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# High Elevation Cultural Use of the Big Belt Mountains: A Possible Mountain Tradition Connection

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**High Elevation Cultural Use of the Big Belt Mountains: A Possible Mountain Tradition Connection**

by

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## Abstract

The Sundog site (24LC2289) was first discovered in 2013 during a field school survey with Carroll College and the Helena-Lewis & Clark National Forest. This archaeological site is located at an elevation of 6,400ft above sea-level in the Northern Big Belt Mountains in Montana. The Sundog Site is a multi-component site with occupations from the Late Paleoindian period to the Late Prehistoric period. This site is significant due to its intact cultural deposits in a high-altitude park, in an elevational range that currently has a data gap. Artifacts recovered from the Sundog site were analyzed as part of this thesis in order to derive a better understanding of the cultural use of high-altitude locations. The material culture from the Sundog site suggests this location was a desired camp location used throughout time. The data from this research did not conclusively point to a residential camp with a mountain adaption. However, the evidence from the Middle Archaic, Late Archaic and Late Prehistoric support a residential camp with multiple people taking advantage of the mountain resources. The mountain environments in Montana have not been fully researched and remain poorly understood, but data from this thesis will be useful in developing a better understanding of the mountain adaptions we see in the archaeological record.

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# Chapter I: Introduction

## Introduction

The Sundog site (24LC2289) is located at an elevation of 6400ft above sea level, along Indian Creek in the Northern Big Belt Mountains (Figures 1 and 2). This archaeological property is located just east of Hogback Mountain, approximately 29 miles northeast of Helena and 9 miles east of the Missouri River (Travis 2016). Area terrain is rugged, with more then 3,937ft relief, from 4,593ft at Trout Creek to more than 8,530ft on Hogback Mountain (Davis et al. 2009). This site was discovered in 2013 during a field school survey with Carroll College (Bodily 2014). At that time the site was recorded as a dense lithic scatter, with approximately 43 artifacts located on the ground scattered throughout the meadow (Bodily 2014). The artifacts primarily consisted of various chert, obsidian and some fine-grained volcanic material (Bodily 2014). One tan chert biface and a few obsidian biface fragments were also noted on the site form (Bodily 2014).

Professional investigation was first conducted at this site in 2014 as part of a long-term research project between Dr. Lauri Travis at Carroll College and the Helena-Lewis and Clark National Forest (HLCNF). Minor subsurface testing was conducted in 2014 with two lines of shovel probes being placed every 5 meters across the terrace and dug to approximately 40cm below surface and two 1m x 1m test units. Additional testing was done in 2015 and 2017 by placing a total of 29 1m x 1m test units (Figures 3 and 4). This additional field research was needed to gather enough data to evaluate the site for the National Register of Historic Places and to fully understand the cultural material and function of the site.

The Sundog site is a multi-component site with occupations that span from the Late Paleoindian period (8,000-9,000 RCYBP) through the Late Prehistoric period (300-1,400 RCYBP). This site is significant due to its intact cultural deposits in a high-altitude park (6,000-7,000ft), in an elevational range that currently has as data gap. For this reason, it was determined eligible for listing in the National Register.

This thesis research will focus on the cultural use of high-altitude locations by using original analysis of the material culture from the Sundog site, coupled with the data gathered from the partnership with Dr. Travis and the HLCNF.

Figure 1: Sundog location in Montana.

