their normal size, Semenov found that striations on the tool's surface "occur as minute grooves intersecting the blade-edge transversely." The grooves revealed that they are wide on the ventral portion of the tool and become narrower near the upper retouched part of the tool. Semenov concluded that this was additional evidence indicating that the tool was moved frontally with the ventral side forward (i.e., in a scraping motion).

L. Keeley

Following in Semenov's footsteps, Lawrence Keeley (1980) employed a wide range of techniques and high-powered magnification focusing on use-wear evidence of end scrapers. Keeley was able to conclude that different types of material being scraped left different forms of polish on the artifacts he observed. Working with an assemblage of Upper Paleolithic tools from England, Keeley was able to isolate distinguishing features related to implement use. Finding microwear signatures on the Upper Paleolithic tools, Keeley compared them to Lower Paleolithic tools to interpret wear similarities exhibited on end scrapers over time. Augmenting this study was Keeley's experimental replication of stone tools similar to the Lower Paleolithic tools and their subsequent implementation on materials such as bone, wood, antler, hide, and vegetable materials in order to observe the different trace wear left on the tools (Keeley 1980:17). Based on his analysis Keeley was able to compare results of edge wear experiments on the stone tools he created with the artifact assemblages he was studying. Keeley identified traces left on the stone tools he had manufactured from the different materials he had conducted experiments on (i.e., wood, bone, antler, hide, and vegetable). Keeley concluded that although end scrapers are most often associated with hide preparation, they could also be considered an all-purpose tool.

Schick and Toth

Karen Schick and Nicholas Toth (1993) examined the use of stone tools over space and time, and the genetic disposition of humans creating stone tool industries. Following the methodology of Semenov (1964) and Keeley (1980), Schick and Toth interpret the function of prehistoric stone tools with the aid of experimental archaeology. Examining the amount of polish, edge damage, and striations on the edge of tools, Schick and Toth substantiated previous claims and continued to build upon the function of stone tools. Schick and Toth acknowledged hide scraping was a big part of the scraper function (they did not differentiate between end or side scrapers), but found that wood-scraping activities could be associated with scraper tools (Schick and Toth 1993:293).

D. Gray

When examining the large number of end scrapers recovered from the Meg's Keep site in southwestern Oregon, Dennis Gray (2002: 40) suggested a "discard ratio" for determining the point at which an end scraper is no longer functionally efficient. Gray (2002) divided the average length (28.3 mm) of the end scraper by the average edge angle (57.4 degrees) to acquire a discard ratio of 0.49 (0.489) for

Meg's Keep. The discard ratio for Meg's Keep was then compared to that of Dry Creek (35DO401) where Gray (2002: 43) acquired a discard ratio of 0.366. The smaller number produced at Dry Creek was correlated to an overall smaller end scraper size with steeper edge angles suggesting repeated use and rejuvenation until the were apparently discarded.

The discard ratio, therefore, is thought to potentially reflect the intensity of end scraper use and reduction at specific sites. The discard ratio can potentially be used to examine how end scraper use varied over time and how they may have been used differently throughout the Umpqua Basin and southwestern Oregon.

B. Blades

Brooke Blades (2003) conducted an end scraper study from two archaeological sites in Europe and proceeded on the intuitive assumption that utilization of the end scraper for hide scraping, planing, etc., would have resulted in a cycle of wear, followed by rejuvenation on the retouched end, thus reducing the initial length of the blade. During the course of the study, Blades asserted that allometry, the relationship between the multi-dimensional characteristics of an end scraper can be measured, and that the initial length of a blank that has been reduced through retouch/use can be measured. Blades states: "These considerations have obvious implications for the evaluation of final length, since the same amount of reduction on end scrapers of different original lengths would result in corresponding differences in final length at discard." More importantly, Blades points out that as a result of the study a direct relationship between less-intense end scraper reduction, percentages of distant raw material, and local fauna during cold and apparently open environmental conditions was detected. In addition, Blades concluded that there was less consistency in the extent of end scraper reduction among assemblages associated with more diverse, and at times, less-mobile fauna. Blades concluded that similar studies continue to require a fine-grained comparison of lithic material and other data regarding the manner in which resources are acquired.

Using end scrapers from a closed, rock shelter environment, Blades examined the allometric relationship of the end scraper with associated faunal remains. Analysis of end scraper reduction, the distance of raw material, and the presence of both local fauna and highly mobile game animals allowed Blades to make several general assumptions. First, Blades suggested that the intensity of reduction on end scrapers needs to consider the means, or technique used in assessing the reduction. Also, and perhaps most important, Blades states: "Further, it is important to recognize that mobility pattern is not the only cause of reduction intensity, and often may not be the primary one" (Blades 2003:154). Finally, Blades insists that similar analyses need to take into account the paleoenvironmental conditions, subsistence resources, and distance to lithic materials in order to examine social choices in mobility.

This thesis draws from the vital sources listed above and it should be pointed out that an analysis regarding use-wear on the edge of end scrapers was not conducted during this study. Rather, this analysis examines the relationship between metric variables such as the length and thickness of end scrapers, as well as examining the degree of each end scraper's edge angle. In terms of edge angles, an assumption was made that steep edge angles are an indication of intensive edge reduction, whereas end scrapers exhibiting long sloping edge angles were less intensively retouched.

The Acquisition of Data

Over the last 25 years, federal agencies have managed cultural resources under the National Historic Preservation Act of 1966 and the Archaeological Resources Protection Act of 1979 (Hutt, Blanco and Varmer 1999). These laws mandate cultural or historical sites are identified prior to agencies beginning federally funded projects. These laws were implemented to consider the consequences of impacts on culturally and historically sensitive areas and provide federal land managers with guidelines on managing these resources. These two laws in general have contributed to archaeological resources across the country being identified, protected, and consequently studied.

This study focuses on southwestern Oregon where sites have been identified and recorded on lands administered by the Umpqua National Forest. Four of these sites are located within the Western Cascade Mountains of southwestern Oregon along the upper stretch of the North Umpqua River (Figure 1). Three of the four sites represent temporary upland hunting camps while the fourth site, Meg's Keep, appears to be a task-specific area related to hide processing. The following sites were utilized during the course of this research, due in part, to the previous archaeological investigations carried out in these locations: Canton Creek (35DO216), Dry Creek (35DO401), Boulder Confluence (35DO535) and Meg's Keep (35DO701).

These four sites were chosen because a relatively large number of scrapers were recovered during excavation. Based on the analyses of tool types recovered during the investigations, each site was identified as a temporary base camp where the occupants utilized the surrounding area to collect and gather various resources as they became available (Baxter 1989; Brauner 1977; O'Neill et al. 1996; Draper 1999). One site, however, Meg's Keep (35DO701), was identified as a task specific area where butchering and hide processing activities were the primary function (Musil 2000; Gray 2002). This limited-use site will provide insightful information that is expected to be dissimilar from the other three sites and will serve to provide a cross-comparison of data for all sites used in this study.

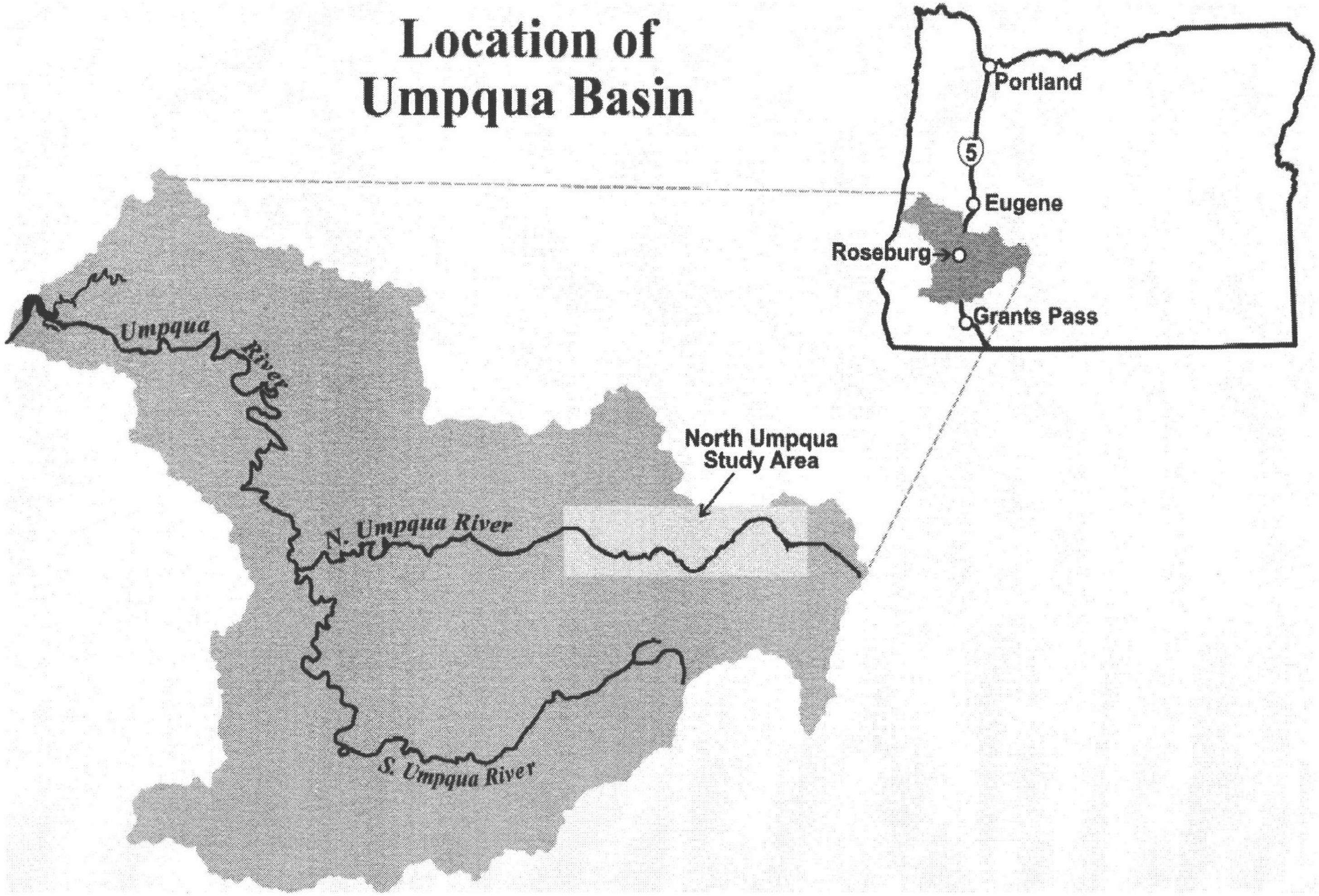


Figure 1. State of Oregon showing the North Umpqua River study area (Umpqua National Forest Map).

Research Perspective

This study seeks to provide a more detailed perspective into scraper reduction at site locations by examining the amount of residual utility remaining in discarded end scraper tools. Measuring the tool's length and edge angle can potentially provide an estimate of the tool's remaining utility in archaeologically recovered assemblages. The remaining utility may offer insight into the extent of end scraper activities at a site.

The curation of scrapers, or moving the tool from one site to another with the intent of reuse is likely to have occurred. Determining which end scrapers may have been curated, however, is difficult to determine at best and relies upon a cognitive choice to include such a tool within the tool kit. Blades (2003) has pointed to original flake size as an indicator of curation, suggesting that a large flake was most likely created near a source of raw material. The opposite would therefore appear to be true and can be based on scarcity: the farther from the source, the smaller a flake or scraper may become either from distance or continued rejuvenation.

The length and edge angle of end scrapers may provide data on the extent to which an end scraper was used or remained functional (Gray 2002, Blades 2003). If this is true, longer scrapers with acute edge angles may be representative of limited use at a site. Alternatively, do short scrapers with steep angles indicate longer use, perhaps a different function at a site, or represent the availability of raw material? If the discard ratio represents the extent to which end scrapers were used until they are no longer functionally efficient, does the data vary between sites and over time?

Examining these tools, excavated in vertical increments of 10 centimeters (Canton Creek was excavated in increments of 20 centimeters), by stratigraphic provenience may help address the extent of tool rejuvenation over time and addresses the variation between scrapers at different sites. The results of this study seek to aid in further refining whether a discard ratio is appropriate for measuring scraper use and rejuvenation. Based on edge angle, these tools may be representative of the degree of processing activities over time.

Hypothesis

Regardless of the activity that end scrapers were involved with, they may exist as a tool following a predictable "life-cycle" of use and rejuvenation. This life-cycle ranges from its original selection and reduction from a core tool to the flake, shaping the flake to fit a particular need, use, re-sharpening, and discard when it is no longer functional, assuming it is not lost prior to discard. Experimental archaeology has shown that an initial flake used as a cutting tool will maintain its edge for five or ten minutes (Schick and Toth 1993:166). Retouching the flake edge can result in the manufacturing of a scraper, which in turn will hold an edge longer, but will not be as sharp as the original flake (Schick and Toth 1993:166).

Gray (2002:40) hypothesized that collecting metric data from the remaining length and edge angle could measure the functional efficiency of the end scraper. The resulting figure produced by the discard ratio can potentially provide insight into scraping activities; long end scrapers with sloping edge angles may imply short-term use, whereas short end scrapers with steep edge angles may suggest longer periods of use with heavier focus on processing activities. When scrapers are found in abundance at an archaeological site and obvious spatial patterns develop, a discard ratio may help in interpreting the extent of processing activities conducted at a site using Gray's proposed formula, although this theory has yet to be substantiated. This study seeks to offer further insight on how the presence of end scrapers could be interpreted at a site.

Research Questions

From the four sites listed above, a total of number of 340 end scrapers and end scraper fragments were excavated. A total of 148 intact specimens served as the study group in this instance. Three questions are posed for this analysis on end scraper tools:

1. Will correlating the number of scrapers by cultural component, examining allometric relationships, and measuring edge angle provide results that indicate the extent of end scraper use at the site?

2. Does a discard ratio using edge angles and end scraper lengths provide an accurate reflection of functional efficiency? If so, does this also represent the stages of resource processing at a site?

3. If apparent differences occur in the edge angle/length ratio, are they related to material differences? If so, what are the differences and what do they suggest?

Thesis Organization

This thesis is organized as follows: Chapter II introduces the environmental context of the research area that would have lead to a specific type of cultural pattern for the inhabitants. Chapter III explores the relevant ethnographic framework for this portion of southwestern Oregon while Chapter IV discusses the previous archaeological fieldwork of the area, and specifically, the excavation methods and materials recovered from the sites discussed in this thesis. In Chapter V, the methodology used for analyzing the archaeological materials is presented. Chapter VI presents the results of the analysis and Chapter VII is a discussion and conclusion of how the interpretations presented in this thesis could be applied.

CHAPTER 2.

ENVIRONMENTAL SETTING

The four sites in this study are located in the North Umpqua River Basin, an interior river valley located in southwestern Oregon (Figure 2). This area is referred to as the Cascades geologic province (Franklin and Dyrness 1988) and is surrounded by mountain ranges heavily carved by erosion from the many small streams draining into the North Umpqua River. At the northern extent of the basin is the Calapooya Divide, which is a portion of the older Western Cascades and separates the Umpqua Basin from the Willamette Basin. At the extreme southern edge of the Umpqua Basin are the Klamath Mountains, looming to the east is the Cascade Mountain Range (High Cascades) which is younger than the Western Cascades, and finally, to the west, the North Umpqua River completes its passage through southern Oregon, entering the Pacific Ocean near Winchester (Winchester Bay, Oregon USGS quadrangle 1986).

The North Umpqua River originates in the Cascade Mountains at an elevation of about 5,800 feet (Tolo Mountain, Oregon USGS quadrangle 1986) and winds its way through the narrow mountain canyons to join the South Umpqua River northwest of the city of Roseburg. The North Umpqua River spans a distance of

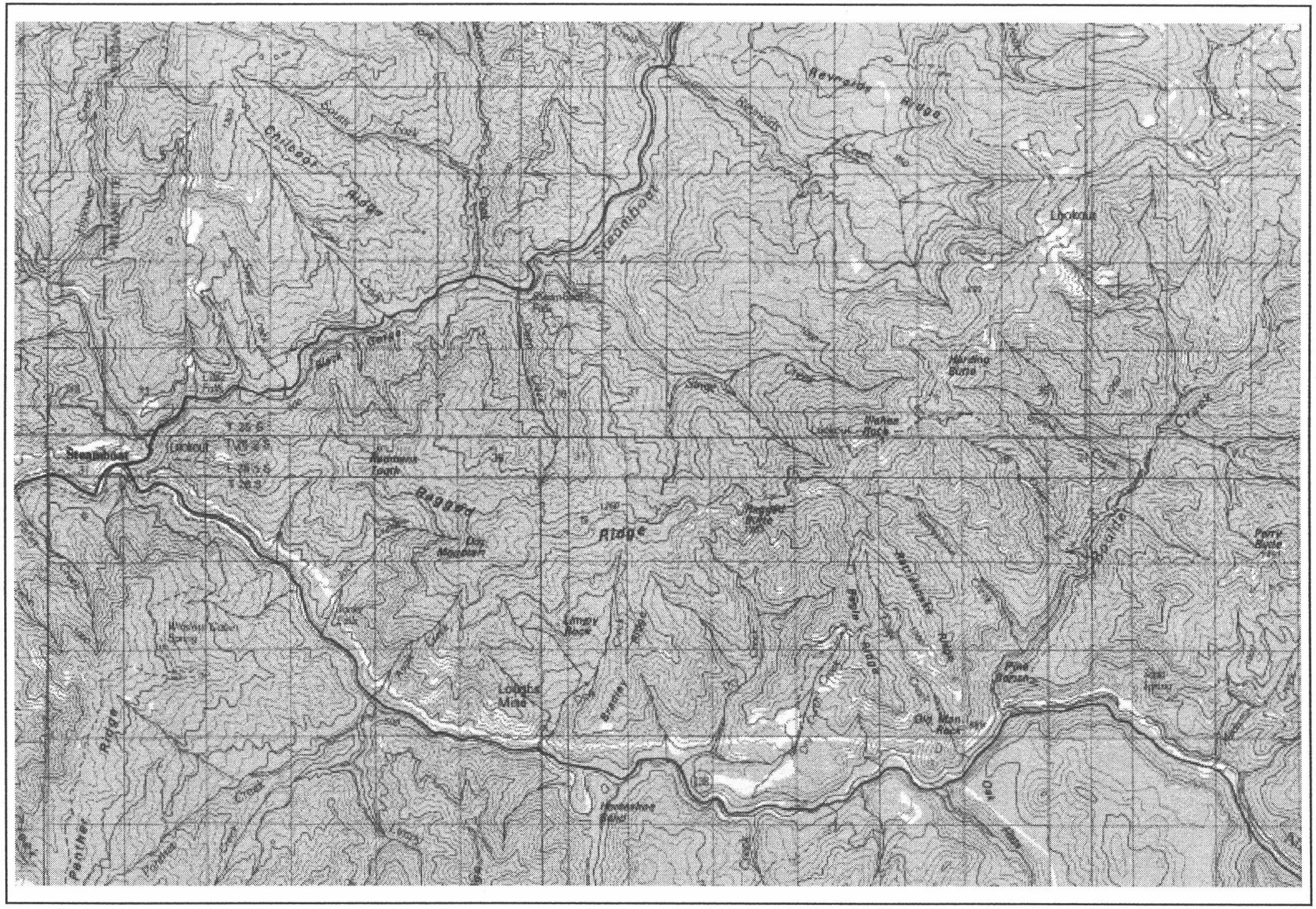


Figure 2. The upper North Umpqua River study area.

approximately 106 miles, while the North Umpqua and its tributaries drain an estimated area of 2,038 square miles (O'Neill 1989).

Geology

The research area focuses primarily along the upper stretches of the North Umpqua River within the Cascades geologic province. This geologic zone can be further subdivided into the Western Cascades physiographic province and High Cascades physiographic province. The older Western Cascades are described as the mountains and foothills east of the interior valleys, whereas the High Cascades are the crest of the mountain chain farther to the east, with volcanic peaks rising to above 10,000 feet in elevation (Winthrop 1993). Orogenesis has provided both the Western and High Cascades physiographic provinces with geology unique to each zone.

The Western Cascades date to the Cenozoic Era where volcanic activity began in the Oligocene epoch. The composition of the Western Cascades is both volcanic and sedimentary in nature (Walker and King 1969). The North Umpqua River lies in an area described by Franklin and Dyrness (1988) as composed of pyroclastic rocks such as tuffs, breccias, and agglomerates. These older Western Cascade flows and tuffs converge with more recent overlapping flows and tuffs dating to the Pliocene/Pleistocene epochs and characterize the High Cascade zone to the east.

Within the High Cascades, volcanic activity dating to the last 5 million years has left the region with precipitous slopes that are interrupted with volcanic peaks and cinder cones reaching elevations of 5,000 feet or more (Draper 1998). Evidence of glaciation in the High Cascades has contributed to the relief in the area and is present in the form of valleys showing evidence of mechanical weathering from rivers and streams. Cirques and cirque basins found on the north slope of higher peaks are also indicative of glacial activity in the High Cascades (Badura and Jahn 1977; Draper 1998). Significantly, the majority of this area, and downstream to the west, volcanic ash deposits from the cataclysmic eruption of Mount Mazama reach up to 100 feet thick in areas along the North Umpqua River (Badura and Jahn 1977; Baldwin 1981; Franklin and Dyrness 1988).