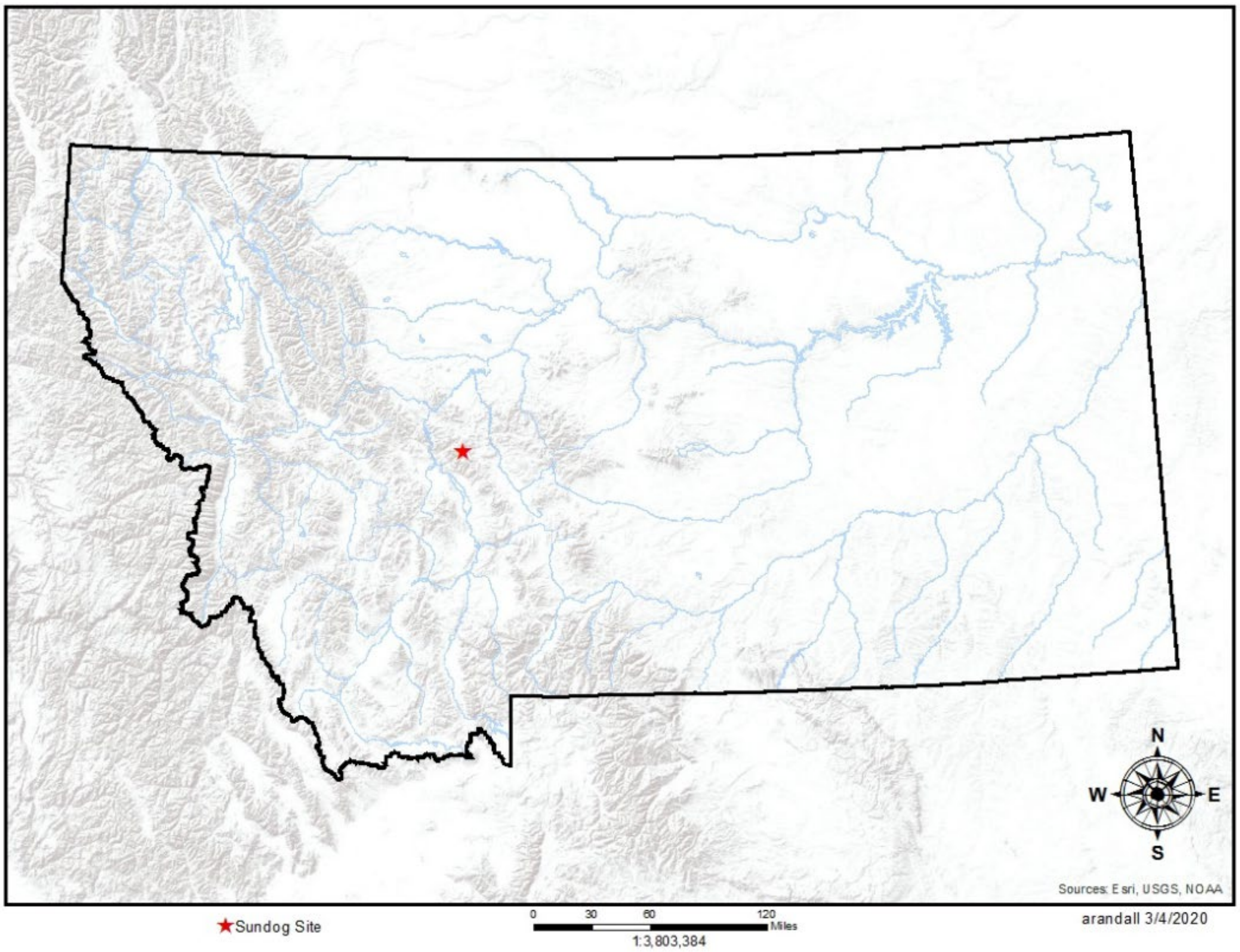


Figure 2: Location overview of Sundog location.

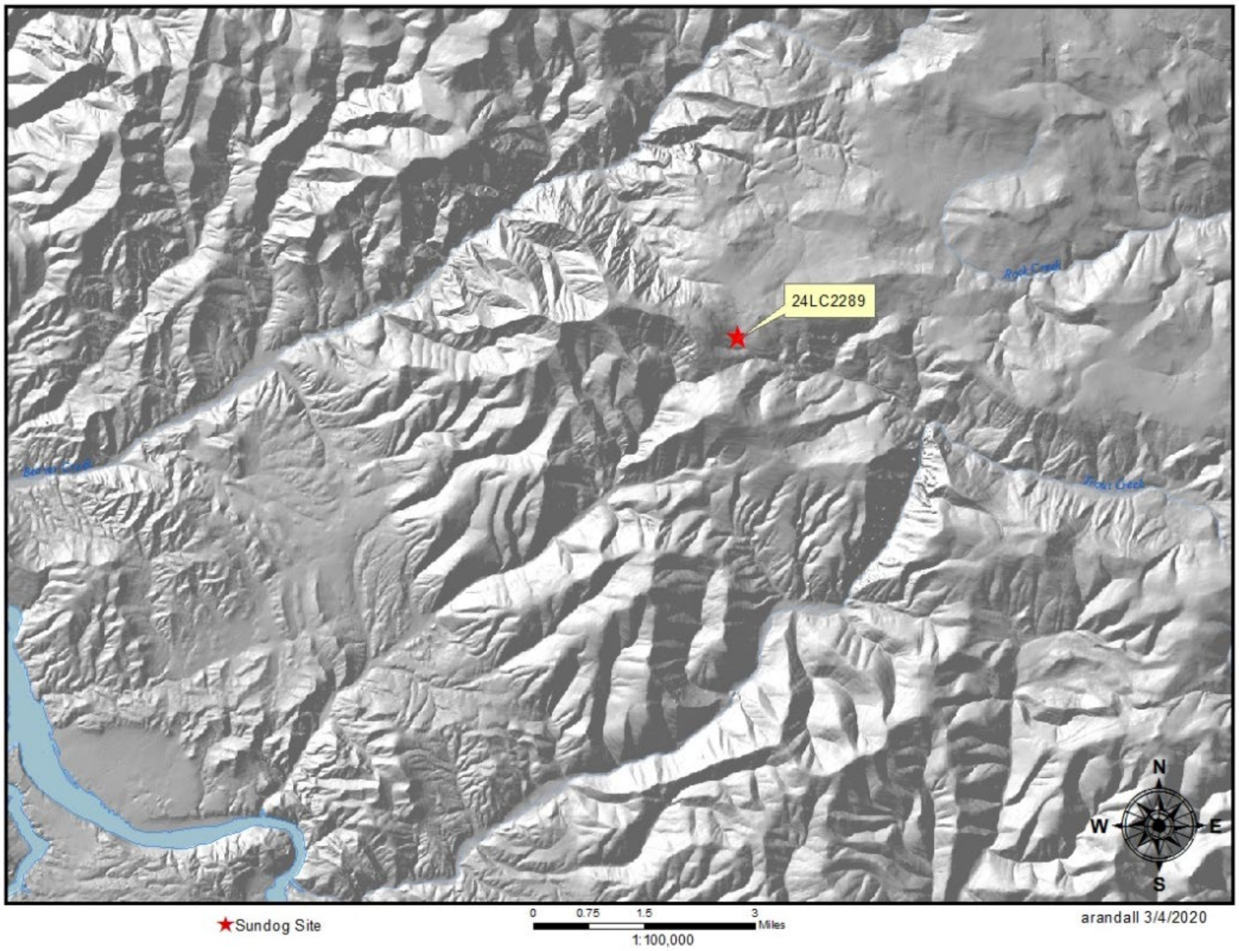


Figure 3: Overview photo of Sundog looking south.

Figure 4: 2017 excavation at Sundog.

**Research Objectives**

Little is known about the cultural use of high elevations in Montana. Environmental factors such as harsh winters, fluctuating water levels and the perceived view of limited resources have contributed to these areas being referred to as “dead-zones” for occupational use (Bender and Wright 1988; Benedict 1992; Black 1991:116, 1991b; Husted 2002). Residential base camps are commonly thought to be located along major rivers and valley bottoms with people only adventuring into the high country for short periods of time or for resource extraction activities (Black 1991; Bender and Wright 1988; Frison 1992). In 1988 Bender and Wright pointed out the fact that a “few researchers” have considered the important role mountain environments played in the adaptation of local populations. In this same article the authors state the “western margins of the North American Great Plains, however, have been slower in recognizing this essential fact” (Bender and Wright 1988:619). I think even to this day, the foothill and mountain environments in Montana have not been fully researched. And this lack of research, has created a large data gap in understanding pre-contact adaptions. I propose to look at local research that is being done on the Helena-Lewis & Clark National Forest (HLCNF) to help fill this data gap and hopefully to better understand the cultural use of mountain environments. This research will use data gathered from a partnership agreement between the HLCNF and Dr. Lauri Travis at Carroll College, as well as data from grey literature gathered during phase 3 investigations in the Big Belt Mountains. The bulk of the research will focus on original analyses of the material cultural (technology) at one high altitude camp site, known as the Sundog site (24LC2289).

A statement I come across frequently in grey literature and in some published work from the foothill and mountains along the western Rocky Mountain Front, is the need for a cultural chronology that fits this environment (Dickerson 2004:10). Plains chronology is frequently used to date or define sites, but research suggests a different cultural group used the foothills-mountain environment differently, therefor leaving a different archaeological record. For example, cultural sites on the Plains typically have distinct stratigraphic separation between cultural components and a wide range of diagnostics using

different stone tool material (Black 1991; Frison 1992). In addition, open plains sites are commonly associated with large kill sites and suggests an emphasis on bison subsistence (Frison 1992). In contrast, cultural sites in the foothills and mountains typically have few diagnostics and very little stratigraphic separation between cultural components (Black 1991; Frison 1992). These sites also suggest less emphasis on bison and more on deer, sheep, pronghorn and other smaller game animals (Black 1991; Frison 1992). Researchers have been exploring this idea for several years and it has shown up in the literature under several names Mountain Tradition, Foothills-Mountain Complex, Mountain Complex, etc. (Black 1991; Frison 1992). Due to the numerous names applied to this research area, I will be referring to all of them when I state the Mountain Tradition in this research, unless referencing a certain topic or article.

The Mountain Tradition, as suggested by Black (1991) is a good starting point to better explaining the cultural use of mountain environments in the study area. Black (1991) argues that high altitude areas have unique adaptions during the Late Paleoindian and Early Archaic periods (9,500 to 4,500 B.P.) in the Southern Rockies of Colorado, that appear in the archaeological record and they do not typically fit into the known Plains complexes.

**Research Question**: *Does the Sundog Site (24LC2289) serve as a representative example of the Mountain Tradition and can this model be used to explain cultural use of the Big Belt Mountains in Montana?*

**Hypothesis 1:** I hypothesize that the cultural material from the Sundog Site (24LC2289) matches the majority of the Mountain Tradition attributes to serve as an example of these models.

**Hypothesis 2:** I expect the wide variety of artifacts found to represent a specific adaptation to mountain environments which would support residential base camp use of these upland areas. I will assume a cultural component with a wide variety of artifacts, that suggests multiply activities, including domestic activities, will represent a residential base camp. Whereas, a cultural component with limited artifact diversity or no artifact diversity will represent a short-term camp or a specialize camp location.

**Hypothesis 3:** I also hypothesize that this Foothills-Mountain adaption will be seen throughout all time periods and not be limited to the Late Paleoindian and Early Archaic time periods, as suggested by other researchers.

# Chapter II: Background

## Previous Investigations

Literature was reviewed using the HLCNF grey literature library, the Montana State Historical Society literature library, and published articles from online databases. Numerous books and scholarly journals were reviewed to provide a background and context for research regarding high altitude use or Mountain Tradition sites in Montana. The biggest challenge has been locating more recent sources. The majority of the research which suggests a different tradition or cultural use in the mountains took place in the late 1980s and early 1990s (Baumler et al. 1996; Benedict 1992; Black 1991; Kornfeld et al. 2010). However, several sources did provide an excellent overview of cultural use on the high elevations of the Southern and Northern Rocky Mountains. The main sources that will be used in this research are summarized below.