Today, the Crater Lake caldera is all that is left following the powerful eruption of Mount Mazama around 6,890 Before Present (BP). Located roughly 40 miles southeast of this study area, the eruption produced a “glowing avalanche" which was sure to have had a considerable effect on the local environment; the region was buried in a thick layer of pumice and ash (Hansen 1942; Purdom 1964; O’Neill 1994). Although it is unknown what effects the eruption had on the human occupants of the North Umpqua drainage, Matz (1990) hypothesized that the impact had potentially negative consequences.

Climate

In southwestern Oregon, the inland climate is represented by mild, wet winters and warm, dry summers. The city of Roseburg has an average temperature of 40 degrees (Fahrenheit) during the winter month of January and 68 degrees in July, with extremes of 1 degree and 106 degrees, respectively. The Coast Range and Cascade Mountains are influential in the types and amount of precipitation that falls in the Umpqua Basin. Annually, precipitation falls mainly as winter and spring rains with little, if any, snowfall occurring on the valley floor. Above 2,500 feet however, winter snow can remain on the ground throughout the colder seasons and elevations above 4,500 feet will receive the majority of their precipitation in the form of snow.

Vegetation

Franklin and Dyrness (1988: 110-149) have defined the major vegetation zones in southwestern Oregon corresponding with elevation. Beginning at the valley floor, the Interior Valley Zone ascends in elevation to 2,600 feet. The Mixed Conifer Zone succeeds the Interior Valley Zone and traverses the rugged canyons to roughly 4,200 feet. Various zones continue into the Cascade Mountains with increasing elevation including the Abies concolor zone (5,200 feet), the Abies magnifica shastensis zone (8,200 feet), and the Alpine Zone (above 8,200 feet), however, the study area lies within the two previously mentioned areas, and is therefore the focus below.

The Interior Valley Zone comprises all of the low-lying valleys in the Umpqua Basin as well as the foothills below 2,600 feet. Lying within this range, the landscape can take on a diverse composition consisting of meadows and oak woodlands, xeric species such as chaparral, and finally the Douglas-fir forest communities made up of various hardwood and conifers. Table 2.1 list the types of species associated with each of the vegetative communities listed above. Above the Interior Valley zone lays the Mixed Conifer Zone. Here the mid-elevation forest communities take on a different character from the valleys. The various common canopy-providing species are listed in Table 2.1.

Both the Interior Valley and Mixed Conifer zones played an essential role in furnishing the American Indians of the region with provisions throughout the year. The meadows, moist grasslands, and oak savannahs were areas where food sources such as acorns and camas grew. Through the use of fire, the American Indian inhabitants encouraged the growth of these plant communities and maintained an open landscape (Franklin and Dyrness 1988). Fire also promoted the growth of browse, which in turn attracted game and provided a reliable food source.

Fauna

The numerous animal species found within southern Oregon and the Umpqua

Basin played an important role both in the subsistence regime, as well as providing an economic base for the local inhabitants. Within the meadow and forest settings, terrestrial species provided sustenance and clothing. Along the many streamside settings of the North Umpqua River, anadromous fish runs provided a major food source.

Table 2.1. Vegetation communities and common species within the Interior Valley and Mixed Confer zones.

-Interior Valley Zone-		
Community	**Common names**	**Scientific names**
Meadows		
Oak Woodlands	California black oak, Oregon white oak	*Quercus kelloggii* *Quercus garryana*
Chaparral	buckbrush manzanita	*Ceonothus spp.* *Arctoshaphulus spp.*
Hardwoods	Pacific madrone bigleaf maple	*Arbutus menziesii* *Acer macrophyllum*
Conifers	Douglas-fir ponderosa pine	*Pseudotsuga menziesii* *Pinus ponderosa*
-Mixed Conifer Zone-		
Community	**Common names**	**Scientific names**
Mixed Woodlands	Douglas-fir, ponderosa pine, sugar pine, incense cedar, white fir grand fir	*Pseudotsuga menziesii* *Pinus ponderosa* *Pinus lambertiana* *Calocedrus decurrens* *Abies concolor* *Abies grandis*

Large game animals found in the North Umpqua River drainage include the black-tailed deer (*Odocoileus hemionus columbianus*), and although less abundant, the white-tailed deer (*Odocoileus virginianus leucurus*). Historically, the Steamboat Creek area is home to one of the Umpqua Basin's largest Roosevelt elk (*Cervus elaphus*) herds (O'Neill 1989). In addition, other large residential mammals such as the black bear (*Ursus americanus*), cougar (*Felis concolor)*, bob cat (*Lynx rufus*), and coyote (*Canis latrans*) still range throughout the hills and mountains. Prior to being driven into extinction, locally grizzly bear (*Ursus horribilis)*, big horn sheep (*Ovis spp.*), antelope (*Antilocapra americana*), and the wolf (*Canis spp.*) lived in the southwest mountains (Winthrop 1993). A sample of the smaller animal species and birds can be viewed in Table 2.2. All of these species were seasonally available to the native inhabitants. Many species, primarily deer and elk, maintain a period of migration that corresponds with snowfall in the higher elevations; coming to the valleys in winter and returning to the higher elevations in spring and summer when browse is more abundant (Winthrop 1993).

Perhaps principal among all game species is the once abundant anadromous fish runs on the North Umpqua River. Netboy (1974) describes the runs of the Umpqua River as one of the most productive on the West Coast. The primary fish runs of the North Umpqua which were important to the native inhabitants were the coho (*Onchorynchus kisutch*) which are present from September to February, chinook

Table 2.2. Select list of smaller mammals and birds in the Umpqua Basin.

Common Name	**Scientific Name**
MAMMALS	
Western gray squirrel	*Sciurus griseus*
Marten	*Martes americana*
Fisher	*Martes pennanti*
Raccoon	*Procyon lotor*
Porcupine	*Erethizon dorsatum*
Brush rabbit	*Sylvilagus bachmani*
Striped Skunk	*Mephitis mephitis*
Red fox	*Vulpes fulva*
BIRDS	
Ruffled grouse	*Bonasa umbellus*
Mountain quail	*Oreortyx pictus*
Red-tailed hawk	*Buteo jamaicensis*
Pileated woodpecker	*Dryocopus pileatus*
Great gray owl	*Strix nebulosa*

(*O. tshawytscha*) are present in the streams between September and December, and steelhead (*O. mykiss)*, which have two runs, one during the winter (December through April) and again during the summer (May to October). Other species such as rainbow (*O. mykiss)* and cutthroat trout (*O. clarkii)*, lamprey (*Lampretra tridentata)*, and the sucker (*Catostomas macrocheilus)* also provided sustenance (Draper 1998). Additionally, freshwater mussels (*Margaritifera falcata*) and crayfish (*Pacifastacus sp.*) were gathered from the rivers and streams to augment the diet.

The environmental constraints of this region were instrumental in providing predictable resources that were available seasonally. Various locations were used along the river as camps where staple foods items could be collected. The local American Indian tribes would shift from their low-lying villages into the mountains when resources became available, returning to the valley when inclement weather moved into the precipitous river canyons.

CHAPTER 3.

ETHNOGRAPHIC BACKGROUND

Within the Umpqua Basin, five different culture groups (Figure 3) were present at the time European exploration of the region began (Beckham and Minor 1992). The Southern Molala occupied the Western Cascades and extended into the High Cascades within portions of the upper North and South Umpqua drainages (Applegate 1907; Spier 1930; Beckham 1986). Upper Umpqua people lived along the central portion of the North Umpqua, from Calapooia Creek to the north and Myrtle Creek to the south (Beckham and Minor 1992) and are thought to have immigrated into the basin 400 to 500 years ago (O'Neill 1989:20). Located in the northern portion of the Umpqua Basin, between Calapooia Creek and Elk Creek were the Kalapuyan Yoncalla (Beckham and Minor 1992). The southwest portion of the Umpqua Basin, including Cow Creek, Myrtle Creek, and the South Umpqua River is the ethnographic home of the Cow Creek Band of Umpqua Tribe of Indians. The Lower Umpqua were present along the main stretch of the Umpqua River from the Pacific Ocean to perhaps as far east as Elk Creek in the northern part of the Umpqua Basin.

The sites under study are located in the ethnographic homeland of the Upper Umpqua and the Southern Molala and, although the extant information available to

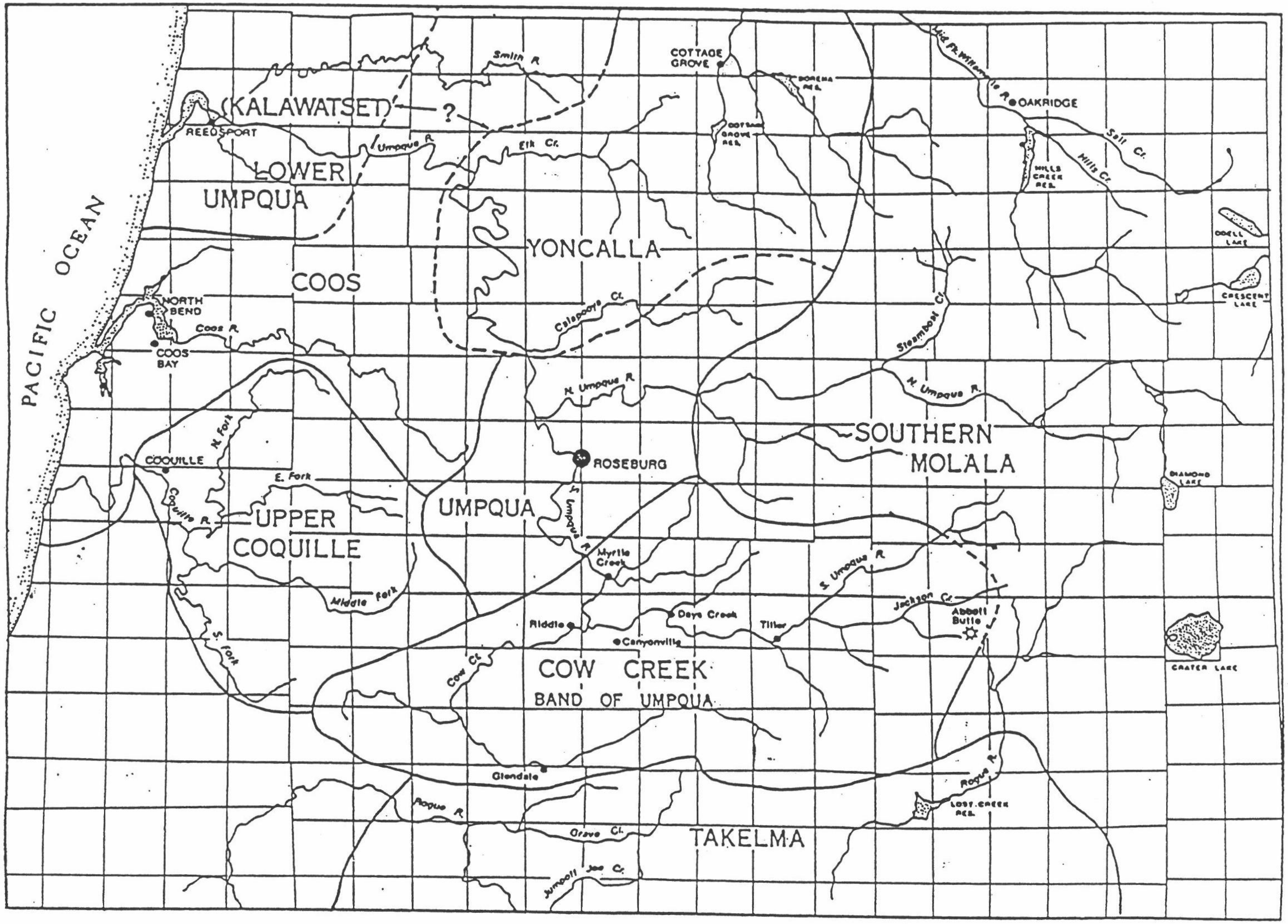


Figure 3. Ethnographic distribution of southwestern Oregon tribes (after Beckham and Minor 1992:102).

ethnographers regarding specific lifestyles of the Upper Umpqua and Southern Molala is limited, several authors have compiled critical accounts of these groups. Toepel (1987:7-31) has provided valuable insight into the past lifeways of the Southern Molala of the Western Cascades. Information compiled by Beckham (1983) regarding the Cow Creek Band of Umpqua Tribe of Indians facilitates a far-reaching approach to a better understanding of the archaeological framework of the Umpqua Basin.

During Euro-American exploration of the Umpqua Basin, the Southern Molala and Upper Umpqua were the primary groups utilizing the resources in the North Umpqua River drainage (Draper 1998). Since the project area for this study focuses specifically on the upper North Umpqua River, details regarding population densities, social organization, and settlement subsistence will be limited to the Southern Molala and Upper Umpqua rather than all of the groups that inhabited the Umpqua Basin. Ethnohistorical data gathered by Stephen Dow Beckham (1983) regarding the Cow Creek Band of Umpqua Tribe of Indians is widely used and is a valuable supplemental source for interpreting the lifeways of other neighboring groups in the Umpqua Basin. The reader is referred to this material for additional information regarding the neighboring people of the Umpqua and Rogue river basins and Minor (1987) for groups in the Willamette Basin.

Southern Molala

Following resources on a seasonal round, the Southern Molala ranged from the crest of the Cascade Mountains near Crater Lake and west into the remote portions of the North and South Umpqua rivers (Beckham and Minor 1992). Toepel (1987) states that the Southern Molala occupied Douglas County west of the Klamath Lakes. Population estimates regarding the Molala at the time of Euro-American contact indicate that they were a people small in number. Beckham and Minor (1992:107) point out that it is unclear what their numbers were because they may have been "widely distributed over a rugged and wild homeland." In 1854, Indian agent for the Umpqua Basin, William J. Martin, indicated that 15 bands were present in the region. One of these groups was identified as a "Mountain Band," and is thought to represent the Southern Molala (Beckham and Minor 1992). Martin identified the "Mountain Band" as having a total of 17 men, 20 women, 8 boys, and 9 girls for a total of 54 persons (cited in Beckham and Minor 1992:108).

Southern Molala social structures were based on extended families and bilateral kinship systems (Draper 1998). Toepel (1987) states that this pattern is similar to Plateau social organization, where complex tribal or village organization is not visible. Group leaders were often chosen by status acquired through personal abilities, rather than through a determination based on wealth (Toepel 1987:28).

Draper (1998) also states that marriages were exogamous and that neighboring groups would commonly be sought out as the source for prospective partners.

Resource availability created seasonal movements for the Molala, who moved to the High Cascades during warmer months, and returning to low-lying streamside settings during the winter (Draper 1998). Mobility allowed the Molala to gather berries, camas, hazelnuts, and acorns when they were available in the mountains during the summer and fall seasons. Large game such as deer, elk, and bear was hunted during all seasons of the year. The importance of resources gathered in the Cascades is apparent by the major items such as smoke-dried meat and mountain huckleberries brought to Willamette Falls for trade by the Molala (Zenk cited in Toepel 1987:24). Camps that were located beside streams would have provided the Molala adequate access to anadromous fish during fall and spring runs.

According to Baxter (1989), the Molala were known by neighboring groups as "hunters." The bow and arrow was utilized as the primary hunting technique employed for acquiring game. Deer were often hunted in communal drives with the aid of dogs in which the ungulates were herded into long brush fences to penned areas where fiber rope snares were used to entangle the deer (Toepel 1987; O'Neill 1989). Game such as deer and elk provided not only sustenance, but furnished the

Molala with resources such as hides for blankets and clothing, and bone and antler for manufacturing tools.

The seasonally available fish runs, as well as native lake fish, are also thought to have provided predictable resources for the Molala (Rigsby n.d.:2 cited in Toepel 1987). Based on ethnographic data from neighboring tribes, it would seem logical that the Molala would have processed and stored fish, a potentially valuable winter food source. Fishing involved tactics such as spearing and constructing weirs in which the fish could be trapped and taken. Locations on rivers and smaller streams such as riffles and falls were chosen to facilitate these practices and can often be identified by archaeological remains.

In the winter, family groups gathered in small numbers in "underground" houses, possibly indicating a similarity to the semi-subterranean houses of neighboring groups (Beckham 1986; Toepel 1987; Draper 1998). In warmer months, brush or mat covered pole shelters were constructed to provide protection from the elements (Baxter 1989). Concrete archaeological evidence regarding the disposition of Molala winter villages is still lacking; however, Canton Creek (35DO216) may have been such a location despite the lack of features encountered at this site to date (Baxter 1989:38-40).

One such place has been documented and is located along the North Umpqua River, upstream from the contemporary community of Idleyld. This portion of the river has cut a constricted channel through bedrock, carving its way through the resistant rock to create several areas of cascading falls. This area is commonly known as "The Narrows." An 1855 survey map shows the Narrows as the home of a Southern Molala winter village (Beckham and Minor 1992:20; Flint cited in O'Neill 1996).

Upper Umpqua

The Athapaskan-speaking Upper Umpqua occupied the main portions of the Umpqua River drainage. Along these stretches the well-watered, grassy meadows were interspersed with groves of oak, and forests of fir dotted the landscape. Acorns and camas, primary staples, were abundant in this region due to environmental and climatic influences. Within this area, the North and South Umpqua rivers have carved out terraces suitable for establishing village settings. Draper (1998) suggests, based on existing estimates for the Umpqua Basin as a whole (cf Mooney 1928; Boyd 1990), which the Upper Umpqua population may have been around 1,000 prior to the introduction of European diseases. Other estimates include approximately 400 persons in 1840 (Hale 1846; cited in Draper 1998) and 212 persons in 1851 (Spalding 1851; cited in Beckham and Minor 1992; Draper 1998). In 1826, David Douglas provided a description regarding the appearance of Upper Umpqua people (Douglas cited in Beckham and Minor 1992):

> The men wore shirts and trousers of undressed deerskin, some decorated with marine mollusks, while the women wore cedar bark shirts covered with a garment of dressed leather more open at the sleeves than the shirts of the men. . . . I observed that the women are mostly tat[t]ooed, principally, the whole of the lower jaw from the ear, some in lines from the ear to the mouth, some across, some spotted, and some completely blue; it is done with a sharp piece of bone and cinder from the fire. . . . The women also used both red and green facial paints.

In contrast to Southern Molala social structures, the Upper Umpqua and other Athapaskan groups practiced a system that was politically and economically independent (Beckham 1983:26-34), yet had "no overarching political structure." This type of social structure is typical of the Northwest Coast social pattern. O'Neill (1994:13) states that groups within this area maintained a patrilineal/patrilocal society, with alliances being formed or strengthened by the acquisition of brides from neighboring villages. Within each group, however, there was a person to whom village affairs and disputes were often deferred. Wealth played a significant role in determining leadership roles, but it was not the sole defining attribute. Additional characteristics such as generosity in redistributing wealth and a strong personality were deemed necessary (O'Neill 1994).

The Upper Umpqua's winter houses were described in an early 1850s encounter by Thomas Smith (Lewis 1906:176) as measuring 15-20 feet in length with cedar planks being used in the construction of a lodge. Within this structure, walls were insulated from the weather with grass and fern mats (Miller and Seaburg 1990). Shelves for drying meat and fish, as well as the presence of baskets, pestles, and mortars have been described within the Upper Umpqua shelters (Beckham and Minor 1992; Miller and Seaburg 1990). Social stratification present within each group is described by Miller and Seaburg (1990:582-583): ". . . wealthy individuals generally lived in large, rectangular, semisubterranean structures measuring 20 by 30 feet in size with space for three hearths; less wealthy individuals occupied smaller houses." Sweat lodges were common features found at both winter villages and temporary camps (Miller and Seaburg 1990). Temporary shelters were occupied by individual families and constructed from poles and brush during the habitation of short-term resource gathering camps (Draper 1998).

The Upper Umpqua had access to an assortment of foods that are available throughout much of the Umpqua Basin. Perhaps foremost among these items were salmon, deer and elk, and camas (Beckham 1986). For many of the tribes in southwestern Oregon, acorns and camas were an integral part of the diet and a primary staple (Spier cited in Beckham 1983:43). Women collected camas with the aid of digging sticks and could gather as much as "one basket per day" (Riddle 1953). Camas bulbs could be cooked in pits lined with rocks and covered with earth and stored for winter consumption (Beckham 1983). Additional sustenance was gained by collecting berries, tarweed, wild carrots, and grasshopper and yellow jacket grubs during various times of the year as they became available (Draper 1998).

The Upper Umpqua moved into the mountains during the late summer and early fall season where they established base camps in order to hunt deer and elk (Draper 1998). Through communal game drives, deer and elk were stalked and captured with rope made from wild iris fibers (Douglas 1972; Riddle 1953:61-62). Douglas (1972:143-144) observed hundreds of iris fiber snares for catching elk and deer at a village site he encountered in 1826. The bow and arrow were instrumental in taking game according to Riddle (1968). Hunting provided meat, which was dried for use during winter months as well necessities such as bone and antler for tools, and hides for clothing, blankets, and armor (Miller and Seaburg 1990:583).

When the rivers and streams filled with anadromous fish in the fall, the Upper Umpqua harvested steelhead, Chinook, and Coho salmon with the aid of fish weirs, clubs, dip nets, spears, and occasionally gaffs (Beckham and Baxter 1988 cited in Draper 1998). The majority of fish caught during this time was dried for use during the leaner winter months. Activities attended to by women during the fish harvests focused on gathering and processing of berries, hazelnuts, and acorns (Miller and Seaburg 1990).

The Umpqua Basin provided an abundance of food items for the inhabitants. Through necessity, the seasonal round of lowland winter villages and spring/summer base camps allowed access to resources such as deer, elk, and other game. The people of the basin had a multitude of resources available to them throughout the year. People have hunted and gathered, acquiring their resources needs from the landscape of the Umpqua Basin for millennia, moving to the resource and leaving behind traces of their material culture.

CHAPTER 4.

ARCHAEOLOGICAL BACKGROUND

The appearance of specific diagnostic artifacts in the archaeological record marks occurrences of cultural developments across a wide span of time in southwestern Oregon, yet "the precise sequence and timing of developments apparently varied from one river valley to another" (Beckham and Minor 1992: 92). Different theoretical perspectives have been postulated regarding the timing of cultural characteristics and technological changes for people inhabiting southwestern Oregon. Based on archaeological evidence, the record of human occupation indicates that there were several different periods dating back over the past 10,000 years. The cultural chronology devised by Beckham and Minor (1992:92) has been used here to establish the periods of time that American Indians occupied the Umpqua Basin.

Cultural Chronology

Paleo-Indian (10,800 BP to 8,000 BP): The Paleo-Indian period marks the earliest known presence of humans in the Umpqua Basin. The appearance of isolated, fluted spear points are an indication of the earliest known cultural tradition. Fluted points have been found in the Umpqua Basin and western Oregon and are thought to represent small groups of highly mobile people entering into the area to hunt big game (Aikens 1993).

Early Archaic (10,000 BP to 6,000 BP): This period is not well represented in the archaeological record, which may be due to relatively small, mobile populations. Occupation in the Umpqua Basin by these Early Archaic people is represented by several archaeological sites in North and South Umpqua river basin settings (cf Snyder 1981; O'Neill 1992; Bevill et al 1994; O'Neill and White 1994; O'Neill 1996; Gray 2001). Stratigraphically, sites from this period are buried beneath airborne ash and pumice from the cataclysmic eruption of Mount Mazama. Diagnostic projectile points recovered beneath Mazama ash share similarities with Borax Lake Pattern assemblages in Northern California and the Windust assemblages of the Plateau (O'Neill 1992). These leaf-shaped and broad-stemmed spear points, and possibly atlatl projectile points, are representative of this period along with the initial appearance of vegetal and milling complexes (Gray 2002).

Middle Archaic (6,000 BP to 2,000 BP): The Middle Archaic marks the first well represented period in southwestern Oregon. The development of a collector-village subsistence and settlement pattern becomes better defined in the archaeological record. Pithouses are thought to date to the latter part of this period (Pettigrew and Lebow 1987), and the beginning of acorn processing is evident by the appearance of the mortar and pestle. The primary weapon system of this era is a wide range of broad-necked projectile points that represent the use of the dart and atlatl during the Middle Archaic.

Late Archaic Period (2,000 BP to 1,000 BP): Perhaps the most definitive characteristic of this time period are the small projectile points, which introduce the arrival of the bow and arrow. Populations are postulated to have been sizeable; semi-permanent pithouse villages are found in a variety of settings where hopper mortar and bedrock mortar milling tools are found in association.

Formative Period (1,000 BP to Contact): An emphasis on wealth marks this period as large obsidian bifaces and dentalium shells are characteristics of a relationship with other Northwest Coast cultures. Pithouse villages in river settings remain common and Gunther Series projectile points mark this era. Siskiyou Utility Ware, found as far north as the upper Rogue River Basin near Trail, Oregon is a short-lived ceramic tradition found south of the current study area (Mack 1983).

Protohistoric Era (500 BP to Contact): This period marks a dramatic change in the way of life for native people. Populations decline, cultural complexity deteriorates, and the ceramic tradition found in the upper Rogue River Basin, Siskiyou Utility Ware, disappears as epidemics affect distant and local populations. Items such as glass trade beads appear in several sites in the North and South Umpqua river drainages and are an indication of the interaction between American Indians and Euro-Americans (O'Neill 2003:18). Small-sized arrow points continue to be representative of this period as Coquille and Gunther series projectile points remain common, and the introduction of the Desert side-notched projectile point occurs (Musil 2000; Gray 2002).

Artifact Assemblage Interpretations

Interpretation of artifact assemblages recovered from the Middle and Late Archaic from the North and South Umpqua river drainages, provides insight into cultural variation and development. The analysis of artifact assemblages originating from these two areas concluded that there were "phases" associated with the broader chronological periods (O'Neill 1989; O'Neill and White 1994). These phases aid in further defining the broader periods by examining technological changes that occurred in the Umpqua Basin.

By examining diagnostic projectile points recovered from archaeological investigations, in conjunction with the geographical settings from which they were recovered, a different perspective has been postulated regarding subtleties within the Middle and Late Archaic (O'Neill 1989:273-283). The broad-stemmed projectile points that are characteristic of Middle Archaic sites (6,000 BP to 2,000 BP) were found to occur in a variety of settings (O'Neill and White 1994:22).

O'Neill (1994) states that this archaeological evidence suggests that riverine resources played an equally important role as terrestrial resources.

Analyses of the Late Archaic (including the Formative Period and Protohistoric Era) projectile point assemblages (2,000 BP to 1850 A.D.) concluded that there are two distinct "phases" that occurred during this course of time (O'Neill 1989; O'Neill and White 1994). The first and earliest of the two phases was the Falls Phase. The Falls Phase is present throughout the Late Archaic and is defined by the presence of Coquille Series projectile points in both the North and South Umpqua river drainages. The Narrows Phase is thought to represent a cultural change in the North Umpqua drainage during the last 400 years of the Late Archaic (O'Neill and White 1994:22). In the Narrows Phase, Gunther Series projectile points dominate assemblages and may be an indication of the immigration into the Umpqua Basin by the Athapaskan speaking Upper Umpqua. In addition, Desert Side-notched projectile points appear in both the North and South Umpqua drainages during the Protohistoric and may reflect the influence of new cultures in the Umpqua Basin.

Site Types

There are three definitions that categorize the types of sites that are found in the Umpqua Basin. Based on the work of Winthrop (1993), the site types were defined to differentiate between groups that practiced a collector subsistence/settlement regime and those who maintained a more mobile way of life. The site types for the collector and mobile models proposed by Winthrop fall within three categories, but are separated based primarily by elevation, or the time of year that a site could be occupied. The sites under investigation in this study consist of two site types: the task-specific site and the seasonal camp. The third type of site is defined below in order to provide the entire spectrum of site types.

Villages

The most diverse type of site is the village encampment where a wide variety of functions pertaining to everyday living would have been carried out. The roles carried out at village site included people of all ages and status, and of both sexes (Winthrop 1993:78). The wide array of tasks conducted at village sites coincided with the need for a variety of tools to meet specific job requirements, and thus a wider range of tools are expected in a village setting. Both small and large winter villages focused their settlements along the banks of productive fisheries in lowland settings, where harsh weather was less extreme than in upland settings.

Seasonal Camps

Seasonal base camps, or residential base camps, were used during the warmer months of the year as people shifted from their winter village settings. The seasonal movement allowed the people to utilize different resources as they became available in different areas and elevations. Seasonal camps are thought to represent a group inhabiting an area, usually with a specific focus, such as gathering berries, collecting root crops, or hunting. These residential base camps were also places where families camped and performed common tasks, leaving behind tools and materials reflecting the generalized focus of the base camp (Winthrop 1993:79). Compared to winter camps, a residential base camp would contain similar characteristics; however, these areas would have been located in higher elevation settings.

Task Specific Sites

Task specific sites are the result of activities performed by people for a specific purpose. These sites can take shape in the form of hunting/butchering sites, hunting blinds, fishing stations, quarries, spiritual sites, and short-term encampments when traveling (Winthrop 1993:81). These specialized, task-specific sites often reflect a single purpose, accomplished by a specialized group of people, such as a few male hunters, people quarrying stone material, or a few women and children gathering certain plants (Winthrop 1993:81).

Previous Archaeological Investigations

Archaeological investigations conducted throughout the Umpqua Basin are extensive and those carried out in the North Umpqua River drainage are equally broad. The sites examined here were selected for study due to data recovery projects implemented under federally mandated laws. The Canton Creek site

(35DO215) was investigated by Oregon State University as part of the mitigation process prior to timber activities. Dry Creek (35DO401) was tested by Coastal Magnetic Search and Survey in 1987, followed by additional testing in 1989 by Brian O'Neill and his crew from the Oregon State Museum of Anthropology (OSMA) and further studied as the result of data recovery conducted by the Oregon Department of Transportation along the North Umpqua Highway. The Boulder Confluence site (35DO535) was discovered and recorded by Umpqua National Forest personnel in the 1980s (O'Neill and White 1994). Boundary determinations occurred in 1994 by OSMA archaeologists during a Pacific Power and Light (PP&L) electrical transmission line corridor survey being conducted for a hydroelectric project, and by 4-D CRM to evaluate the damage caused by hazardous tree removal, and later, fire suppression activities. Meg's Keep (35DO701) was recorded by Umpqua National Forest in 1995 and damaged during fire suppression activities in 1996. Subsequently, archaeological investigations occurred in order to evaluate the damage to the site. A more thorough discussion of these four sites follows.

Canton Creek (35DO215)

Lying just upstream from where Steamboat Creek joins the North Umpqua River is the Canton Creek site (Figure 4). Encompassing the banks and terraces surrounding the confluence of Canton and Steamboat creeks, the Canton Creek

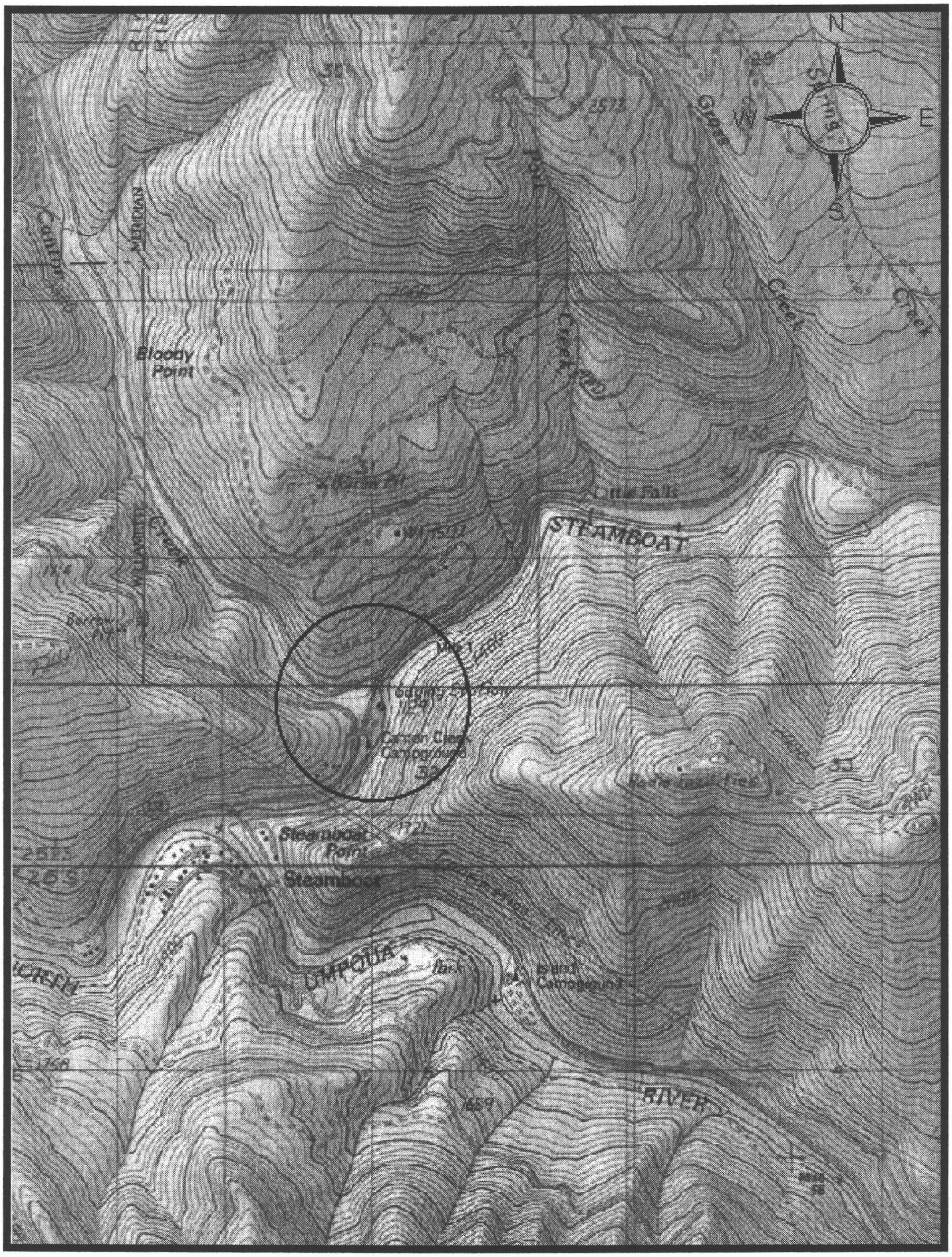


Figure 4. Location of the Canton Creek site (USGS Steamboat Quadrangle, 7.5' Series, 1989)

investigations conducted by Oregon State University archaeologists recovered chipped-stone tools, debitage, fire-cracked rock, and cobble tools. The presence of charcoal and bone has also been documented across the site.

When the Canton Creek site was evaluated in the mid-1970s, it was described as follows: "cultural material. . . .were observed scattered in skid trails on the slopes between terraces and on the terraces" (Brauner and Honey 1977:20). Despite past disturbances to the site, intact deposits contain artifacts thought to represent various occupations reflecting the past 6,000 years. Excavations at Canton Creek in 1977 produced 39 projectile points, 60 biface fragments, 21 drills, 55 scrapers, 204 used flakes, 12 cores and core fragments, one hammer/anvil stone and one chopper and 4,317pieces of debitage (Baxter 1989). Debitage included 2,617 CCS flakes (61%), 1,401 obsidian flakes (32%), 298 basalt flakes (6%), and a single unidentified flake material made up the final one percent. Obsidian sourcing has not been conducted at Canton Creek to date.

Recovered with the stone tools from Canton Creek are faunal remains that total 293 bone fragments. Of the faunal fragments that could be placed into identifiable categories, elk and deer made up the majority of the collection. Within this assemblage, dominated by the presence of ungulates, a single salmon vertebra was identified (Brauner and Honey 1977; Baxter 1989).

Due to the diverse make up of the artifact and faunal assemblage, it is clear that a wide range of activities were undertaken at the site. Artifact densities point to repeated occupations for thousands of years. It was suggested by Brauner and Honey (1977:25) that the site "may well have functioned as an annually visited hunting camp," but the lack of features and a narrow range of artifacts suggest that this site was probably not used as a winter village. Baxter (1988:39-40) hypothesizes that Canton Creek may have been used as both a Southern Molala winter village and an Upper Umpqua summer base camp, which in turn would have created a site with relatively dense deposits of cultural material.

Although a radiocarbon date has not been established for the site, Canton Creek artifact types demonstrate the area was used during the Middle and Late Archaic periods. A relative dating technique (i.e., projectile point typology) was used to establish a chronological sequence for the Canton Creek site. Based on the presence of a large stemless point, the apparently oldest diagnostic point recovered from Canton Creek, archaeologists believe humans were present roughly 6,000 to 7,000 BP at Canton Creek (Baxter 1989:28-29). Several Heavy Broad-necked and Medium Broad-necked atlatl dart points recovered at depths ranging between 60-100 cm below the surface attest to occupations occurring during the Middle Archaic period. Coquille and Gunther series projectile points were recovered from the upper 60 cm of the cultural deposits and are representative of the Late Archaic. Stratigraphically, artifacts were recovered from the surface of the site to a depth of 1.4 meters below the surface (Brauner and Honey 1977). Baxter (1989:28) states that the projectile point styles are in the appropriate stratigraphic positions to indicate that the site is relatively intact. Therefore, the relative dating techniques applied to Canton Creek are in accordance with a site that contains deposits representing the last 6,000 years. The depth of the site, and its location, above Steamboat and Canton creeks, helps demonstrate that habitation at the site extends significantly back over time and provides valuable data regarding occupation.

Dry Creek (35DO401)

The Dry Creek site is located on a terrace above the North Umpqua River near the small, unincorporated community of Dry Creek, Oregon (Figure 5). Initial test excavations were conducted in 1989 by archaeologists from Coastal Magnetic Search and Survey who, based on limited tool assemblages, concluded that the site "appeared to be a seasonal encampment that was occupied on a short term, probably seasonal, basis over an extended period of time" (Churchill and Jenkins 1989: 38).

This limited test excavation of 16 shovel probes and four 1 x 1 meter test units resulted in the excavation of 5.5 cubic meters of cultural deposits. From this investigation, 83 historic artifacts and 2,386 prehistoric artifacts were recovered including 11 cores, 5 core fragments, two finished projectile points, 14 bifaces, 19 scrapers, 11 unifaces, 14 utilized flakes, 2 cobble tools, and 2,305 pieces of debitage.

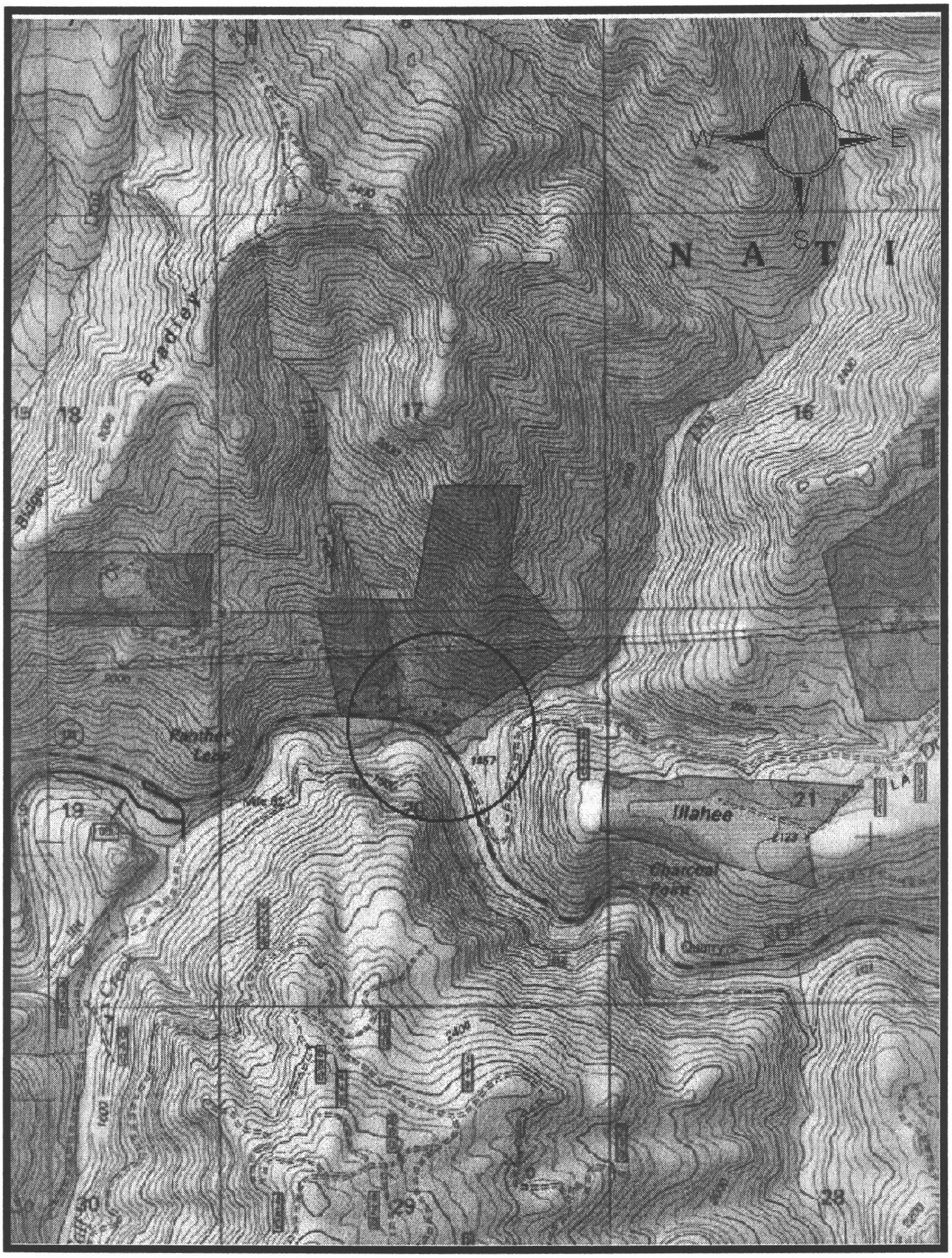


Figure 5. Location of the Dry Creek site (USGS Illahee Rock Quadrangle, 7.5' Series, 1989).