In 1988 Susan J. Bender and Gary A. Wright looked at two models (climatic models and task-specific models) that have been used to describe sites which have been found in mountain environments in the Northwest Plains. They found that both models shared the common interpretation that mountains contain marginal environments and those sites found in the mountains should be considered marginal when studying adaptive processes (Bender and Wright 1988:619). Bender and Wright (1988) strongly disagreed with these interpretations of mountain pre-contact sites. They believe that to truly understand occupations in the mountain researchers need to look at models that account for the varied subsistence and settlements that utilized the unique potential of mountain environments (Bender and Wright 1988). In this same article they propose a different framework, "the integration of mountainous ecosystems into subsistence and settlement strategies was a viable option for broad spectrum, pre-horse High-Plains hunters and gatherers" (Bender and Wright 1988:619). They go on to explain that an understanding of the "adaptive dynamics underlying mountainous occupations" needs to be understood when interpreting such sites (Bender and Wright 1988:619).

Bender and Wright (1988) believed that the climatic model misconceptions of the mountain environments came from the Mulloy's (1958) interpretation of the Altithermal period and the adverse conditions that would have been present on the Plains, which in turn would have pushed people to the mountains only during these adverse times. Bender and Wright believed this was based on incomplete data and Mulloy's interpretation has not been supported. According to Meltzer (1999) the climate of the Great Plains during the Altithermal period varied, but on average the climate was warmer and dryer. These warmer and dryer conditions would produce resource patches, reduce surface water and change resource abundance (Meltzer 1999). Understanding the human response to this climatic change is important because it could lead to changes in their diet breath by including lower ranking resources and could lead to location abandonment due to a reduction in resources (Meltzer 1999). It is interesting that some research suggests the climatic changes seen during the Altithermal did not occur at the same pace and time in the foothill and mountain areas as they did on the plains (Baumler et al. 1996).

Bender and Wright's second task-specific model is something I see commonly used (Aaberg et al. 2007; Davis et al. 2009). This model focuses on the concept that mountains were used for specialized tasks and again the mountains resource potential was limited. Bender and Wright believed that studies which focus on this model type have biased misconceptions about mountain environments and these biases over-shadow the data that are in the archaeological record (Bender and Wright 1988:625). These biases are centered on two main points: survey strategies are focused on low elevation basins and river valleys with mountain use only inferred based on the lower sites, and the second being single site investigations which lead to a narrow scope for interpretation (Bender and Wright 1988:625).

Bender and Wright propose a new model that focuses on mountains being a fundamental adaptive strategy rather than a marginal one (Bender and Wright 1988:626). Under this model hunters and gatherers used the mountains for their wide variety of resources and became an integral part of their seasonal rounds (Bender and Wright 1988). This broad-spectrum model proposed by Bender and Wright takes into account the range of ethnographic and archaeological data that suggests the utilization of

mountain environments and goes beyond our culturally rooted ideas that mountain environments are marginal (Bender and Wright 1988).

In 1991 Kevin Black proposed the Mountain Tradition as a unique adaption during the Archaic period in Colorado in his article titled *Archaic Continuity in the Colorado Rockies: The Mountain Tradition* (Black 1991). In this article he points out the difficulty of categorizing Late Paleoindian and Early Archaic period sites into known Plains complexes (Black 1991). Black (1991) believes mountain sites have common data attributes that support this new tradition:

1) Year-round exploitation by nomadic to semi-sedentary groups;
2) Long term continuity in such patterns of exploitations; and
3) Separate archaeological identity from adjacent lowland patterns beginning as early as late Paleoindian times.

Black even points out the same issue as Bender and Wright did in 1988 when it comes to "current interpretations of mountain prehistory lean too heavily on framework established for lowland regions, without considering the upland evidence on its own merits" (Black 1991:2).

Black notes that the idea of a separate adaptation to mountain environments has been mentioned by several researchers over the years and typically shows up as either Mountain branch, Mountain complex, Mountain tradition or Montane tradition (Black 1991:2). However, these terms have been used without a formal definition. Therefore, Black defines the Mountain Tradition "as a separate ecological adaption to upland terrain, over an extended length of time and covering a broad geographical area" (Black 1991:4). He goes on to state that the Mountain Tradition survived for a minimum of 5000 years from at least 9500 B.P to 4500 B.P. but seemed to continue until 700 B.P. in some areas (Black 1991:4). Black (1991:4) also defines six traits that separate this tradition from other sites:

1) Settlement systems emphasizing upland environments on a year-round basis;
2) Frequent use of a split cobble core reduction strategy and derivative split cobble tools, particularly in Late Paleoindian and Early Archaic contexts;

3) Presence of micro-tools (not micro-blades), especially after 6000 B.P.;
4) Divergent styles of projectile points with general similarities to Great Basin types;
5) Habitations and shorter-term dwelling structures in upland settings; and
6) Distinctive rock art with general similarities to Great Basin styles.

Under Black's Mountain Tradition, site locations and seasonal variations do exist but the main difference between this tradition and other groups during the Archaic was the response to cool and cold seasons during the seasonal rounds. Typical Archaic groups or traditions would exit the mountains and foothills and seek out shelter in lower elevation timbered valleys and river corridors (Black 1991:6). However, the Mountain Tradition groups would exit the alpine and sub-alpine regions and seek shelter in the montane and foothill regions, which had ample resources (Black 1991:6).

Outside of the site locations, the Mountain Tradition seems to have a distinct material cultural, for example the split cobble and micro-tools, but most notably in projectile point styles. Mountain Tradition projectile points commonly seem to be large un-stemmed, stemmed, serrated and side notched (Black 1991). In addition, projectile points have the following common attributes: thick, biconvex longitudinal cross sections, collateral flaking patterns, moderate to good flaking patterns, reworking of broken specimens, hafted edges and notches that are not ground, tools made on flakes including large dart points, and tools that show a bifacial reduction sequence (Black 1991:11). The hallmarks for this tradition seem to be the fact that points are well made from flakes, they used local material, and they frequently reused broken points (Black 1991). Black believes this is important, and I would have to agree, because it suggests "expediency in manufacturing and use" (Black 1991:11) yet an emphasis on curation and maintenance.