Coastal Magnetic Search and Survey archaeologists Jenkins and Churchill (1989) tested Dry Creek and determined that the artifact assemblage demonstrated a variety of task-oriented activities. Hunting, butchering, and the skinning of game was a common activity based on the number of end scrapers, scraper fragments, and utilized flakes as well as projectile points and projectile point fragments recovered from the site. Plant processing and lithic tool manufacturing were other activities perceived to have been important tasks carried out at the site.

Although the test excavations were limited at Dry Creek in 1989, Jenkins and Churchill were able to recover diagnostic artifacts, as well as a carbon sample that returned a radiocarbon date. The radiocarbon date, recovered at a depth of 100 cm below the surface yielded an age of 5,220 ±80 BP (Beta-31832) for Dry Creek. Diagnostic projectile points recovered from Dry Creek also indicate that habitation of the site occurred during the Early and Middle Archaic periods.

The Dry Creek site was examined again in 1991 by archaeologists from the Oregon State Museum of Anthropology (OSMA) operating under a contract with the Oregon Department of Transportation. At this time, 2.8 cubic meters of soil was excavated from the site to a depth of 140 cm. From the 2.8 cubic meters of soil that was evaluated, five projectile points, one drill, 12 bifaces, 13 scrapers, 2 unifaces, 19 utilized flakes, one core, two hammerstones, one chopper, an anvil/edge-faceted cobble, and 2,760 pieces of debitage were recovered. This investigation corroborated the date of 5,220 BP for the site by the recovery of additional diagnostic artifacts.

Data recovery was conducted in 1996 when OSMA archaeologists evaluated an additional 64.2 cubic meters of cultural fill at Dry Creek. A total of eleven 2 x 2 meter units, eight 1 x 2 meter units, one 1 x 1 meter unit, and four 50 x 50 cm profile columns were excavated. Artifacts recovered from these deposits include 747 chipped stone tools, which include 123 projectile points, three drill fragments, 121 bifaces, 108 scrapers, 83 unifaces, 197 utilized flakes, 20 cores, 19 choppers, 17 hammerstones, ten battered cobbles, three pointed cobbles, ten grinding slabs, nine manos, one pestle, eight edge-faceted cobbles, six stone bowl mortars, three polished stones, two drilled stones, and 35,837 pieces of debitage.
The lithic debitage counts included 18,910 pieces of obsidian (53%), 16,526 pieces of CCS (46%), and 401 basalt flakes (1%).

Obsidian sourcing was conducted on a total of 76 specimens from the 1996 testing at Dry Creek (O'Neill and White 1996), 47 (62%) of which were recovered from the Early Archaic component. A total of eight different sources from eastern and northeastern Oregon were identified within the Early Archaic component. The number of obsidian sources declines to five during the Middle Archaic and four sources are associated with the Late Archaic. The decline in sources may be an indication of sampling error, however both the number of obsidian items and sources appear to decline over time in each of the sites in this study. Silver Lake and Sycan Marsh obsidian was the most common source of material with 51%, followed by Spodue Mountain (22%), and McKay Butte (12%). A total of five other sources identified made up roughly 11% of the remaining sample and include: Newberry Crater (3%); Obsidian Cliffs (4%); Deer Creek (2%); Inman Creek A (1%); Cougar Mountain (1%); and Grasshopper Flat (1%).

The test excavations in 1996 yielded several charcoal samples that were submitted for radiocarbon testing and dates returned on these samples provided new data on habitation at Dry Creek. Radiocarbon dates of 7,390 BP (Beta-48725) and 7,500 BP (Beta-50250) were returned on charcoal collected from deposits identified below Mazama ash. These radiocarbon dates indicate that Dry Creek was occupied during the Early Archaic period. Additionally, obsidian hydration analysis further indicated ages for habitation occurring between 6,820 and 8,000 BP. Diagnostic artifacts associated with the obsidian analysis are similar to Borax Lake Widestem and Windust points and substantiate the hydration dates (O'Neill and White 1996). Calcined bone yielded a radiocarbon date as well, indicating use during the Late Archaic, and as recent as the last 290 years (Beta-50251), or during the Protohistoric Era. The Dry Creek site spans much of the Holocene Epoch, including the Early, Middle, and Late Archaic, where the inhabitants conducted a wide variety of tasks covering nearly 10,000 years.

Boulder Confluence (35DO535)

Boulder Confluence (35DO535) was recorded in the 1980s by Umpqua National Forest personnel. In 1993, archaeological investigations were conducted by OSMA at Boulder Confluence to determine the horizontal boundaries of the site as well as examining the depth of cultural deposits under a contract with PacifiCorp.

Located in a setting adjacent to the North Umpqua River (Figure 6), the Boulder Confluence site would appear to have been suitable for harvesting anadromous fish. Approximately 4.0 cubic meters were excavated in 1993 that included twenty test probes, a combination of 50 x 50 cm shovel probes, and 25 cm diameter auger probes excavated to an average depth of 90 cm.

The Boulder Confluence site yielded a total of 82 tools and 8,633 pieces of debitage and 18 pieces of modern debris. Chipped stone tools included 27 projectile points, 20 bifaces, seven scrapers, seven unifaces, seven utilized flakes, one core, eight hammerstones, one battered cobble, one chopper, one stone bowl fragment, one edge-faceted cobble/mano, and one pointed stone. In addition, 329 pieces of bone were recovered from the site, all of which were terrestrial in nature. Blood residue analyses were conducted on two stemless projectile points with one producing a positive reaction to trout antiserum (O'Neill and White 1996:217).

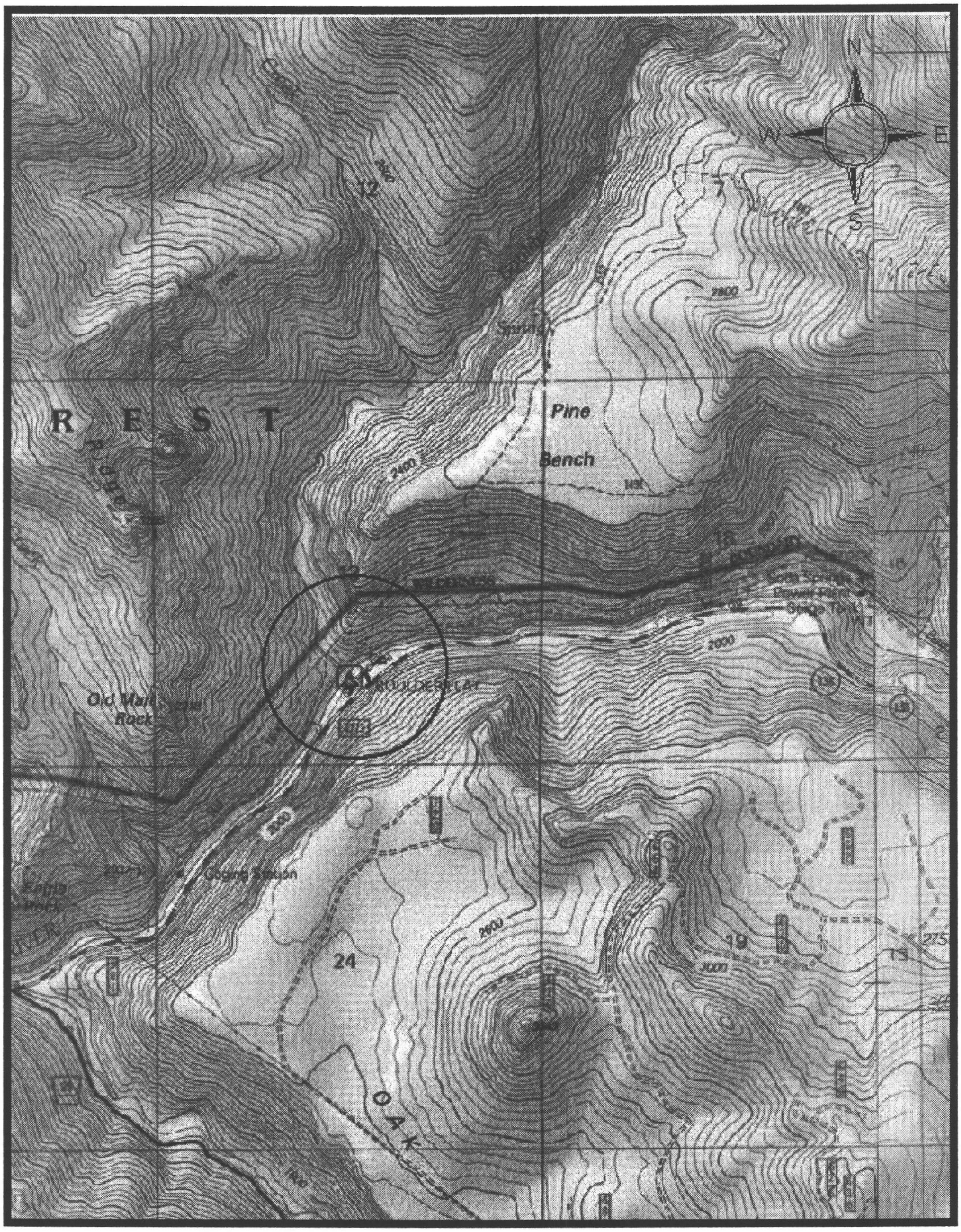


Figure 6. Location of the Boulder Confluence site (USGS Illahee Rock Quadrangle, 7.5' Series, 1989).

This investigation demonstrated that dense cultural deposits occur at Boulder Confluence. Diagnostic projectile points indicate that habitation occurred during the Middle and Late Archaic periods. Samples of culturally related charcoal were not acquired and therefore radiocarbon dates demonstrating a scientific date for occupation were not produced during the testing of the site in 1993.

In 1997, data recovery excavations were conducted at the Boulder Confluence site by 4-D CRM. This investigation was conducted to assess and mitigate damage to the site caused by fire suppression activities as well as to assess damage to the site resulting from transmission line maintenance.

In all, archaeologists evaluated three distinct areas with 16 cubic meters of cultural deposits being excavated in fourteen 1 x 1 square meter test units to a depth of 110 cm. From this investigation, the following artifacts were recovered: 44 projectile points, 24 projectile point fragments, four projectile point preforms, one biface, 41 biface fragments, four bifacial blanks, three drill-perforators, 58 scrapers, 92 edge-modified flakes, 91 utilized flakes, three hammerstones, four battered cobbles, a pestle and one mortar, three flaked/battered cobbles, and one split/flaked cobble, one glass trade bead, nineteen bone tools and 2,402 faunal remains with bird, deer, dog, elk, fish, and turtle being represented in this collection (Draper 1998:112). A total of 35,837 pieces of debitage were collected and are listed here by material types; obsidian: 18,706 (52%); CCS: 14,652 (41%); basalt/andesite: 1,925 (3%); and siltstone: 112 (1%).

A total of 20 items were submitted from Boulder Confluence for obsidian sourcing studies. Eleven (55%) of the items submitted came from the Middle Archaic component and eight specimens were submitted from the Late Archaic component along with one from a surface context. All of the obsidian artifacts were identified as having come from four locations in eastern Oregon. The Silver Lake and Sycan Marsh obsidian (n=11) represents 50 percent of the sample followed by Spodue Mountain (25%), Inman Creek (15%), and Obsidian Cliffs (10%). This sample is similar to Dry Creek; the most common source of obsidian appears to have been the Silver Lake and Sycan Marsh area. Also of note is that there are fewer obsidian sources represented at Boulder Confluence that may be correlated to the lack of an Early Archaic component.

Habitation at the Boulder Confluence site spans both the Middle and Late Archaic periods. Radiocarbon dates have not been established for the site, however, diagnostic projectile points indicate occupation of the site may date to 6,000 BP. The glass trade bead and several small arrow points help date the upper component of this site to the Protohistoric or early historic period (Draper 1999:141).

Meg's Keep (35DO701)

The Meg's Keep site (35DO701) is located in a saddle situated between the Boulder and Slide creek watersheds at an elevation of 4,400 feet above sea level

(Figure 7). Heritage Research Associates evaluated the site following impacts from fire suppression activities in 1996. In 1999, archaeological investigations commenced at the Meg's Keep site with 26 shovel probes, eighteen 50 x 50 cm test probes, and one 1 x 1 meter test unit being excavated. Cultural deposits extended to a depth of 80 cm below the surface; however, excavation continued in one location to a depth of 150 cm. A total of 4.1 cubic meters of cultural fill was excavated at Meg's Keep in 1999 (Musil 2000:10).

Artifacts recovered from the excavation resulted in two projectile point fragments, 18 bifaces, 29 scrapers, two unifaces, 16 used flakes, a battered cobble, and 3,842 pieces of debitage (Musil 1999). A single projectile point had been collected from the surface of the site when it was originally recorded in 1995. Due to the limited nature of diagnostic projectile points recovered during this investigation, Meg's Keep was tentatively thought to represent an Early to Middle Archaic site.

Forty-two percent of the chipped stone tool assemblage was dominated by the presence of scrapers (n=29). Meg's Keep stands out among the other sites previously discussed due to the limited variety of chipped stone artifacts recovered from the site. Based on the abundance of scrapers recovered from the site, it was concluded that considerable hide scraping was conducted at Meg's Keep (Musil 2000:43).

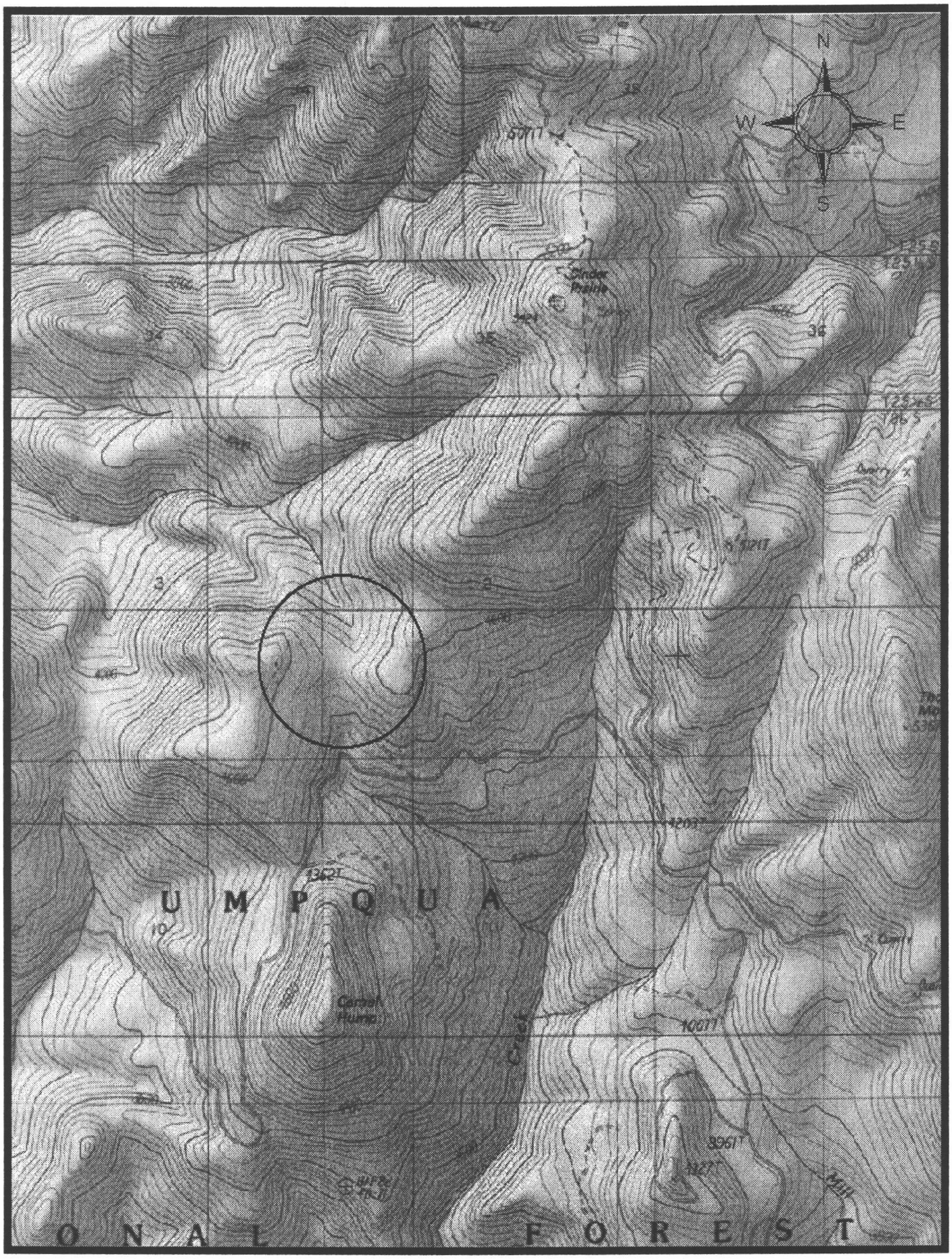


Figure 7. Location of Meg's Keep (USGS Toketee Falls Quadrangle, 7.5'Series, 1989).

In 2000, data recovery efforts were initiated by Cascade Research to mitigate damage caused by fire suppression activities. A total of 12 cubic meters of cultural deposits were excavated within twenty-four 1 x 1 meter test units. The site was excavated to a maximum depth of 110 cm below the surface in one 1 x 1 meter unit, with the majority of the test units being excavated to a depth of 40 cm.

The excavations yielded similar results to the 1999 testing with eight projectile points and projectile point fragments, three biface fragments, one complete biface, 51 scrapers, 15 edge-modified flakes, six utilized flakes, one end-battered cobble, one cobble manuport, and 5,582 pieces of debitage of which 5,542 (99.3%) is obsidian and 40 (.7%) is CCS. The large number of scrapers, coupled with the high percentage of obsidian (99.3%) demonstrates a wealth of information regarding the occupants of Meg's Keep. Gray (2002:51) states that:

> Functionally, the combination of the site's location at an elevation of over 4,000 feet, the low diversity of tool types and specialized nature of the assemblage, and the lack of any features, suggest the site was used as a warm season specialized task site devoted primarily to hide processing, along with some hunting tool kit repair. The relatively high density of chipping debris and the presence of a large number of scrapers also indicates that the site was repeatedly occupied.

A limited number of diagnostic projectile points were recovered from the site making the age determination for the site difficult. The few diagnostic projectile points recovered from the site, however, do suggest a Middle Archaic occupation

(Gray 2002:51). The archaeological excavations substantiate that, stratigraphically, Meg's Keep dates to the Middle Archaic. Gray (2002:51) states:

> The stratigraphic position of the points at Meg's Keep above the air fall deposits of Mazama ash, together with the lack of small projectile points characteristic of the Late Archaic era, indicates that the site was occupied during the Middle Archaic.

A total of 20 obsidian tool specimens and 12 pieces of debitage were submitted for sourcing at Meg's Keep. A total of four obsidian sources were identified on 18 of the specimens and two items could not be sourced. Silver Lake and Sycan Marsh represented 71 percent of the sample and is relatively high when compared to Boulder Confluence and Dry Creek. McKay Butte represents the second largest source at 13 percent and is comparable to the Early Archaic sample at Dry Creek. Spodue Mountain and Obsidian Cliffs are weakly represented and account for only three percent of the obsidian sample submitted.

Cultural Component Summary

<u>Meg's Keep</u>

Archaeological investigations at Meg's Keep have identified a single cultural component at the site that is thought to be representative of the Middle Archaic (Musil 2000; Gray 2003). Therefore, the scrapers from Meg's Keep are thought to be associated with hide-working activities conducted during the Middle Archaic period.

Dry Creek

Stratigraphy at Dry Creek is well documented and archaeologists have identified four cultural components at the site dating from the recent historic era to an occupation that predates the eruption of Mount Mazama (O'Neill et al 1996). Component one, a modern component, dates to the 20th century and will not be further discussed due to its lack of prehistoric artifacts.

Canton Creek

The Canton Creek is a large site as previously discussed, so interpreting the age of this location required looking at the terraces individually to define the relative ages of the diagnostic artifacts. Each of the four terraces was defined by naming the highest loci Terrace 4 and the tested location as Excavation Unit AA (Brauner and Honey 1977). Subsequent terraces followed this pattern, resulting in the lowest occupied loci being Terrace 1 and Excavation Unit DD. The resulting components as they occur stratigraphically are presented in Table 4.1. As can be seen in Table 4.1, there is significant variation in diagnostic artifacts recovered from each loci and the chronological component that they represent. Terrace 4 contains artifacts associated with the Middle Archaic, whereas the diagnostic tools from Terrace 3 are primarily from the Late Archaic. A dual occupational component spanning the Middle and Late Archaic occurs at Terrace 2, and at Terrace 1 a large stemless projectile point recovered from the lowest level of the excavation unit, suggests the site extends back to the transitional period between the Early and Middle Archaic.

Table 4.1. Diagnostic projectile points locations and vertical provenience.