George Frison (1992) explored the difference between open plains sites and foothills-mountains sites during the Paleoindian period and found several differences. Frison states "mountain sites have fewer diagnostics and the range of projectile points is poorly known" (Frison 1992:329). Frison suggests this could be related to the absence of larger kill sites (Frison 1992). He also states that it is rare to find a

wide variety of raw material from distant sources and the stone material is generally local (Frison 1992:329). Another very important distinction seems to be that sites with heavy occupation are almost always close to raw material sources and there is very little stratigraphic separation between occupations (Frison 1992:330). Frison (1992:330) goes on to state that a "common strategy at the higher elevations was to recover and select pieces from the sources and remove them to the nearest meadow or spring source for further reduction in size and selection quality". This practice could tether these mountain occupations to the raw material source, and this connection would affect their mobility.

Frison also suggests that bison were less important to mountain groups than they were for plains groups and this is reflected in the material cultural left behind (Frison 1992). He believes mountain sheep and deer hunting would leave a smaller amount of projectile points in the archaeological record and a club would work better if an animal was trapped, say in a net, than a dart or a spear (Frison 1992:335-336). It is interesting to note that a folded juniper bark net, believed to be associated with mountain sheep trapping, was found in the Absaroka Mountains at 2440m of elevation (Frison and Todd 1986; Kornfeld et al. 2010). Wooden stakes, which were incorporated with the net, were radiocarbon dated to approximately 8800 years RCYBP (Kornfeld et al. 2010). This find lends support to the fact that little to no stone projectile points would be needed to procure animals in this nature (Kornfeld et al. 2010). Frison (1992:336) also suggests less time would need to be spent on manufacturing projectile points and their maintenance and in turn a lower quality stone could be used. This could also mean that the higher quality tool stone would not be as highly desired, according to Frison (1992). In summary, Frison suggests the foothill-mountain groups and the plains groups are separate cultural groups and lived in ecologically different locations that required subsistence strategies that were mutually exclusive from one another (Frison 1992:339). For example, the foothills-mountains groups were hunter-gatherers which focused more on sheep and deer, while the plains people focused more on communal hunting of bison (Frison 1992). In addition, the foothill-mountain groups lived in smaller groups and utilized local tool stone, while plains groups lived in larger groups and desired exotic and/or high-quality tool stone (Frison 1992).

In 1992 James Benedict explored the cultural use of the Front Range in Colorado. In his article *Footprints in the Snow: High-Altitude Cultural Ecology of the Colorado Front Range, U.S.A* Benedict states "our knowledge of high-altitude archaeology in the Rocky Mountain region is rudimentary and incomplete" (1992:1). In his research, Benedict (1992) proposes two seasonal transhumance systems were in operation in the Front Range, with both systems being based out of winter camps on the eastern foothills. Under his transhumance system he proposed "one involved simple up-and-down seasonal migration, with lengthy stays at high altitude, and the other a 300-400km counterclockwise grand circuit that brought people to the crest of the Front Range from the west for brief periods in late summer and autumn" (Benedict 1992:1). Benedict's (1992) research suggests that long term base camps and plant food processing stations are not typically found above 3,000m (9,842ft), but other sites such as vision quest, butchering sites, and hunting camps are located above this elevation.

Benedict's (1992) Front Range research showed camp sites were typically located in valleys near passes that cross the Continental Divide and are located near game drive locations. He believes this suggests that humans were moving across the mountains and game driving played a significant role in choosing their camp locations (Benedict 1992). Most of these campsites are small but multicomponent and have domestic artifacts in the form of hide working and woodworking tools, pottery and grinding tools (Benedict 1992). Benedict also states that evidence of structures (portable or semi-permanent) are almost always missing from the archaeological record. But this should not indicate that people were sleeping out in the open, instead the structural evidence has more than likely been lost to time (Benedict 1992).

When Benedict (1992) reviewed the stone tools and debitage from these Front Range sites he came to a couple of conclusions. Benedict believes the evidence suggests that tools were typically brought into the mountains already formed or as flaked preforms (Benedict 1992). He also emphasizes the reuse of tools that were no longer useful for their original intent (Benedict 1992). It is interesting that Benedict (1992:8) suggests people "quarried" occupation sites for cherts and other tool stone that could

be recycled. This concept of "quarrying" could account for stratigraphic mixing of artifacts. Benedict also states "knives, scrapers, gravers, perforators, and spokeshaves are relatively common" and that waste flakes suggests more sharpening of tools taking places than tools being abandoned.

Mark Baumler and colleagues (1996) participated in a large-scale study of prehistoric use of the foothills-mountains of the Northern Rockies on the Flying D Ranch in Montana. This research focused on gathering information to better understand how people used these upland settings by focusing on three aspects: "plants, lithic resources, and travel" (Baumler et al. 1996:41). Like many other researchers focusing on these upland settings, Baumler and colleagues (1996) agree that prehistoric use in these areas need to be reviewed. They state, "that the use of the foothills and mountains that surround and otherwise define the valleys, basins and plains of the landscape is perhaps more complicated and variable than we have led ourselves to believe" (Baumler et al. 1996:41). From the various forms of lithic scatters Baumler and colleagues (1992) analyzed, they determined these site types represented basecamps due to their artifact density and diversity and their location and size, even though these sites lacked habitation structures.