EXCAVATION UNIT				
Component	MIDDLE	LATE	MIDDLE/LATE	MIDDLE/EARLY
Level (20 cm)	AA	BB	CC	DD
	Terrace 4	Terrace 3	Terrace 2	Terrace 1
1	Dart-sized (n=2)	Arrow-sized (n=2)	Arrow-sized (n=2)	-
2	Dart-sized (n=1)	Arrow-sized (n=4) Dart-sized (n=1)	Arrow-sized (n=2)	-
3	Dart-sized (n=2)	Arrow-sized (n=1)	Dart-sized (n=1) Arrow-sized (n=1)	-
4	Dart-sized (n=2)	-	Dart-sized (n=1)	-
5	-	-	Dart-sized (n=1)	Lanceolate (n=1)

<u>Boulder Confluence</u>

Boulder Confluence shares a similar problem in terms of distinctly identifying cultural components, as differential deposition, road building, and fire suppression activities have affected portions of the site. At Boulder Confluence, archaeologists have tentatively identified three cultural components (O'Neill and White 1994; Draper 1998). The first component, dating to the era of historic contact is poorly represented across the site and may have been destroyed by road building in one location (Draper 1998:141). The second component spans most of the Middle and Late Archaic eras. The "degree of mixing" in this 80-centimeter component did not allow for a complete separation of the Late and Middle Archaic periods to occur. The third component is the best represented at Boulder Confluence and is though to date between roughly 6,000 and 4,000 BP. Diagnostic projectile point provenience data was briefly examined stratigraphically in an attempt to isolate locations that appear to represent individual components. At best, however, this alternative view provides only a rough estimate of when overlapping weapon systems were present, absent, or replaced altogether by a new technology (Table 4.2).

As an alternative to the three accepted components defined at Boulder Confluence, an alternative chronology is suggested here (see O'Neill and White 1994 and Draper 1998 for original interpretations). The first component (Protohistoric) will remain the same as that described above. The second components (Late Archaic) offered here ranges in depth from 20 to 60 cm, and the third component (Middle Archaic) varies in depth from 60 to 110 cm. For the purpose of this study, the original three components defined at Boulder Confluence (O'Neill and White 1994; Draper 1998) will be maintained and the scraper data from both component models will be compared and the results discussed.

Table 4.2. Distribution of projectile points at Boulder Confluence.

DART-SIZED POINTS	UNIT	DEPTH (BS)
FS-A4-4-4	AREA A	30-40
FS-A2-7-4	AREA A	60-70
FS-A2-7-5	AREA A	60-70
FS-A3-9-3	AREA A	80-90
FS-A2-10-4	AREA A	90-100
FS-A4-10-6	AREA A	90-100
FS-A1-11-7	AREA A	100-110
FS-B1-3-10	AREA B	20-30
FS-C5-3-9	AREA C	20-30
FS-C6-4-3	AREA C	30-40
ARROW-SIZED POINTS	**UNIT**	**DEPTH (BS)**
FS-SC-3-10	SURFACE	SURFACE
FS-SC-2	SURFACE	SURFACE
FS-A3-2-4	AREA A	10-20
FS-A3-2-3	AREA A	10-20
FS-A4-4-5	AREA A	30-40
FS-A6-4-1	AREA A	30-40
FS-A4-4-3	AREA A	30-40
FS-A2-5-11	AREA A	40-50
FS-A1-6-5	AREA A	50-60
FS-A1-6-6	AREA A	50-60
FS-A1-6-7	AREA A	50-60
FS-B1-1-5	AREA B	0-10
FS-B1-1-7	AREA B	0-10
FS-B1-1-3	AREA B	0-10
FS-B1-1-4	AREA B	0-10
FS-B2-2-3	AREA B	10-20
FS-B2-3-4	AREA B	20-30
FS-B2-3-8	AREA B	20-30
FS-B1-3-3	AREA B	20-30
FS-B1-3-4	AREA B	20-30
FS-B1-4-13	AREA B	30-40
FS-B1-4-6	AREA B	30-40
FS-C5-3-10	AREA C	20-30
FS-C4-3-4	AREA C	20-30
FS-C3-6-5	AREA C	50-60
FS-C3-6-5	AREA C	50-60

SUMMARY

Archaeological investigations in the North Umpqua drainage have been extensive, resulting in numerous sites being tested with a variety of data being analyzed as a consequence. The four sites described above are only a small representation of the archaeological work conducted in the Umpqua Basin as a whole. These sites were chosen from a larger population of sites due to their geographical location on the North Umpqua River and the large numbers of scrapers recovered. Canton Creek (35DO215) has been described as a seasonal base camp dating to the Middle and Late Archaic. Dry Creek (35DO401) occupations span the entire Archaic period with the latest occupational episode thought to represent a residential base camp. Diagnostic artifacts at Boulder Confluence (35DO535) are consistent with hunting camps associated with the Middle and Late Archaic periods. The Meg's Keep site (35DO701) stands alone as a task specific site, and is thought to represent a Middle Archaic hide-processing site based on the limited variety of artifacts recovered from the cultural matrix of the site.

Each of the three sites (i.e., Canton Creek, Dry Creek, and Boulder Confluence) is considered to be a temporary base camp occupied on a seasonal basis. Diagnostic projectile points and radiocarbon dates (when available) show that these sites contain artifacts representing a broad range of time spanning from the Early Archaic to the Late Archaic and Euro-American contact periods. By using the available scrapers excavated from the three sites representing residential base camps, an analysis of the technological attributes exhibited on the scrapers can be conducted and compared to the task specific site at Meg's Keep. Due to the limited variety of artifacts at Meg's Keep and the task specific nature it represents, this analysis seeks to determine if end scrapers will provide insights into the nature of hide processing at different functional site types. In addition, by comparing end scrapers and other tools from the previously discussed sites, further analysis can examine whether potential variations between lithic tool kits exists, and what this may represent in terms of an economic focus and to an extent, the ability to observe the duration of particular tasks carried out at individual sites.

CHAPTER 5.

ARCHAEOLOGICAL METHODOLOGY

Archaeological excavations conducted at Canton Creek, Dry Creek, Boulder Confluence, and Meg's Keep has yielded a wealth of information about the inhabitants and site functions. Although many artifacts representing more specific details of the lives of these people are absent, owing primarily to the lack of preservation at open-air sites, lithic technology still provides a window for exploring past lifeways of people who lived in the North Umpqua River drainage.

This chapter focuses on the methods for analyzing chipped stone tools known as end scrapers. End scrapers were a common tool recovered from each site and provide insight into economic activities carried out at these locations. Archaeological investigations have postulated that three of these locations served as temporary or seasonal base camps and a single site is a task specific location where butchering and hide scraping was the primary activity.

A total of 340 scraper tools were recovered from all of the sites. The total number of scrapers collected from each site are: Canton Creek produced at total of 55 (16%) scrapers, at Dry Creek a total of 140 (41%) scrapers were recovered, Boulder Confluence yielded a total of 65 (19%), and at Meg's Keep 80 (24%) scrapers were identified; however, for reasons relating to insufficient metric data and disturbed contexts, these numbers were reduced as will be demonstrated in Chapter 6. The relatively high number of recovered end scrapers provided data for archaeologists to determine that the occupants of these sites were actively hunting and processing the hides they acquired. The following pages will further discuss the perceived functions of the tool, attributes of an end scraper tool, how end scrapers from each site were chosen for this study. Also discussed are the methods in which the tools were analyzed, the manner in which metric data was acquired and how it will be applied, and how the stratigraphic provenience of scrapers was analyzed and its application in this study.

Scraper Function

Archaeologically, the end scraper is perceived as a tool that was used primarily in the processing of hides (Semenov 1964). End scrapers have also been labeled an "expedient" tool due to the minimal number of alterations it must undergo to be functional (Andrefsky 1998). The "expediency" in which the scraper is produced is of design and allows the manufacturer/user to fulfill an immediate need and discard the tool with a minimal amount of time invested in manufacturing the item.

Microscopic wear analyses have been performed to determine a wider array of possible uses for end scraper tools (cf. Keeley 1980; Schick and Toth 1993; Morrow 1997). Scrapers may have been used in other capacities such as whittling, planing, and cutting/slicing while working with additional materials such as bone, wood, and antler (Keeley 1980; Andrefsky 1998).

Depending upon the function of the scraper, various changes occur during the life cycle of the scraper. The scraper can exhibit various allometric dimensions suggesting the intensity of use. In general terms, a scraper will exhibit highly rounded, rough, and pitted edges with scratches perpendicular to the tool edge (Schick and Toth 1993:161). Edge-wear patterns, however, can come in several forms and are defined by Keeley (1980: 24-25) as (a) large deep scalar; (b) small deep scalar; (c) large shallow scalar; (d) small shallow scalar; (e) large stepped; (f) small stepped; and (g) half-moon breakages (Table 5.1; Figure 8). Of the types of edge-utilization expected to be present on scrapers used in hide processing, Keeley (1980:53) states that out of 117 experiments performed while slicing and fleshing, small deep scalar scars and step fractures were the most common. It must be kept in mind that as the scraper is used and acquired these types of scarring patterns, the tool became dull and less efficient. The dulling of the working edge necessitates the sharpening of the scraper to extend its use life and results in a scraper that may be shorter in relation to other scrapers over time. While experimental archaeology provides insight into the use and morphology of scrapers, it is less clear how scraper tools were utilized in prehistoric times.

Table 5.1. Edge-wear characteristics of scrapers (from Keeley 1980:24-25)

Scar Type	Definition
Large deep scalar (a)	Deep, scale-shaped scars, with a maximum width greater than 2 mm on the working edge.
Small deep scalar (b)	Deep, scale-shaped scars with a maximum width no greater than 2 mm, but not less than .5 mm.
Large shallow scalar (c)	Shallow scalar scars with a maximum width greater than 2 mm. "Feathering" is often present on the distal end of the scars.
Small shallow scalar (d)	Shallow scalar scars that do not exceed 2 mm in width. This category is rare.
Large stepped (e)	Generally shallow with an abrupt termination. Flake scars will exceed 2 mm in width.
Small stepped (f)	Shallow, abruptly terminated scars. Maximum width ranges from than 2 mm, but not less than .5 mm.
Half-moon breakages (g)	These are crescent-shaped scars ranging in width from 1 to 10 mm on a used edge.

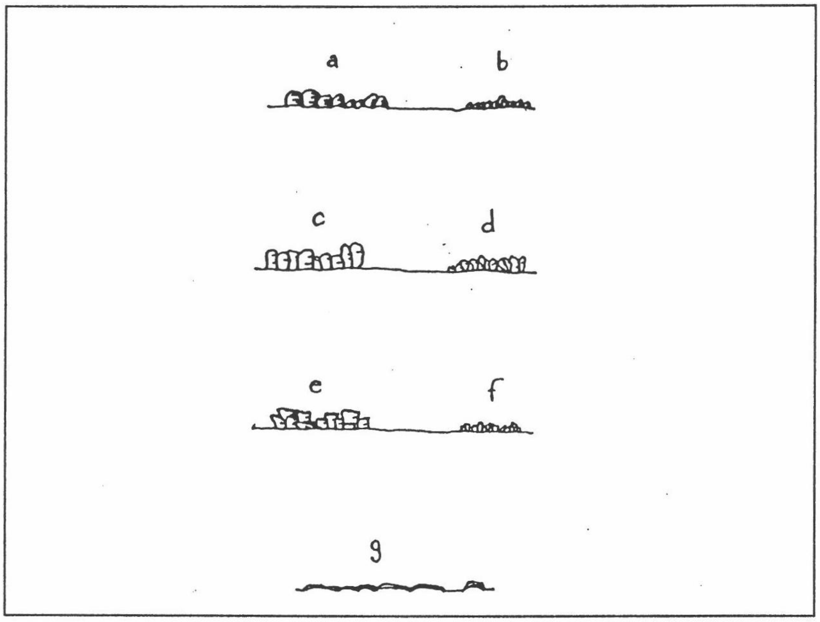


Figure 8. Edge-wear patterns (after Keeley 1980:24).

Ethnographically, accounts regarding the use and function of end scrapers in daily life are meager at best. Efforts to salvage the wider range of cultural characteristic took precedent, and often overlooked the more minute details of daily life. Two ethnohistorical accounts from members of the Cow Creek Band of Umpqua Tribe of Indians provide some insight into the potential uses of scraping implements. Although the use of the term "scraper" is not directly referred to in these accounts, parallels can be drawn from the description. From Beckham (1983:50), Thomas W. Rondeau, Sr. recalled:

> Dad showed me how Uncle John McKay showed him how to make a gaff hook out of vine maple. The end of the vine maple stick was burned in the fire and worked down with a sharp piece of obsidian or red jasperrock [sic]. This was done two or three times until it was worked to a hard, razor sharp point....

In addition, Beckham (1983:138) lists an account from tribal member Rena Denny Cox who described hide processing, although metal implements are apparently part of her description. Cox stated that:

> ...(Grandma had what she called the skinning post. This was a large log about 2' through and smoothed off. She had it buried in the ground at one end and the other was braced up against a tree so that it was at an angle and easy to work around)....Remove all hair with skinning knife....and begin working the hide to make it soft. She used what she called a softening knife.
>
> This was a dull knife with a long handle so that she could work both sides of the hide up and down and back and forth across in order to get every bit of hair and flesh off of the hides...."

These remembrances of Cow Creek tribal members provide a small glimpse into several occasions where scrapers may have been utilized. Judging from Mrs. Cox description of the tanning process, had modern tools not been available, several different forms of scrapers may have been used in preparation of processing and tanning hides.

Scraper Anatomy

Scrapers are most commonly manufactured from flakes removed from a core and retain most of the characteristics commonly found on a complete flake. The basic parts of a flake consists of the following attributes: a striking platform, the bulb of percussion, eraillure scars, radial fissures, ripple marks, and can exhibit negative flake scars on the dorsal side from earlier flake removals (Figure 9). Due to the manner in which an end scraper is manufactured, there are usually only minor modifications needed to create a functional scraper and therefore many of the characteristics of a flake can be located on a scraper as well (Figure 10).

The distal (flake tip) and proximal end (platform) of a flake remain the same on the scraper tool with modifications occurring either at the end of the flake or the margins of the flake. Side scrapers are defined by retouch applied to the margin or margins of the flake between the distal and proximal ends, whereas an end scraper displays retouch at the distal end of the flake. The area where the retouch has been

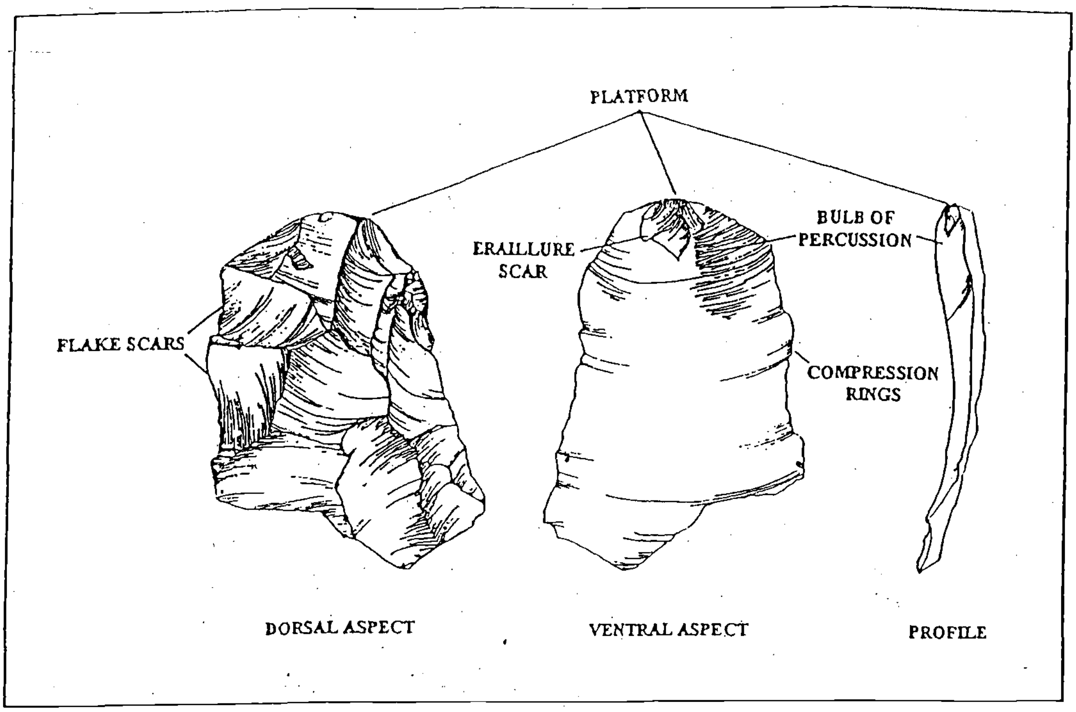


Figure 9. Characteristics of a flake (after Sutton and Arkush 1996: 45).

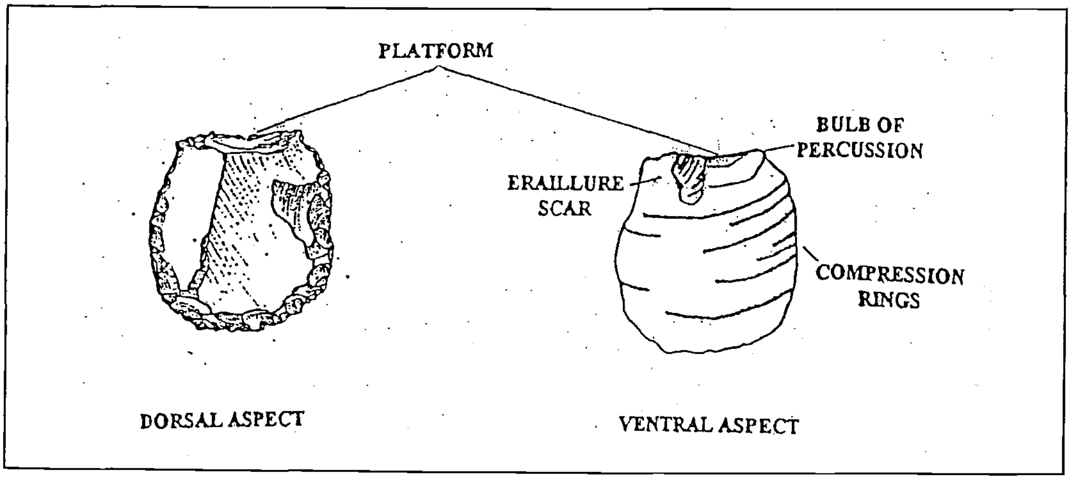


Figure 10. Scraper characteristics (after Gray 2002:31).

applied is referred to by archaeologists as the "bit" or the portion of the tool that was designed to fit a particular scraping need.

It should be pointed out that a specific type of diagnostic debitage can be created during biface manufacture that could result in a flake that is morphologically similar to a scraper. This flake type, known as an *outre passe* or overshot flake, is produced when too much force is applied during the reduction stages of a biface and results in the removal of the opposing margin of the biface as part of the flake (Whittaker 1994; Draper cited in Gray 2002). Characteristics of this flake type include a platform on the proximal end and distal edge of the biface from which it was detached (Draper 1994:94). The similarities between an *outre passe* flake and a scraper could potentially result in an improper categorization of a flake as a scraper and is mentioned here to alert the reader to a potential problem when analyzing end scraper tools.

This study focuses on the discard ratio as an indicator of the location of the end scraper in a life cycle continuum. The edge angle of the end scraper can vary from sloping (≤50 degrees) to steep (50 to ≤90 degrees) and is important in defining the amount of use and number of times a bit may have been repeatedly sharpened to meet an objective. After an end scraper surpassed the ability to receive additional sharpening (≤90 degrees) the tool ceased to be functional and was inevitably discarded.

Scraper Forms

A scraper is defined as a unifacially chipped stone tool created from a core, blade, or a flake. The scraper will exhibit a steeply retouched edge that is uniform and continuous along one or more of its formed edges. Depending upon the location of the retouch, modification along the lateral margin produces a side scraper, and retouch at the distal end of the flake results in an end scraper. The angle of retouch ranges most commonly between 45 and 90 degrees, and the flake scars may invade the dorsal (exterior) surface of the tool (Nilsson and Kelly cited in Gray 2000).

In southwestern Oregon, there are generally four accepted morphological types or classes that scrapers fall into (O'Neill et al 1996:288-291). The four variations are described as:

> **Type 1** endscrapers are manufactured on thick, robust flakes and exhibit a bit thickness ≥7.5 mm.
>
> **Type 2** endscrapers are those that have a bit thickness <7.5 mm and lateral edges that are proximally tapered. The tapering results in the endscraper being teardrop-shaped, which in turn may imply hafting.
>
> **Type 3** endscrapers with a bit thickness <7.5 mm and that have their lateral margins unmodified: the only modification being upon the distal end of the tool.
>
> **Type 4** endscrapers that are discoidal in shape, and flaked around their entire perimeter.

It is unclear whether these morphological variations are indicative of a specific function for each type of scraper, and if so, what those specific task-related functions may have been. Despite the realm of possible functions scrapers served, it is widely accepted that they were used in butchering and hide processing, shaping wood, and manufacturing bone tools. The scraper types listed above are included to orient the reader to the forms these tools can appear as among archaeological sites in southwest Oregon. The morphology of the scraper is important to this study, but it is the edge angle and the length of the scraper that the data in this analysis relies upon.

Selection Process

End scrapers were chosen from these sites primarily due to their "seasonal base camp" status. The similarity of the Dry Creek and Boulder Confluence site locations, at the confluence of tributary streams of the North Umpqua River, and Canton Creek, which is located roughly one-third of a mile from the confluence of Steamboat Creek and the North Umpqua River offer insight into river-oriented habitation sites. Meg's Keep varies in that it is considered a task specific site that appears to have been occupied infrequently. Meg's Keep is also approximately three air miles from the North Umpqua River, where it is located in an upland setting. The characteristics of a setting away from the North Umpqua River and a location perceived as being task specific, the Meg's Keep site will potentially demonstrate a difference in scraper edge angles due to a different function or initial processing of hide-working activities.