Baumler and colleagues (1996) had some interesting things to say about plant resources and their cultural use in the foothills-mountains. They referenced ethnographic studies that indicate that more than 50% of a hunter-gatherer diet is made up of plant foods (Baumler et al. 1996). They go on to add that plants are used for non-food activities as well, such as medicine and ceremonial reasons (Baumler et al. 1996). Baumler and colleagues (1996:53) believe the following aspects are important to consider when reviewing sites in the foothill-mountain environments:

1. There is an incredible diversity of plant species;
2. There are numerous microenvironments and the biotic environments are spatially heterogeneous;
3. While the abundance of a species varies greatly, there is sufficient quantity of many plants to sustain intensive harvesting;

4. Seasonal availability is important at these altitudes, but this is mitigated to some extent by the diversity of plant species which can serve similar functions and by the multiple uses of a single species at different times of its growing cycle.

They follow this up with the fact that foothills and mountains provide opportunities for different cultural groups to use plants as a major resource (Baumler et al. 1996).

In addition to plants, tool stone resources are abundant in foothills and mountain environments, due to their uplift nature (Baumler et al. 1996). According to Baumler and colleagues (1996:55) “acre for acre, foothill-mountain environments probably provide the optimal setting with respect to the quality, quantity and diversity of lithic resources of any topographic area”. For this reason, they believe Binford’s (1978) theory that acquiring tool stone for hunters and gatherers was secondary to other quests is a little premature (Baumler et al. 1996). Baumler and colleagues (1996) believe these tool stone sources represent more than a secondary quest and this information needs to be considered more when researching foothill and mountain environments.

Lastly Baumler and colleagues (1996) suggests travel routes through the foothills and mountains need to be considered when researching these environments. Since the topography of these environments only provide a limited number of optimal routes, such as “low passes, dividing ridge lines and open linear river and stream drainages” then a model could be created to determine where sites could be located (Baumler et al. 1996). They go on to clarify that sites in their study area appeared to be located along routes that crossed the foothills and mountains between the Madison and Gallatin Rivers and this suggested frequent travel between these two major river drainages (Baumler et al. 1996).

Baumler and colleagues (1996) argue that the foothills and mountains are complex, and we must approach research in these environments with that understanding. They conclude that a simple or single interpretation for sites in these environments is unlikely due to the multiple resource opportunities and the long-term use in the foothills and mountains (Baumler et al. 1996).

In 2002 Wilfred Husted published an article titled *Archaeology in the Middle Rocky Mountains: Myopia, Misconceptions and Other Concerns*, which talks about the need for fresh ideas when interpreting mountain sites and he followed the common theme of stating the problem of using Plains concepts to influence mountain site interpretations. Husted states two common problems for why the Rocky Mountain sites do not get the recognition they deserve, and they are the same concepts mentioned by Bender and Wright in 1988, Black in 1991, and Frison in 1992. Husted (2002) defines the two problems as:

1. The tendency of archaeologists to confine their investigations to a river basin, state, cultural area or some other political or geographic area, and
2. The failure of archaeologists to make a clear distinction between mountains and plains.

Husted's concerns seem to revolve around the common trend of archaeologists who lump mountain and foothills site into Archaic Plains discussions to prove that the plains were occupied during the Altithermal, instead of looking at the data which suggests the Plains saw a decline in populations and use during this timeframe (Husted 2002:382).

As Husted points out, the Rocky Mountains have a 10,000-year occupation continuum and people did not suddenly come streaming out of the Great Basin the last 2,000 years (Husted 2002). Husted seems to have a perspective that goes against the grain of traditional interpretations and is worth exploring. He believes the Archaic traditions on the northwestern Plains came from the mountains, instead of the Archaic groups moving from the Plains into the mountains (Husted 2002). He states, "the high western Plains from at least central Colorado northward into southern Alberta and Saskatchewan were marginal and subordinate to the Rocky Mountains from the disappearance of the Plains Paleoindian until the arrival of peoples from the north and east beginning some 2,000 years ago" (Husted 2002:384). Husted goes on to state that the Rocky Mountains are not only high snow-covered peaks, but they also include foothills, valleys, basins and parks with a great variety of habitats and resources for prehistoric occupants (Husted 2002).

The book *Prehistoric Hunter-Gatherers of the High Plains and Rockies* uses the term Foothills/ Mountain Complex rather than Mountain Tradition like Kevin Black, but the concept is the same (Kornfeld et al. 2010). Kornfeld and colleges (2010:95) state "the Foothill/Mountain complexes favored more hunting and gathering subsistence in foothill and mountain slope areas and were more Archaic in terms of subsistence strategies. The authors go on to state that there has been enough research showing different subsistence strategies to indicate the difference between the groups living on the plains and the groups in the foothills or mountains (Kornfeld et al. 2010). With the plains groups focused around communal hunting of bison and groups in the foothills or mountains subsiding on a wide variety of resources, the research suggests the archaeological record would be different. The only challenge in formulating a full explanation for the Foothills/Mountain complexes seems to be the lack of comparative data in the foothill and mountain environments (Kornfeld et al. 2010). his is due to the fact that archaeology at the higher elevations is just gaining steam and becoming its own study area (Kornfeld et al. 2010). In the past it has been easier logistically to conduct research in easily accessible areas, which also produce large amounts of data, but that strategy left a large data gap in our understanding of cultural use of landscapes (Bender and Wright 1988; Black 1991; Husted 2002; Kornfeld et al. 2010). As the authors state, the continued research in the foothills and mountains can force a rethinking of cultural concepts, such as tools being imported from different areas (Kornfeld et al. 2010).