If the variation of edge angles and length is an indication of discard rates among scrapers, sites can be compared for differences in establishing the scraper's potential residual value. Simply put: if a scraper's edge angle is steep and worn out (e.g., >70 degrees), the scraper may have been used extensively, and if a scraper's edge angle is sloping (i.e., ≤50), the scraper may have received minimal use at a site before being discarded or lost. Edge angles may suggest a preference for sloping angles over a steep angle depending on the task involved.

Criteria were established to determine what scrapers would be included in this study. Scrapers had to meet the following:

Criterion 1: The first of the criteria is based on the class of the scraper. This decision was based on whether the scraper was an end or side scraper. Only end scrapers were used in this study. The difference between end scrapers and side scrapers is the location of the retouch (distal and lateral margins). The retouch often results in the scraper edge being convex on the end scraper and concave on the side scraper. The variation of these two tools likely represents contrasting functions such as hide scraping versus whittling bone or wood.

Criterion 2: The second criteria needed for this study was that the scraper be as intact as possible and exhibit at least 75 percent of the working edge to provide a reliable representation of the edge angle. Scrapers also needed to maintain at least 50 percent of its overall length to provide an appropriate length measurement. Scrapers with less than this were considered too fragmentary and excluded from this portion of the analysis.

Criterion 3: Contextually, an artifact must come from an undisturbed area. If during the archaeological investigation, the stratigraphy was found to be disturbed, specimens from that area were discarded. Since more weight is put on the cultural component of a site, individual tools from uncertain provenience cannot be placed, and were therefore excluded from this study.

Material Influences

End scrapers can come in a wide variety of material ranging from cryptocrystalline silicate (CCS) that commonly includes jasper, chert, and chalcedony to obsidian and basalt. Various other materials were likely used as well, but with less frequency (e.g., petrified wood).

The strength of material type (i.e., basalt, CCS, and obsidian) is determined geologically by Mohs scale of hardness. Mohs scale is a determination of the hardness of stone and is ranked by order from one to ten, with one being the softest and ten being the hardest. Talc is the softest mineral and represents "one" on the hardness scale, whereas a diamond is the hardest and is represented by the number "ten" on Mohs scale. In terms of ranking the most common scraper material types, the various subclasses of CCS fall into a scale ranging between 6.5 and 7, while obsidian can range between 5 and 5.5. The hardness scale for basalt varies depending on location, but is commonly found to be a 7 on the hardness scale.

The strength, or hardness, of each stone can have significant implications in terms of scraper use. Scrapers made from CCS can be one and one-half times stronger than those manufactured from obsidian. This in turn would suggest a more frequent discard rate for scrapers made from obsidian. Obsidian scrapers are potentially going to be shorter, have steeper bit angles, and may have broke more frequently than CCS scrapers. The fact that basalt is harder than CCS, however, does not necessarily imply that basalt scrapers should occur more frequently than CCS. An advantage that CCS has over basalt is that the crystalline structure of CCS can be altered during heat treatment of the stone making it malleable. Basalt is not known for being heat-treated to improve the malleability of the material. Although the material type of the scraper is important to discard rates, and discussed more in the following chapters, metric data on scraper morphology also provides significant data towards interpreting rejuvenation and duration of scraping activities.

Scraper Analysis

Scrapers were defined by type and measured metrically at three of the four sites involved in this study. The Dry Creek site scraper analysis included metric data on scraper provenience, material type, the overall length, width, and thickness, flake type, edge angle, and the component (contextual associations) from which they were recovered (O'Neill et al 1996:284-288). End scrapers from the Meg's Keep data recovery were analyzed in a similar fashion and included provenience data, scraper type, material, bit angle, bit thickness, the overall length, width, and thickness of the tool, and the weight of each item (Gray 2002). End scrapers from Boulder Confluence included data on the provenience, the overall length, width, and thickness of the tool, and the material type, but lacked edge angle data (Draper 1999: 79-80). The analysis of Canton Creek end scrapers was confined to a brief discussion of material types and the shape of the scraping edge. Metric and provenience data were not included in the Canton Creek report due to the expedient nature of the project.

Due to the lack of metric data available for the Canton Creek and Boulder Creek sites, the scrapers for these two sites were physically acquired to gather additional information. Provenience data is important to this study and was added to the Canton Creek scraper assemblage in this report. Metric data involving the edge angle of the bits were also collected for both Boulder Confluence and Canton Creek and are located in the appendices.

The metric data collected at Dry Creek and Meg's Keep was consistent with the data used here and considered significantly represented to repeat in this study. Analytical data on Canton Creek and Boulder Confluence scrapers were physically gathered during this study and include scraper provenience, material type, the overall length, width, and thickness, flake type, and edge angle. Sliding calipers were used to collect the physical dimensions of the scrapers and scraper bits were measured by means of a protractor to determine their edge angles. Edge angles were rounded to the nearest five degree increment to remain consistent with data collected on scrapers excavated from the Dry Creek and Meg's Keep sites.

Stratigraphy

Stratigraphy refers to the composition of soils and the manner in which they are horizontally deposited. By examining these sequences of deposition, age correlations are made on the diagnostic projectile points and atlatl darts found within specific layers, or levels in the soil. The cultural component where the artifacts were recovered is an integral part of this study.

The archaeological excavations conducted at three of the four sites were completed in 10 cm levels; however, Canton Creek was excavated in levels of 20 cm increments. Chronological data collected on radiocarbon dates and diagnostic artifacts has been maintained and was correlated with the end scrapers in this study. Stratigraphic data aids in examining the number of end scrapers used over the Middle and Late Archaic and the amount of use they received. A cross comparison of scraper edge angles and stratigraphic data compiled from these sites is examined in the next chapter.

CHAPTER 6.

RESULTS OF THE ANALYSES

Gray (2002) described the two variables related to the discard ratio as the length and edge angle of end scrapers. As the end scraper is repeatedly sharpened, it should logically become shorter in overall length while the edge angle grew steeper. This examination of end scrapers sought to place the tools into chronological components, to establish a discard ratio for each component, and an overall discard ratio for each site. Each unique ratio will then aid in cross comparing end scraper data from the four sites discussed in this study. The end scrapers are expected to exhibit varying degrees of edge angles. Edge angle similarities may suggest end scrapers served similar functions, identify a point where they may have been discarded, or had surpassed the ability to rejuvenate the edge.

An examination of lithic material type was undertaken to determine if material type had an influence on end scrapers. The analysis was conducted to observe changes in the overall shape, length, and edge angle of end scrapers of different material types to determine if material had an influence on end scraper morphology. By examining material type, changes in the amount of local material (e.g. CCS and basalt) can be observed and compared to imported material (i.e., obsidian) demonstrating shifts in material types for end scrapers in the North Umpqua region.

Significant shifts in the presence or absence of exotic material types may be an indication of trade relationships or mobility over time (Gray 2002).

Analysis of the depth from which the end scrapers were recovered will aid in placing the tools into temporal components. The scrapers used here came from well-defined stratigraphy, with end scrapers from disturbed areas being excluded during the initial phase of analysis. This allows for chronological changes to be observed and provides the opportunity to identify potential patterns or clusters in vertical distributions. By stratigraphically assigning end scrapers to cultural components, a cross comparison of end scraper lengths and edge angles frequencies can be tabulated. Comparing data from discard ratios, material, and cultural components may provide a perspective on end scraper reduction at each site and aid in determining if end scrapers were used in various ways at different types of site as discussed in Chapter 4.

Organizing the Data

End scrapers were initially sorted and organized by field specimen number and level of provenience. Based upon whether the specimen's length was adequate enough to provide a representative measurement, and whether the context of a specimen was intact or disturbed, the end scrapers were either included or excluded from analysis. Provenience data, material type, and metric data on the end scraper's morphology were all collected and are presented in Appendix A. This first step was necessary in facilitating the creation of a database of end scrapers and assigning them to corresponding cultural components. As discussed in Chapter 5, a total of 340 end scrapers were recovered from all sites.

In the analysis process, end scrapers were chosen by the year in which the largest amount of cultural matrix was excavated, proving both a more detailed analysis of stratigraphy and a larger sample of tools. The sites and years selected are as follows: Canton Creek (1977), Dry Creek (1994), Boulder Confluence (1998), and Meg's Keep (2002). The total number of end scrapers recovered at these sites during the selected years of investigation include: 40 from Canton Creek; 87 from Dry Creek; 58 from Boulder Confluence; and 51 from Meg's Keep. This resulted in a total of 236 potential end scrapers available for analysis.

The 236 end scrapers also had to meet the previously discussed criteria prior to their inclusion in this study. To achieve an accurate discard ratio, end scrapers needed to be at least 50 percent intact on a longitudinal plane demonstrating at least half of their entire length; otherwise they were excluded from analysis. End scrapers also needed to be from a well-defined archaeological context. The end result of meeting these criteria was a net loss of 73 end scrapers. Excluded end scrapers totaled 12 from Canton Creek, 48 from Dry Creek, 10 from Boulder Confluence, and 14 from Meg's Keep.

Since the end scrapers from Canton Creek had not been previously examined, all specimens are reported on in Appendix A and if they were discarded from analysis, an asterisk denotes their exclusion. The end scrapers from the three other sites are well defined in terms of their measurements and intact or fragmentary nature and the interested reader is referred to the original reports for data on individual end scrapers.

The material type was correlated during analysis to aid in determining the frequency that different material types occur. It is important to consider the amount of residual utility left in an end scraper at the point of discard or loss (Blades 2003). The amount of retouch or reduction of an end scraper can be used to interpret the extent of utilization of a specific artifact or assemblage (Blades 2003:142). Therefore, end scrapers manufactured from various material types can be used to examine and compare the final length/angle relationship between CCS and obsidian end scrapers. Addressing lithic material type can help determine whether locally available CCS or imported obsidian material appears in higher frequencies in the assemblages analyzed. Higher frequencies of locally available materials may be an indication of preference for locally obtained material (Blades 2003), whereas a higher frequency of exotic material could imply varying reduction technologies, a higher rate of mobility, proximity to the exotic material source, or easier access to trade items.

Due to the natural differences in the chemical make-up of cryptocrystalline materials and obsidian, the strength of the material was considered when examining edge angles. Since obsidian is a softer material than CCS, it would seem logical that obsidian end scrapers would need rejuvenation more often and may appear in larger numbers as shorter end scrapers with steep edge angles. As data was sorted by component, these characteristics were monitored and noted by cultural component.

Stratigraphic Summary

Based on the presence of radiocarbon dates and time diagnostic artifacts recovered from well-defined stratigraphic profiles, a chronological sequence can be employed to analyze data from each of the archaic periods. The following summary defines the framework for comparing and contrasting site data on end scrapers across both time and space:

- Meg's Keep: Middle and Late Archaic
- Dry Creek: Early, Middle and Late Archaic
- Canton Creek: Middle and Late Archaic
- Boulder Confluence: Middle and Late Archaic

End Scraper Analysis by Site and Component

Data on the vertical distribution of end scrapers is presented in Appendix A and was tabulated to assign end scrapers to individual components within each site.

The data on end scrapers from individual components was tabulated by site and is presented in Appendix B.

The discard ratio data is presented first in Table 6.1 followed by the average edge angle per component. As can be seen from the data in Table 6.1, the discard ratio is relatively consistent when comparing each site, except for Meg's Keep, where the data stands significantly outside of the average and may be an indication of a limited range of end scraper use at the site. The discard rates in Table 6.1 at Dry Creek and Meg's Keep are essentially the same as those acquired by Gray (2002; 43). Overall, there appears to be very little difference between lengths and only slight variation in terms of edge angles.

Table 6.1. Discard rate and edge angle comparisons.

COMPONENT	Canton Creek	Dry Creek	Boulder Confluence (Draper 1998)	Boulder Confluence Kelly (2003)	Meg's Keep
Protohistoric	Absent	Absent	(n=1)	(n=1)	Absent
Late Archaic	.41/50	.39/65	.35/60	.32/62	Absent
Middle Archaic	.36/57	.36/60	.38/53	.37/57	.46/58
Early Archaic	Unconfirmed	.35/62	Absent	Absent	Absent
Average	.38	.36	.36	.34	.46

Several measurements were taken to examine whether there is a correlation regarding the overall size of end scrapers across time. In order to create a discard ratio, it was important to examine the data to assure it is accurate and statistically reliable. To do this, the allometric data regarding morphological characteristics produced by Blades (2003:147) was used to create a continuum to observe morphological variation of end scrapers. The Pearson Correlation Coefficient was used to statistically test the relationship between multiple measurements to find the best "fit." The results of the allometric analysis are presented in Table 6.2. Each test was run at a confidence level of 95 percent to determine the strongest statistical relationship.

These tests included examining a combination of measurements such as length, width, thickness, and edge angle to examine where the strongest relationship occurred. Although similar results were attained here, the correlations were not as overwhelmingly strong as those acquired during Brooks' study (2003). High

Table 6.2. Results of linear correlations and allometric relationships.

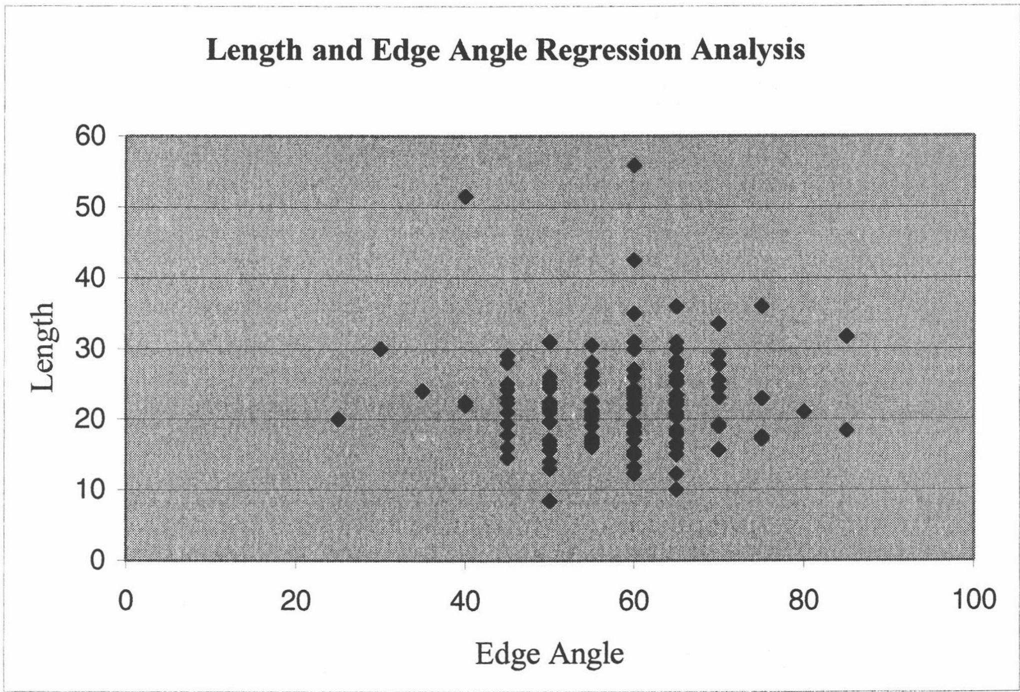
	Canton Creek	Dry Creek	Boulder Confluence	Meg's Keep
Length: thickness	r = .35	r = .44	r = .63	r = .30
	p = >.05	p = <.01	p = <.01	p = <.05
Width: thickness	r = .47	r = .30	r = .55	r = .30
	p = <.05	p = >.05	p = <.01	p = <.05
Length: width	r = .59	r = .24	r = .79	r = .52
	p = <.01	p = >.05	p = <.01	p = <.01
Length: edge angle	r = -.13	r = .35	r = .14	r = -.17
	p = >.05	p = <.05	p = >.05	p = >.05
Thickness: angle	r = .30	r = .42	r = .15	r = .03
	p = >.05	p = <.01	p = >.05	p = >.05
Width: angle	r = -.03	r = .21	r = .13	r = .03
	p = >.05	p = >.05	p = >.05	p = >.05

r-values (above .50) and strong p-values (e.g., <.01) indicate the strongest allometric relationships. In this case, the length:width ratio is strongest as was the result obtained by Brooks. The length:thickness and width:thickness measurements also show strong correlation, but not as convincingly as the relationship between the length:width of end scrapers (Table 6.2).

In this study, however, it is the length:edge angle relationship that is of interest. As discussed earlier, in order to acquire a discard ratio, it is hypothesized that the length of an end scraper divided by the edge angle will result in a number representing the remaining usefulness (residual utility). This should allow for end scrapers to be compared by both a component and a site.

The relationship between length and edge angle would appear to be an apparent result of use, rejuvenation, and additional use until discard or loss. As Blades states (2003:147), "It seems logical to assume that more heavily reduced end scrapers would have steeper end angles, so that end angle increases as end scraper length decreases." At Canton Creek and Meg's Keep, this relationship is evident; however, at Boulder Confluence and Dry Creek, there is a wider range of variation, and less correlation between the variables. Table 6.3 shows the distribution of lengths and edge angles of the end scrapers through regression analysis. The table shows a wide variety of angles and lengths without any apparent correlation. From the Table 6.3, there does not appear to be a definable relationship between lengths averages and edge angles.

Table 6.3. Regression analysis table of end scraper lengths and edge angles.



When end scrapers length and edge angles are compared by component at each site, there is an even wider range of variation. These differences demonstrate a lack of correlation over time, except for Dry Creek where a weak correlation is represented. Statistically, this suggests that the discard ratio does not accurately reflect the extent of use at a site and does not appear to be related to differential hide processing techniques.

As an example, applying the discard ratio at Meg's Keep (Table 6.1), it is apparent that there is comparative difference among end scraper at the three other sites. With a discard ratio of .49 and average edge angle of 58 degrees, Meg's Keep end scrapers would appear to have been discarded relatively early within their "life cycle." If so, the .49 discard rate is high and this would appear to suggest that the tools had a high residual utility value. Comparatively, the Late Archaic component at Boulder Confluence has a lower discard rate of .32, smaller length end scrapers (20.6 mm), and a steeper edge angle average (62 degrees).

At Canton Creek, however, end scrapers from Terrace 3, Unit CC, have a similar discard rate as Meg's Keep. End scrapers from this unit have a discard ratio of .47 with an average edge angle of 50 degrees. Although this discard rate was acquired from a sample of six, it represents the Late Archaic and also suggests processing and discarding the tools after use. The comparison of scrapers at Meg's Keep and Canton Creek highlights another problem with the discard ratio. Despite a similar discard ratio at each site, scrapers were shorter at Canton Creek although edge angles were similar. Attempting to acquire a discard ratio by averaging the lengths of end scrapers obscures the data and cannot provide an accurate reflection of the extent of rejuvenation.

Examining edge angles by component does suggest end scrapers had steeper angles during the Early and Middle Archaic at three of four sites. This may imply that groups of people may have been staying in one location longer in order to finish processing resources. A cursory overview of the lithic material was undertaken to determine if material preference over time was discernible.

Raw Material Variation

In terms of the variety of material among the sites, the data on debitage and stone tool types were tabulated to identify trends and is presented in Table 6.4. It is readily apparent that the high percentage of obsidian (99%) at Meg's Keep is substantially different from the other three sites. As the sites continue down river to the west farther from obsidian quarries, the data in Table 6.4 indicates that the use of obsidian tapers off, while the presence of CCS debitage begins to occur in higher frequencies.

Table 6.4. Debitage and material distributions.

SITE	Debitage	CCS (percentage)	Obsidian (percentage)	Basalt (percentage)	Other (percentage)
Canton Creek	4,420	2,720 (61%)	1,401 (31 %)	298 (7%)	1 (<1%)
Dry Creek	35,837	16,526 (46%)	18,910 (53%)	401(<1%)	-
Boulder Confluence	35,885	14,652 (41%)	18,706 (52%)	1,925 (5%)	112 (<1%)
Meg's Keep	5,582	40 (1%)	5,542 (99%)	-	-
SITE	Formed Tools	CCS (percentage)	Obsidian (percentage)	Basalt (percentage)	Other (percentage)
Canton Creek	391	224 (57%)	151 (39%)	16 (4%)	-
Dry Creek	652	281 (43%)	350 (54%)	11 (1%)	10 (<1%)
Boulder Confluence	283	144 (51%)	133 (47%)	3 (<1%)	3 (<1%)
Meg's Keep	84	1 (<1%)	83 (99%)	-	-

It is also apparent from the data in Table 6.4 that there does not appear to be any correlation of material between sites. Higher percentages of obsidian tools occur at both Meg's Keep (99%) and Dry Creek (54%), whereas at Boulder Confluence

(51%) and Canton Creek (57%) CCS tools dominate the recovered assemblages. These differences are attributed to, in part, higher degrees of mobility (e.g., Meg's Keep was a temporary site used by hunters), better access to trade, or perhaps have to do with sampling during test excavations.

In terms of the number of end scrapers present, there are a total of 148 end scrapers of which 92 are manufactured from obsidian (62%) and 56 were produced on CCS flakes (38%). Complete end scrapers recovered from the sites were relatively even in terms of number: Canton Creek (n=27), Dry Creek (n=38), Boulder Confluence (n=46), and Meg's Keep (n=37).