Dr. Lauri Travis and HLCNF worked on a long-term research partnership to investigate the relationship between human adaption and paleoclimate change within the Beaver Creek drainage of the Big Belt Mountains (Travis 2011; Travis 2012; Travis; 2014; Travis 2015; Travis 2016; Travis 2018). This research gathered archaeological and paleoenvironmental data from three ecosystems: high altitude parks (6,000-7,000ft), mid-altitude conifer forests (4,000-5,000ft) and low altitude locales (under 4,000ft). "Excavation at two mid-altitude sites, one dating to 2,400RCYBP and the other to 5,400RCYBP, and one high-altitude site dating to 2,400RCYBP, revealed evidence of a significant drought period about 2,000 years ago" (Travis 2016:4). The first high altitude site to be tested was 24LC0099, which is located

approximately a quarter mile to the north of the Sundog site. The Sundog site was the second high altitude site to be tested.

This research had two main goals "identify climate change and local ecological responses and exploring the relationship between paleoenvironmental change and prehistoric population adaption" (Travis 2018:10). Climate change and local responses was addressed by "collecting pollen cores, faunal assemblages, sedimentation rates, granulometry, charcoal content, and changes in terrestrial and aquatic snail species" (Travis 2018:10). Thus far the paleoclimate data indicates a significant dry period and warm period that occurred approximately 2,000 and again 8,000 years ago (Travis 2011, 2012; Travis et al. 2012; Travis 2013; Travis 2015; Travis et al. 2015). Unfortunately, the second research goal proved to be harder to identify. By merging paleoclimate data and prehistoric lifeways, Travis (2018) proposes this can lead to new conceptual models to explain population movement and land tenure. The following behavioral change hypotheses were tested:

1. Modification in diet;
2. Variation in timing of activities;
3. Changes in long-distance trade and land tenure;
4. Adjustments in site location;
5. Variations in technology.

Under the modification in diet hypothesis Travis (2018) states the carrying capacity of an ecosystem can be directly affected by a dramatic change in climate. For example, dry periods would result in a shortage of food and water which would reduce the ecosystem's carrying capacity (Travis 2018). Since hunter and gatherer subsistence depends on the availability of certain resources as well as the activities of other resource consumers, then a shift in the local population diet should be seen during a climate change event (Travis 2015, 2018). Travis (2018:11) proposes that "through the use of diet breadth models combined with local paleoenvironmental data, predictions on resource availability and choice can be made". Under the diet breadth model consumers do not use all the resources available to

them, but when they are available, they will choose the resources that have the highest cost-benefit returns, commonly known as high ranking resources (Travis 2015, 2018). Ethnographic research has developed a general ranking of resources with the highest ranked resources being big game and lower ranking resources are generally small game (Travis 2015, 2018). Travis proposed that "occupation layers with faunal assemblages dominated by extra-large and large game may indicate moist conditions. Occupation layers dominated by a more diverse, wider diet, including lower ranking resources may indicate a drier more stressed environment" (Travis 2018:69). With the data from the Beaver Creek drainage in the Big Belt Mountains, the faunal assemblage from three sites (24LC1064, 24LC1993/ 24LC2186 and 24LC2039) indicate more lower ranking resources compared to higher ranking resources during the Late Archaic cultural component (Travis 2018). However, the faunal assemblage from 24LC2039 during the Late Prehistoric and Middle Archaic components were dominated by large game, not small as found during the Late Archaic (Travis 2018). The paleoclimate data gathered so far shows a dry, warming trend near the end of the Late Archaic period, approximately 2,000 years ago (Travis 2018). According to Travis (2018), if the population increased during the Late Archaic like several researchers suggests, then this would have happened right before a dry warm period which could stress the environment and could lead to competition for resources.

For the variation in timing of activities hypothesis, Travis (2018) looked at changes in the timing of subsistence activities due to a change in environment. For example, during warm years high altitude locations would have less snowpack, which could lead to high altitude resources being used earlier in the year. However, as Travis (2018) states this timing of activities can be hard to see in the archaeological record. Some indicators of seasonal use could be found in faunal assemblages if herd composition (males, females, and young) could be determined or tooth eruption is preserved since these change seasonally (Travis 2018). Unfortunately, no faunal remains from either high-altitude site could point to seasonal use. But site 24LC1993/24LC2186 did have a fetal or sub-adult antelope bone in a cultural component dating to the Late Archaic period. Travis (2018:71) suggests the "inclusion of the late winter

or early spring antelope may signal a warmer, drier environment leading to a scarcity of high ranked resources or high ranked resources in poor condition".