The end scrapers from each site were tabulated by material type and component to determine what differences may exist among sites with the results presented in Table 6.5. The analysis by material suggests that obsidian may have been a preferred material but also demonstrates that obsidian end scrapers tend to be smaller than those manufactured from CCS. Table 6.5 shows that CCS end scrapers have steeper edge angles than obsidian scrapers. This may be suggestive of a need to sharpen CCS end scrapers more frequently, that the technology related to rejuvenation varied based on material type, or that CCS scrapers served a function different from the obsidian tools.

Table 6.5. Average end scraper size by component and material.

Site	Component	Material	Length	Widt	Thick	Angl
Canton Creek	Late (n=9)	CCS	21.6	21.7	6.1	50.0
	Late (n=4)	Obsidian	18.3	18.0	5.3	48.7
	Middle (n=8)	CCS	20.5	15.1	7.1	58.8
	Middle (n=8)	Obsidian	20.8	18.25	4.5	55.6
Dry Creek	Late (n= 1)	Obsidian	25.1	18.4	4.2	65.0
	Middle (n= 7)	CCS	20.0	16.2	5.3	58.6
	Middle (n=7)	Obsidian	23.2	16.4	4.5	61.4
	Early (n=3)	CCS	27.0	20.6	6.4	66.7
	Early (n=20)	Obsidian	21.6	17.7	4.8	62.0
Boulder	Late (n=25)	CCS	21.7	20.2	7.0	62.0
	Late (n=12)	Obsidian	19.5	18.2	6.1	57.0
	Middle (n=5)	CCS	22.2	19.4	7.7	52.0
	Middle (n=3)	Obsidian	17.0	18.1	4.4	55.0
Meg's Keep	Middle (n= 1)	CCS	51.5	42.5	11	40.0
	Middle (n= 36)	Obsidian	26.9	22.0	6.6	58.7

Surprisingly, the total number of complete end scrapers manufactured from CCS and obsidian vary little over time. Boulder Confluence shows minimal signs of an increase in the use of CCS as an end scraper material. The other sites have equal distributions of end scrapers, and other than obsidian end scrapers being smaller with equally steep edge angles, there are no apparent difference between the sites. What appears to be significant, however, is that obsidian end scrapers with steeper edge angles appear to be more common farther back in time (Table 6.6). Sampling of the site during excavations, however, may have contributed to this manifestation.

Dry Creek, during the Early Archaic, stands out as having a significant number of obsidian end scrapers. Unfortunately, none of the other sites have an Early Archaic component available for comparison, but this is most likely tied to greater mobility during this period. O'Neill and White (1994:333) state: "...deposits associated with this component include projectile points similar to Borax Lake Widestem and Windust points..." and is likely an indication of curation and mobility. Obsidian sourcing on artifacts from Dry Creek identified eight different sources and suggested: "...that pre-Mazama Component 4 occupants were drawing from a wider area than the later, post-Mazama occupants of Dry Creek" (O'Neill and White 1994).

Meg's Keep also shows an obvious difference in the amount of obsidian present at the site (99%). Obsidian was sourced to four major locations in central and eastern Oregon and three specimens submitted for testing were acquired from an unknown source (Gray 2002:35). At Dry Creek, the large number of obsidian end scrapers can potentially be related to greater group mobility during the Early Archaic. Gray (2002:50) suggests that part of the reason for obsidian to have been the primary material used at Meg's Keep relates to "...different resource acquisition strategies based on the availability of tool stone through trade, proximity to the source, or to group settlement pattern mobility."

Allometry and Artifact Curation

Blades (2003:142) used the allometric relationship of length:width to examine the issue of curation, or saving a tool "in anticipation of future use." Finding a correlation between longer end scrapers and distant raw material sources, Blades suggested that curation of artifacts may lie in the relationship between the length and thickness of a tool. Obsidian sources are known to occur on the eastern side of the Cascade Mountain Range in Oregon and can be interpreted as having traveled considerable distance to reach the Umpqua Basin. Cryptocrystalline materials, on the other hand, occur widely throughout the basin and have not been geo-chemically traced to known sources.

Blades (2003:145) provides important insight on the perspective of curation stating that, "smaller initial blank sizes, as reflected in blades that were thinner or narrower, may indicate a greater intensity of core reduction." It appears that material availability contributed to CCS end scrapers being longer and thicker than obsidian end scrapers. Only Boulder Confluence and Meg's Keep show that scrapers were manufactured on thicker flakes. The thicker flakes at these two sites resulted in longer end scrapers and appear to be a manifestation of curation, whereas the smaller, thinner flakes at the other sites suggest more intensive core reduction of obsidian.

CHAPTER 7

DISCUSSION AND CONCLUSIONS

End scrapers represent the means by which hides were processed in order to manufacture clothing and other items; they were used to shape wooden implements, and have been identified as tools used to work bone and antler (Semenov 1964, Keeley 1980; Vaughan 1985; Schick and Toth 1993; Andrefsky 1998; Gray 2002; Blades 2003). Placing end scrapers into cultural components provided information on material variation over time. Scraper morphology appears to be related to the availability of local material in contrast to imported material types. The discard ratio, however, does not have the ability to provide information on the characteristics of activities at a site or determine expedient or intensive use.

By component, edge angles range between 50 and 67 degrees at a 95 percent confidence level with a standard deviation of five. Averaged, the sites have a smaller range of edge angles and vary between 54 and 61 degrees. It appears that end scrapers may have served similar functions, were technologically retouched for use at a certain angle (some perhaps never being used), providing an appearance of relatively uniform edge angles when comparing data from each site. Based on the range of values for complete end scraper specimens, it appears end scraper may have been at peak utility between 54 and 61 degrees with effectiveness decreasing as the angle increases.

The material analysis of end scrapers provided several interesting insights. Based on the complete specimens analyzed, obsidian end scrapers appeared to be more common with 92 (62 %) while CCS end scrapers total 56 (38%). Meg's Keep, however, contributed to this with a total of 37 obsidian end scrapers; otherwise there material types are essentially equal in number. The data also showed that edge angles from longer specimens were steeper, but not significantly. The site averages indicate that the CCS end scrapers were 3 mm longer than their obsidian counterparts.

Material type does appear to have an influence on end scraper size. The analyses indicate that there is a correlation between the thickness of a flake and the length of the flake blank. These results are similar to those obtained by Blades (2003) during his study of end scrapers and relate to lithic technology and material availability. During analyses it was observed that obsidian end scrapers are shorter than CCS end scrapers and only surpassed them in length during the Middle Archaic at Dry Creek. This may indicate the availability and size of obsidian, or a preference to rejuvenate the obsidian end scraper's edge. As discussed earlier, the smaller obsidian end scrapers were apparently manufactured from smaller flake blanks and are an indication of more intensive core reduction (Blades 2003). It would seem that function and hardness of stone had less of an influence on end scraper morphology than the availability of raw material. The data from this study suggests that in terms of scrapers types (discussed in Chapter 5), one of the types may be an indicator of curation.

The defining characteristic between a Type 1 and Type 3 end scraper is the thickness of the end scraper. A Type 1 scraper was defined as a robust flake ≥7.5 mm, whereas the Type 3 is defined as <7.5 mm. The analyses indicate that Type 1 CCS end scrapers at Canton Creek, Dry Creek, and Boulder Confluence out-numbered Type 3 scrapers 20 to 4. In contrast, from the large number of end scrapers at Meg's Keep had a total of nine Type 1 end scrapers. From the above data, Type 1 and Type 3 end scrapers may be a direct result of the availability of raw material and potentially an indicator of curation.

Research Questions Addressed

At the beginning of this study, three questions were posed defining the research strategy. To paraphrase, these questions were: (1) will examining edge angle and length of end scrapers by cultural component indicate varying degrees of reduction; (2) can an edge angle/length ratio be developed that will provide useful data on the site; and (3) what does variation between edge angle and length represent and are the differences related to material? The following sections discuss these question based on the results of the analyses.

Edge Angle and Length Data by Component

As the tools were sorted by component, there was little difference that could be detected visually regarding edge angle and length. The majority of the sites represent end scraper-related activities from the Middle and Late Archaic periods. The sole Early Archaic component found at Dry Creek could not be compared to the other sites, but had a higher number of obsidian end scrapers that were longer than any site, other than Meg's Keep. The longer scrapers suggest importation of larger flakes were most likely produced closer to the source material.

In addition, Meg's Keep offered a variation from the other sites based on a 99% obsidian end scraper assemblage. Obsidian end scrapers from Meg's Keep have the longest overall length and an average edge angle of 58 degrees, which falls within the range of peak efficiency for end scrapers as discussed earlier. The overall average among the sites for obsidian end scrapers is 57 degrees. Considering the number of obsidian end scrapers at Meg's Keep total 37, nearly twice as many when compared to other site components, it would appear that a large number of end scrapers were discarded at peak efficiency.

Since scrapers were longer at Meg's Keep, this suggests larger flakes were manufactured closer to source material and imported into the Umpqua Basin for use. Gray (2002: 48-50) compared sourced obsidian at Meg's Keep to averages throughout the Umpqua Basin examining variation and similarities. Gray (2002) found that obsidian was imported eastward from Silver Lake and Sycan Marsh to

Meg's Keep in larger percentages than the Umpqua Basin as a whole, but were fewer in number when compared to Spodue Mountain averages for the basin. Northeastern obsidian sources were similar for Obsidian Cliffs (Meg's Keep: 8.6% compared to regional average of 7.9%) and McKay Butte obsidian was twice as common at Meg's Keep (Gray 2002: 49). Although a cultural affiliation could not be determined at Meg's Keep, Gray (2002: 50) suggests, "The obsidian analyzed from the site certainly indicates trade, contact, or travel to the north and east, and therefore suggests a Molala presence." The large size of end scrapers at Meg's Keep suggests that flakes were manufactured closer to the source and imported to the site. Although edge angles suggest rejuvenation, the average angles suggest end scrapers may have been used expediently based on the lengths of the tools.

By creating an average discard ratio for each site, a uniform relationship was observed suggesting that end scrapers were used in a similar manner or function. Although edge angles and lengths varied across time, the discard ratio does not, and highlights a failure of its application. It was shown that the discard ratio at Meg's Keep (.49) compared to the Late Archaic component at Canton Creek (.41) are similar but Canton Creek produced shorter end scrapers with edge angles that are steep.

At Canton Creek, a scenario for examining end scrapers suggested how these tools might have been used differently in task specific areas. Terrace 3 (Unit CC) appears to have been a task specific area where processing tasks occurred. The total number of end scrapers recovered at Canton Creek numbered 27, with 19 of these tools coming from Terrace 3. A large number of edge-modified flakes (i.e., greater than 50) were recovered from Terrace 3 in apparent association with the end scrapers suggesting that significant cutting and scraping occurred in this location. Data on edge angles is presented in the next section and provides additional data on this scenario.

Edge Angle and Length Applications

This study has shown that there are definite implications regarding allometry, however, the discard ratio is not capable of accurately reflecting site activities. This came to light using Canton Creek's Late Archaic component. A discard rate of .41 was acquired by combining two loci (Terrace 2 and 3). Individually, Terrace 2 had a discard rate of .34 whereas a discard rate of .47 was acquired for Terrace 3. End scrapers at Terrace 2 were shorter with steep edge angles, while Terrace 3 had longer scrapers with lower edge angles.

Combining the data by component to create a "site average" altered the nature of the ratio and obscured what the data appears to represent. The discard ratio attempted to provide a new way to examine end scraper variation across time and can compare the extent of use between sites, but cannot be used as currently hypothesized. The relationship between length and thickness of the end scraper should not be overlooked since it is an indication of the original blade size, may represent curation, and reflects material availability and lithic technology.

Edge Angle Variation and Material Influences

End scrapers exhibited a wide array of edge angles ranging from 25 to 85 degrees. The data suggests that CCS end scrapers may have been sharpened more often than obsidian resulting in a higher number of CCS end scrapers with steep edge angles. This may be an indication that obsidian holds its sharp edge longer than CCS. It is also possible that different materials represent different functions. To attempt to interpret the amount of reduction, or initial edge angles can only be based on assumptions.

Each site was similar when edge angles were averaged and compared. Canton Creek has a mean end scraper edge angle average of 54 degrees; Dry Creek's mean is 51; Boulder Confluence site's mean is the highest at 59; and Meg's Keep is also high at 58 degrees. The data suggests that an end scraper with an edge angle in the mid 50-degree range may be at its peak utility due to the intact nature of the specimens and the smaller number of scrapers with edge angles above 60 degrees.

After defining the mean average for edge angles, the data on edge angles was combined to examine the range. The end scrapers fall within a range of 60 (i.e., 25 to 85 degrees) and have a mean of 56 degrees with a mode of 60 degrees. This suggests that an end scraper reaches its peak between 55 and 60 degrees with residual utility declining after 60 degrees. The median was also 60 degrees demonstrating that there are an equal number of end scrapers with edge angles above and below 60 degrees. In terms of material strength and hardness, the edge angle, or residual utility left in an end scraper appears to be a variable dependent on material.

It was determined in the material analysis of end scrapers that morphology does appear to be influenced by the material type. As discussed in Chapter 6, Blades (2003:145) states, "... smaller initial blank sizes, as reflected in blades that were thinner or narrower, may indicate a greater intensity of core reduction." When examining the length of the tools, longer end scrapers were almost always CCS, which indicates manufacture and selection at a local source. The exception to this observation lie in the Middle Archaic component at Dry Creek where obsidian end scrapers were longer and at Canton Creek's Middle Archaic component, although the obsidian scrapers at Canton Creek only surpassed CCS scraper lengths by three millimeters in length, an insignificant amount.

Overall, the edge angle on materials showed little variation; however, changes over time imply different types of manufacturing and perhaps more intensive use of end scrapers. For instance, during the Early Archaic at Dry Creek end scrapers, whether CCS or obsidian, were predominantly longer and had steeper edge angles. The Middle Archaic period had the largest number of scrapers available for analysis owing primarily to Meg's Keep and suggests that length and size decreased over time. During the Late Archaic, scraper size as well as edge angles continue to decrease. This suggests three possible scenarios: 1) that scrapers from older components were used more intensively; 2) that moves between resources were more frequent; or 3) that curation and intensive core reduction manifest themselves in the size of the end scrapers (i.e., smaller, thinner scrapers appear to represent intensive core reduction and longer, thicker flakes are likely to represent curated items).

It appears that material type has a direct influence on end scraper morphology. For instance, CCS end scrapers were manufactured on a thicker flake, which in turn implies that flake blank were longer and results in longer scrapers. This data indicates that a Type 1 and Type 3 end scraper are essentially the same, most likely served the same function, and appears to be a direct result of material availability. Blades (2003:148-151) interpreted longer, thicker flakes as a sign curation were manufactured and imported to the sites under study. In the Umpqua Basin, where CCS material is available locally and obsidian is not, an interesting point presents itself regarding the use of different material types.

Based on the number of obsidian end scrapers, obsidian appears to have been used more intensively. From a total of 148 specimens, 92 (62%) were manufactured from obsidian. The presence of an almost exclusive obsidian end scraper assemblage at Meg's Keep that lacks CCS end scrapers (n=1) has significant implications. The reason for the higher number of end scrapers manufactured from imported material points to the curation of end scrapers or preform end scrapers and most likely, as Gray states (2002:50: "The obsidian analyzed from the site certainly indicates trade, contact, or travel to the north and east, and therefore a Molalla presence."

Conclusion

This study was undertaken in an attempt to examine whether a discard ratio is significant in determining the extent to which end scrapers were used at prehistoric sites. The study of multiple dimensions of an artifact such as the length and thickness provided interesting insight, but the discard ratio did not accurately reflect the extent of use or the use different processing techniques at individual sites. The discard ratio was very similar at each site, however, and if additional studies were to be undertaken, they should focus on individual scrapers and not average the data.

The aspect of material influence appears to have the most implications. The acquisition of imported material to create "expedient" tools for immediate use and discard would appear to be contradictory due to the effort it would have taken to acquire the material. The large number of obsidian end scrapers provides a small glimpse on raw material use in the upper North Umpqua River drainage. The smaller size of end scrapers, coupled with the steeper edge angles suggest that obsidian was heavily utilized and was an important commodity to the local inhabitants.

Each site had previously been determined to be a hunting camp based on location and elevation, as well as the limited variety of artifacts. Dry Creek appears to have had longer occupations and Meg's Keep has been interpreted as a task-specific site. It is clear from edge angles and lengths that end scrapers were used to different extents. Although end scrapers from a known village site were not used in this study, it remains to be seen if edge angle data would reflect even shorter end scrapers with steeper angles or if end scraper morphology would be different at all, a perspective that should be examined.

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APPENDICES

APPENDIX A

ARTIFACT CATALOGUE

Canton Creek - 35DO216						
Unit/Cat. No.	Level BS	Material	L	W	T	Edge Angle
CC59	0-20 cm	CCS	20	19	6	55
CC60	0-20 cm	CCS	17*	9	4	40
CC63	0-20 cm	CCS	20	20	5	45
CC64	0-20 cm	CCS	18*	22	6	60
AA160	20-40 cm	CCS	21	5	6	50
AA253	20-40 cm	CCS	22	11	4	40
BB13	20-40 cm	CCS	17	20	6	60
BB19	20-40 cm	CCS	15	14	5	60
CC69	20-40 cm	Obsidian	13*	21	6	55
EE139	20-40 cm	CCS	17	22	4	55
EE142	20-40 cm	CCS	17*	2	6	60
AA169	40-60 cm	Obsidian	13	14	4	50
BB33	40-60 cm	CCS	20*	20	4	25
CC76	40-60 cm	Obsidian	16	15	7	45
CC79	40-60 cm	Obsidian	26*	29	7	50
CC80	40-60 cm	CCS	31	33	11	60
CC81	40-60 cm	CCS	30	24	5	30
DD124	40-60 cm	CCS	20*	19	8	65
BB42	60-80 cm	Obsidian	17	10	3	50
CC88	60-80 cm	CCS	16*	26	7	40
CC89	60-80 cm	CCS	25*	17	5	50
CC91	60-80 cm	CCS	26	19	8	65
CC94	60-80 cm	Obsidian	24	19	4	35
CC206	60-80 cm	CCS	16*	15	8	65
CC208	60-80 cm	CCS	19	14	7	70
DD126	60-80 cm	CCS	16*	25	7	65
CC102	80-100 cm	Obsidian	23	23	7	45
CC103	80-100 cm	CCS	17	21	8	55

APPENDIX A (Continued)

Canton Creek - 35DO216						
Unit/Cat. No.	Level	Material	L	W	Th	Edge Angle
CC104	80-100 cm	Obsidian	25	20	6	45
CC105	80-100 cm	Obsidian	19	16	4	55
CC108	80-100 cm	Obsidian	22*	21	4	65
CC213	80-100 cm	Obsidian	23	16	3	60
AA180	100-120 cm	CCS	17*	26	6	50
BB52	100-120 cm	Obsidian	8*	24	3	50
BB55	100-120 cm	CCS	11*	19	2	45
CC115	100-120 cm	Obsidian	22	20	5	65
CC117	100-120 cm	CCS	22	17	7	60
CC118	100-120 cm	CCS	21*	19	9	65
CC120	100-120 cm	Obsidian	19	16	3	60
BB57	120-140 cm	Obsidian	14	18	4	50

APPENDIX A (Continued)

Dry Creek - 35DO401						
Specimen No.	Level	Material	L	W	T	Edge Angle
401-QB/1-1	0-10 cm	Obsidian	25.1	18.4	4.2	65
401-KA/2a-1	10-20 cm	Obsidian	18.2	18.4	2.5	65
401-OA/2a-2	10-20 cm	CCS	19.5	16.1	6.6	60
401-LB/2b-2	10-20 cm	Obsidian	25.4	22.0	6.0	65
401-LD/2b-3	10-20 cm	Obsidian	15.7	15.2	3.9	70
401-MC/2A-4	10-20 cm	Obsidian	32.7	5	5.4	65
401-OB/3a-2	20-30 cm	Obsidian	20.7	18.7	3.4	55
401-JB/3a-2	20-30 cm	CCS	29.4	15.2	4.6	70
401-LB/3b-1	20-30 cm	Obsidian	20.0	15.0	4.8	70
401-KA/3a-1	20-30 cm	CCS	12.3	12	6	60
401-P1/4a1	30-40 cm	Obsidian	19.2	22	5.4	70
401-IC/4a-3	30-40 cm	CCS	17.5	20.3	5.8	55
401-KC/4a-2	30-40 cm	Obsidian	22.2	12.4	4.5	50
401-FD/4b-3	30-40 cm	Obsidian	19.4	14.1	3.2	50
401-LD/4b-2	30-40 cm	Obsidian	22.1	15.2	2.9	65
401-ID/5a-4	40-50 cm	CCS	16.6	14.5	4.8	55
401-IC/5a-4	40-50 cm	Obsidian	27.8	25.3	6.6	70
401-JC/5a-1	40-50 cm	CCS	26.7	21.2	4.8	55
401-GC/5b-1	40-50 cm	Obsidian	21.4	12.9	6.0	70
401-GC/5b-5	40-50 cm	Obsidian	24.5	17.9	4.5	65
401-FD/5b-3	40-50 cm	CCS	21.4	16.5	4.6	60
401-BC/6b-1	40-50 cm	CCS	29.8	23.9*	9	70
401-BC/6b-2	50-60 cm	Obsidian	23.5	19.3	4.7	65
401-CB/8b-2	70-80 cm	Obsidian	20.7	20.0	4.1	60
401-HB/9b-1	80-90 cm	Obsidian	26.0	21.6	12.8	70
401-DB/9b-1	80-90 cm	Obsidian	24.2	19.8	4.6	70
401-HB/9b-3	80-90 cm	Obsidian	21.0	17.2	2.5	50
401-JD/9b-3	80-90 cm	Obsidian	16.6	14.8	3.3	55
401-P2/10a-1	90-100 cm	Obsidian	21.3	13	3.9	55
401-BB/10b-2	90-100 cm	Obsidian	24.8	19.5	6.6	55
401-JC/10b-8	90-100 cm	Obsidian	18.8	16.6	2.6	45

APPENDIX A (Continued)

Dry Creek - 35DO401						
Specimen No.	Level	Material	L	W	T	Edge Angle
401-JD/10b-9	90-100 cm	Obsidian	21.7	17.8	2.8	50
401-OA/11b-1	100-110 cm	CCS	29.6	21.3	5.6	70
401-MB/11b-5	100-110 cm	Obsidian	28.2	19.2	10.0	65
401-MC/11b-1	100-110 cm	Obsidian	20.3	19.9	3.9	65
401-OA/16b-1	150-160 cm	Obsidian	22.8	19.8	4.1	65
401-PA/17b-1	160-170 cm	Obsidian	22.3	19.7	3.4	60
401-P1/20b-1	190-200 cm	Obsidian	14.9	17.2	3.3	60

APPENDIX A (Continued)

Boulder Confluence - 35DO535						
Unit/Cat. No.	Level	Material	L	W	Th	Edge Angle
FS-B2-1-3	0-10 cm	Obsidian	14.6	15.2	3.2	45
FS-A3-2-7	10-20 cm	Obsidian	17.2	16.1	4.8	75
FS-B2-2-5	10-20 cm	CCS	27.5	23.9	11.1	65
FS-A3-3-4	20-30 cm	Obsidian	22.7	14.4	5.8	55
FS-B1-3-6	20-30 cm	Obsidian	22.5	20.0	6	55
FS-B1-3-7	20-30 cm	CCS	16.7	16.2	7.5	55
FS-B2-3-11	20-30 cm	CCS	15.5	16.6	3.5	60
FS-A2-4-4	30-40 cm	CCS	12.3	18.2	3.4	65
FS-B1-4-9	30-40 cm	CCS	24.3	18.9	8.3	60
FS-C6-4-5	30-40 cm	CCS	25.6	20.3	9.9	70
FS-A2-4-5	30-40 cm	Obsidian	15.7	20.7	4	50
FS-B1-4-8	30-40 cm	CCS	18.6	13.5	4.1	65
FS-A6-5-1	40-50 cm	Obsidian	19.4	19.9	3.8	60
FS-A6-5-2	40-50 cm	Obsidian	16.5	17.7	4.2	50
FS-A6-5-3	40-50 cm	CCS	23.1	18.3	8	70
FS-A2-5-5	40-50 cm	CCS	16.6	13.0	6.2	65
FS-C5-5-3	40-50 cm	CCS	14.9	12.8	5.1	60
FS-C6-5-7	40-50 cm	Obsidian	22.9	20.6	5.4	75
FS-A2-6-4	50-60 cm	CCS	22.2	20.2	9.2	65
FS-A2-7-6	60-70 cm	CCS	22.5	22.6	7	50
FS-A2-7-7	60-70 cm	CCS	20.7	23.0	8	65
FS-A2-7-8	60-70 cm	Obsidian	22.3	20.1	5.5	45
FS-A2-7-9	60-70 cm	Obsidian	23.8	22.5	5.2	60
FS-A2-7-10	60-70 cm	CCS	24.2	25.6	6.9	45
FS-A2-7-11	60-70 cm	CCS	18.4	21.4	7.1	85
FS-A2-7-12	60-70 cm	CCS	18.2	16.7	4.3	60
FS-A2-7-13	60-70 cm	Obsidian	19.4	19.4	16.1	45
FS-A2-7-15	60-70 cm	CCS	16.1	15.4	4.5	55
FS-A2-7-16	60-70 cm	CCS	15.9	12.6	4.1	55
FS-A2-8-4	70-80cm	CCS	25.5	21.4	9.5	70
FS-A3-8-4	70-80cm	CCS	19.7	17.6	5.9	50

APPENDIX A (Continued)

Boulder Confluence - 35DO535						
Unit/Cat. No.	Level	Material	L	W	Th	Edge Angle
FS-C4-8-5	70-80 cm	CCS	55.9	45.0	14.7	60
FS-A1-9-3	80-90 cm	Obsidian	14.0	8.5	2.2	50
FS-A1-9-5	80-90 cm	Obsidian	17.8	18.3	9.7	65
FS-A2-9-6	80-90 cm	CCS	13.3	18.7	4.4	60
FS-A1-9-4	80-90 cm	CCS	21.0	28.7	9.1	80
FS-A1-10-4	90-100 cm	CCS	25.4	24.6	6.1	65
FS-A1-10-5	90-100 cm	CCS	21.8	23.3	6.7	50
FS-A1-10-6	90-100 cm	CCS	17.8	13.2	6.4	45
FS-A2-10-6	90-100 cm	CCS	31.7	22.3	12.8	85
FS-A2-11-4	100-110 cm	CCS	21.4	20.3	7.1	50
FS-A2-11-6	100-110 cm	Obsidian	22.3	18.3	4.4	60
FS-A2-11-7	100-110 cm	Obsidian	20.1	17.9	2.9	55
FS-A2-13-3	120-130 cm	CCS	22.5	22.5	9.4	40
FS-A2-13-4	120-130 cm	Obsidian	8.5	18.0	5.9	50
FS-A2-14-3	130-140 cm	CCS	26.6	16.9	11.4	55
FS-A4-15-3	140-150 cm	CCS	25.3	23.2	5.9	50
FS-A4-18-3	170-180 cm	CCS	15.0	14.1	4.7	65

APPENDIX A (Continued)

Meg's Keep - 35DO701						
Number	Level	Material	L	W	Th	Edge Angle
1	0-10 cm	Obsidian	36	19	6.5	75
2	0-10 cm	Obsidian	29	18	4	45
6	0-10 cm	Obsidian	34	26	5	55
13	0-10 cm	Obsidian	30.5	21.5	3	55
23	0-10 cm	Obsidian	28	26.5	5	45
26	0-10 cm	Obsidian	23.5	28.5	7.5	60
30	0-10 cm	Obsidian	33.5	26.5	10.5	70
33	0-10 cm	Obsidian	21	20	3	45
34	0-10 cm	Obsidian	21	20	3	45
37	0-10 cm	Obsidian	44.5	21	3.5	45
44	0-10 cm	Obsidian	24.5	23.5	4	50
54	0-10 cm	Obsidian	24	28.5	5.5	55
55	0-10 cm	Obsidian	42.5	32.5	11.5	60
57	0-10 cm	Obsidian	24.5	19	4.5	70
66	0-10 cm	Obsidian	25	21	4.5	55
68	0-10 cm	Obsidian	10	19.5	2	60
74	0-10 cm	Obsidian	26.5	17.5	2	45
78	0-10 cm	Obsidian	10	16	2.5	65
7	10-20 cm	Obsidian	25	21.5	35	50
16	10-20 cm	CCS	51.5	42.5	11	40
18	10-20 cm	Obsidian	31	19.5	7	65
20	10-20 cm	Obsidian	29	26	6	70
31	10-20 cm	Obsidian	24	15	3	35
36	10-20 cm	Obsidian	13	21	3.5	55
38	10-20 cm	Obsidian	17.5	23	3.5	75
45	10-20 cm	Obsidian	17	21	3.5	60
46	10-20 cm	Obsidian	28	21	5	65
58	10-20 cm	Obsidian	26	20	4	60
64	10-20 cm	Obsidian	15.5	25	4.5	55
25	0-10 cm	Obsidian	30	20	8	65
8	20-30 cm	Obsidian	34.5	26.5	7	50

APPENDIX A (Continued)

Meg's Keep - 35DO701						
Number	Level	Material	L	W	Th	Edge Angle
9	20-30 cm	Obsidian	31	21.5	7	50
24	20-30 cm	Obsidian	24	23	6	60
40	20-30 cm	Obsidian	36	26	13	65
41	20-30 cm	Obsidian	27	21	4.5	60
48	20-30 cm	Obsidian	22.5	19.5	6	65
59	20-30 cm	Obsidian	31	26	9.5	60
61	20-30 cm	Obsidian	26.5	33.5	10	60
62	20-30 cm	Obsidian	21	19.5	4	50
76	20-30 cm	Obsidian	22	23	4	65
80	20-30 cm	Obsidian	30	20	11.5	60
4	30-40 cm	Obsidian	26	29.5	5.5	55
12	30-40 cm	Obsidian	21	16.5	3.5	55
43	30-40 cm	Obsidian	25.5	25	5	65
51	30-40 cm	Obsidian	28	11	3	55
19	40-50 cm	Obsidian	31	31	8.5	60
5	50-60 cm	Obsidian	35	32	5.5	60
39	20-30 cm	Obsidian	31	23	6.5	65

* BS represents a "below surface" measurement.

APPENDIX B

SCRAPERS BY COMPONENT

Specimen No.	Component	Material	Length	Edge Angle	Component Average (Discard Rate and Edge Angle)
Canton Creek					
BB13	1	CCS	17	60	
BB19	1	CCS	15	60	
BB33	1	CCS	20	25	
BB42	1	Obsidian	17	50	
BB57	1	Obsidian	14	50	.34/49 (Unit BB)
CC59	1	CCS	20	55	
CC64	1	CCS	18	60	
CC76	1	Obsidian	16	45	
CC79	1	Obsidian	26	50	
CC80	1	CCS	31	60	
CC81	1	CCS	30	30	0.47/50 (Unit CC)
					.41/50
AA160	2	CCS	21	50	
AA169	2	Obsidian	13	50	
AA253	2	CCS	22	40	.40/47
CC91	2	CCS	26	65	
CC102	2	Obsidian	23	45	
CC103	2	CCS	17	55	
CC104	2	Obsidian	25	45	
CC105	2	Obsidian	19	55	
CC108	2	Obsidian	22	65	
CC115	2	Obsidian	22	65	
CC117	2	CCS	22	60	
CC118	2	CCS	21	65	
CC120	2	Obsidian	19	60	
CC206	2	CCS	16	65	
CC208	2	CCS	19	70	
CC213	2	Obsidian	23	60	.35/60
					.36/57

APPENDIX B (Continued)

Specimen No.	Component	Material	Length	Edge Angle	Component Average (Discard Rate and Edge Angle)
Dry Creek					
401-QB/1-1	2	Obsidian	25.1	65	0.39/65
401-P1/4a1	3	Obsidian	19.2	70	
401-KA/3a-1	3	CCS	12.3	60	
401-KA/2a-1	3	Obsidian	18.2	65	
401-IC/5a-4	3	Obsidian	27.8	70	
401-IC/4a-3	3	CCS	17.5	55	
401-OB/3a-2	3	Obsidian	20.7	55	
401-KC/4a-2	3	Obsidian	22.2	50	
401-P2/10a-1	3	Obsidian	21.3	55	
401-ID/5a-4	3	CCS	16.6	55	
401-JB/3a-2	3	CCS	29.4	70	
401-JC/5a-1	3	CCS	26.7	55	
401-OA/2a-2	3	CCS	19.5	60	
401-OA/5a-2	3	CCS	17.7	55	
401-MC/2A-4	3	Obsidian	32.7	65	0.36/60
401-BC/6b-1	4	CCS	29.8	70	
401-HB/9b1	4	Obsidian	26.0	70	
401-FD/4b-3	4	Obsidian	19.4	50	
401-FD/5b-1	4	Obsidian	19.9	75	
401-GC/5b-1	4	Obsidian	21.4	70	
401-OA/11b-1	4	CCS	29.6	70	
401-CB/8b-2	4	Obsidian	20.7	60	
401-BB/10b-2	4	Obsidian	24.8	55	
401-DB/9b-1	4	Obsidian	24.2	70	
401-GC/5b-5	4	Obsidian	24.5	65	
401-HB/9b-3	4	Obsidian	21.0	50	
401-JC/10b-8	4	Obsidian	18.8	45	
401-JD/9b-3	4	Obsidian	16.6	55	

APPENDIX B (Continued)

Specimen No.	Component	Material	Length	Edge Angle	Component Average (Discard Rate and Edge Angle)
Dry Creek					
401-LD/4b-2	4	Obsidian	22.1	65	
401-MB/11b-5	4	Obsidian	28.2	65	
401-OA/16b-1	4	Obsidian	22.8	65	
401-BC/6b-2	4	Obsidian	23.5	65	
401-FD/5b-3	4	CCS	21.4	60	
401-LB/2b-2	4	Obsidian	25.4	65	
401-LD/2b-3	4	Obsidian	15.7	70	
401-MC/11b-1	4	Obsidian	20.3	65	
401-PA/17b-1	4	Obsidian	22.3	60	
401-P1/20b-1	4	Obsidian	14.9	60	0.35/62

APPENDIX B (Continued)

Specimen No.	Component	Material	Length	Edge Angle	Component Average (Discard Rate and Edge Angle)
Boulder Confluence (after Draper 1998)					
FS-B2-1-3	1	Obsidian	14.6	45	.32/45
FS-A3-2-7	2	Obsidian	17.2	75	
FS-B2-2-5	2	CCS	27.5	65	
FS-A3-3-4	2	Obsidian	22.7	55	
FS-B1-3-6	2	Obsidian	22.5	55	
FS-B1-3-7	2	CCS	16.7	55	
FS-B2-3-11	2	CCS	15.5	60	
FS-A2-4-4	2	CCS	12.3	65	
FS-A2-4-5	2	Obsidian	15.7	50	
FS-B1-4-8	2	CCS	18.6	65	
FS-B1-4-9	2	CCS	24.3	60	
FS-C6-4-5	2	CCS	25.6	70	
FS-A6-5-1	2	Obsidian	19.4	60	
FS-A6-5-2	2	Obsidian	16.5	50	
FS-A6-5-3	2	CCS	23.1	70	
FS-A2-5-5	2	CCS	16.6	65	
FS-C5-5-3	2	CCS	14.9	60	
FS-C6-5-7	2	Obsidian	22.9	75	
FS-A2-6-4	2	CCS	22.2	65	
FS-A2-7-6	2	CCS	22.5	50	
FS-A2-7-7	2	CCS	20.7	65	
FS-A2-7-8	2	Obsidian	22.3	45	
FS-A2-7-9	2	Obsidian	23.8	60	
FS-A2-7-10	2	CCS	24.2	45	
FS-A2-7-11	2	CCS	18.4	85	
FS-A2-7-12	2	CCS	18.2	60	
FS-A2-7-13	2	Obsidian	19.4	45	
FS-A2-7-15	2	CCS	16.1	55	

APPENDIX B (Continued)

Specimen No.	Component	Material	Length	Edge Angle	Component Average (Discard Rate and Edge Angle)
Boulder Confluence (after Draper 1998)					
FS-A3-8-4	2	CCS	19.7	50	
FS-C4-8-5	2	CCS	55.9	60	
FS-A1-9-3	2	Obsidian	14.0	50	
FS-A1-9-4	2	CCS	21.0	80	
FS-A1-9-5	2	Obsidian	17.8	65	
FS-A2-9-6	2	CCS	13.3	60	
FS-A1-10-4	2	CCS	25.4	65	
FS-A1-10-5	2	CCS	21.8	50	
FS-A1-10-6	2	CCS	17.8	45	
FS-A2-10-6	2	CCS	31.7	85	.35/60
FS-A2-11-4	3	CCS	21.4	50	
FS-A2-11-6	3	Obsidian	22.3	60	
FS-A2-11-7	3	Obsidian	20.1	55	
FS-A2-13-3	3	CCS	22.5	40	
FS-A2-13-4	3	Obsidian	8.5	50	
FS-A2-14-3	3	CCS	26.6	55	
FS-A4-15-3	3	CCS	25.3	50	
FS-A4-18-3	3	CCS	15.0	65	.38/53

APPENDIX B (Continued)

Specimen No.	Component	Material	Length	Edge Angle	Component Average (Discard Rate and Edge Angle)
Boulder Confluence (after Kelly 2003)					
FS-B2-1-3	1	Obsidian	14.6	45	.32/45
FS-A3-2-7	2	Obsidian	17.2	75	
FS-B2-2-5	2	CCS	27.5	65	
FS-A3-3-4	2	Obsidian	22.7	55	
FS-B1-3-6	2	Obsidian	22.5	55	
FS-B1-3-7	2	CCS	16.7	55	
FS-B2-3-11	2	CCS	15.5	60	
FS-A2-4-4	2	CCS	12.3	65	
FS-A2-4-5	2	Obsidian	15.7	50	
FS-B1-4-8	2	CCS	18.6	65	
FS-B1-4-9	2	CCS	24.3	60	
FS-C6-4-5	2	CCS	25.6	70	
FS-A6-5-1	2	Obsidian	19.4	60	
FS-A6-5-2	2	Obsidian	16.5	50	
FS-A6-5-3	2	CCS	23.1	70	
FS-A2-5-5	2	CCS	16.6	65	
FS-C5-5-3	2	CCS	14.9	60	
FS-C6-5-7	2	Obsidian	22.9	75	.32/62
FS-A2-6-4	3	CCS	22.2	65	
FS-A2-7-6	3	CCS	22.5	50	
FS-A2-7-7	3	CCS	20.7	65	
FS-A2-7-8	3	Obsidian	22.3	45	
FS-A2-7-9	3	Obsidian	23.8	60	
FS-A2-7-10	3	CCS	24.2	45	
FS-A2-7-11	3	CCS	18.4	85	
FS-A2-7-12	3	CCS	18.2	60	
FS-A2-7-13	3	Obsidian	19.4	45	
FS-A2-7-15	3	CCS	16.1	55	

APPENDIX B (Continued)

Specimen No.	Component	Material	Length	Edge Angle	Component Average (Discard Rate and Edge Angle)
Boulder Confluence (after Kelly 2003)					
FS-A2-7-16	3	CCS	15.9	55	
FS-A2-8-4	3	CCS	25.5	70	
FS-A3-8-4	3	CCS	19.7	50	
FS-C4-8-5	3	CCS	55.9	60	
FS-A1-9-3	3	Obsidian	14.0	50	
FS-A1-9-4	3	CCS	21.0	80	
FS-A1-9-5	3	Obsidian	17.8	65	
FS-A2-9-6	3	CCS	13.3	60	
FS-A1-10-4	3	CCS	25.4	65	
FS-A1-10-5	3	CCS	21.8	50	
FS-A1-10-6	3	CCS	17.8	45	
FS-A2-10-6	3	CCS	31.7	85	
FS-A2-11-4	3	CCS	21.4	50	
FS-A2-11-6	3	Obsidian	22.3	60	
FS-A2-11-7	3	Obsidian	20.1	55	
FS-A2-13-3	3	CCS	22.5	40	
FS-A2-13-4	3	Obsidian	8.5	50	
FS-A2-14-3	3	CCS	26.6	55	
FS-A4-15-3	3	CCS	25.3	50	
FS-A4-18-3	3	CCS	15.0	65	.37/57

APPENDIX B (Continued)

Specimen No.	Component	Material	Length	Edge Angle	Component Average (Discard Rate and Edge Angle)
Meg's Keep					
1	1	Obsidian	36	75	
2	1	Obsidian	29	45	
4	1	Obsidian	26	55	
5	1	Obsidian	35	60	
7	1	Obsidian	25	50	
9	1	Obsidian	31	50	
12	1	Obsidian	21	55	
13	1	Obsidian	30.5	55	
16	1	CCS	51.5	40	
18	1	Obsidian	31	65	
20	1	Obsidian	29	70	
23	1	Obsidian	28	45	
24	1	Obsidian	24	60	
25	1	Obsidian	30	65	
26	1	Obsidian	23.5	60	
30	1	Obsidian	33.5	70	
31	1	Obsidian	24	35	
33	1	Obsidian	21	45	
34	1	Obsidian	21	45	
38	1	Obsidian	17.5	75	
39	1	Obsidian	31	65	
40	1	Obsidian	36	65	
41	1	Obsidian	27	60	
43	1	Obsidian	25.5	65	
44	1	Obsidian	24.5	50	
46	1	Obsidian	28.0	65	
48	1	Obsidian	22.5	65	
51	1	Obsidian	28	55	
55	1	Obsidian	42.5	60	
57	1	Obsidian	24.5	70	

APPENDIX B (Continued)

Specimen No.	Component	Material	Length	Edge Angle	Component Average (Discard Rate and Edge Angle)
Meg's Keep					
58	1	Obsidian	26	60	
59	1	Obsidian	31	60	
62	1	Obsidian	21	50	
66	1	Obsidian	25	55	
76	1	Obsidian	22	65	
78	1	Obsidian	10	65	
80	1	Obsidian	30	60	
					.49/58