Changes in long distance trade and land tenure were expected when the climate changed (Travis 2018). According to Travis (2018:13) the "presence and absence of long-distance trade or travel goods in the archaeological record can exhibit changes in exchange systems". Travis (2018:13) goes on to state "as long-distance, high quality lithic materials are often scarce during drought periods, conservation of the prized material is expected". Looking at these data through time coupled with paleoclimate data could indicate travel routes, territorial behavior and trade (Travis 2018). When looking at the lithic data from the Sundog site, Travis (2018) only considered local material (North Belts Chert) versus non-local material (dacite and obsidian). Research suggests that tool stone sources, regardless of quality, located closest to a site would be frequently used, because they are considered cheaper when considering the travel cost to distant higher quality tool stone (Travis 2018). Since both dacite and obsidian were found at the Sundog site, it suggests trade or long-distance travel did occur, but Travis (2018) looked to see if there was a correlation between drought periods and a reduction in the amount of dacite and obsidian being used. The lithic data from the two mid-altitude sites showed the local North Belts Chert (NBC) was being used at a higher rate during the warmer, drier climate near 2,000 RCYBP during the Late Archaic period and NBC only saw minor use during the Late Prehistoric and Middle Archaic periods when the climate was wetter and more favorable (Travis 2018). The same result was not observed at the Sundog site. Travis (2018) found that the non-local material was significant and non-randomly distributed throughout all cultural components and while the NBC was randomly distributed. Travis (2018:74) found that "obsidian and dacite decreased in the archaeological record around 8,000 RCYBP and 2,000 RCYBP" which correlates with the warmer, drier climate, but NBC was highly used throughout all time periods. From these two drought periods the obsidian came from the two closest obsidian sources Bear Gulch (240km) and Obsidian Cliff (250km), whereas the sources were located much farther away during the

other cultural components. Travis (2018) suggests this could be evidence that people are less likely to travel long distance during a drought, but the sample size is too small to say for sure.

When it comes to studying adjustments in site location, Travis (2018) suggests changes in spatial and temporal variation in site locations in relation to changes in climate could lead to a better understanding of population movement. This is in relation to resource choice and transport since resource choice would change as environmental constraints change, which would then cause changes in camp locations (Travis 2018). Travis (Travis 2018:14) suggests the "site locations are expected to be tied to stable, permanent, water sources during both dry and wet periods, but only be found near sporadic, short lived water sources during wet periods". Research in the Beaver Creek drainage has shown that lower ranking resources increase in the archaeological record during drought periods, therefor it would be expected that camps would be located close to lower ranking resources to reduce the cost of acquisition, according to Travis (2018). Further research is needed to fully address this hypothesis, since the sample size is currently too small to make any reliable conclusions (Travis 2018).

The last hypothesis tested was the variation in technology. Travis (2018) suggests changes in technology and procurement strategies would change as resource subsistence changes, "For example, the use of rabbit nets in the Great Basin to reduce hunting costs of the low ranked resources, or the use of mortal and pestles to reduce the cost of processing hard seeds or nuts" (Travis 2018:15). Another possible explanation could be tool reuse. Research suggests that obsidian points are easier to re-sharpen than less forgiving lithic material (Travis 2018). Travis (2018) also suggests this could be due to the fact that local lithic material was easier to access, therefor the need to reuse was not necessary. When looking at the data from the Beaver Creek drainage, Travis (2018:78) "expected that during times of drought the debitage size of obsidian will be smaller because Native Americans would have conserved their non-local, expensive lithic material". Travis (2018) found that smaller obsidian flakes dominated every cultural component and not just the ones during a drought, which suggests tool maintenance was taking place rather than tool production (Sullivan and Rosen 1985).

**Physical and Environmental Setting**

**Geology.** The Big Belt Mountains are an island mountain range bordered by the Missouri River flowing northwest and the Smith River flowing northeast. The tallest mountains are found in the south central part of the range, Mount Baldy and Mount Edith. Some of the highest elevations have evidence of localized glaciation, such as the cirque on Mount Edith, to the south of the Sundog site (USDA, FS 2018). The geology of the Big Belts is somewhat complex, but an important aspect is the Belt Supergroup (Davis et al. 2009). The Belt Supergroup is a series of Precambrian sedimentary rocks that is slightly metamorphosed and widely distributed in Montana, Idaho, eastern Washington and western Canada (Davis et al. 2009; Travis 2018). Research suggests the Belts Supergroup rocks were deposited in the Middle Proterozoic intracratonic basin known as the Belt Basin (Davis et al. 2009).

The Big Belt Mountains are part the Disturbed Belt, which is a broad zone of folded and faulted rocks that stretches along the eastern front of the Northern Rocky Mountains (Shaffer 1971). Igneous rocks cover a very small portion of the Hogback Mountain area, surrounding the Sundog site. Small remnants of once extensive Tertiary basalt flow are also found in the area, which is black, weathers red-brown to dark brown, and usually shows flow structures (Shaffer 1971). The age range for sedimentary rocks include Precambrian Belt Supergroup, Cambrian, Devonian, Mississippian, Pennsylvanian and Recent deposits (Shaffer 1971). The Mississippian deposit is important in regard to human use for two reasons. The Mississippian deposit in this area is separated into two formations commonly known as the Madison Group including the Lodgpole Limestone and the Mission Canyon Member (Shaffer 1971). The Mission Canyon Member is the dominate limestone in Hogback Mountain and the Sundog site area. Chert is abundant in the upper part of the Mission Canyon and this limestone commonly forms cliffs, caves and rockshelters in the upper hundred meters (Aaberg 2006; Davis et al. 2009; Shaffer 1971). These caves and rockshelters offer valuable shelter opportunities for human groups.

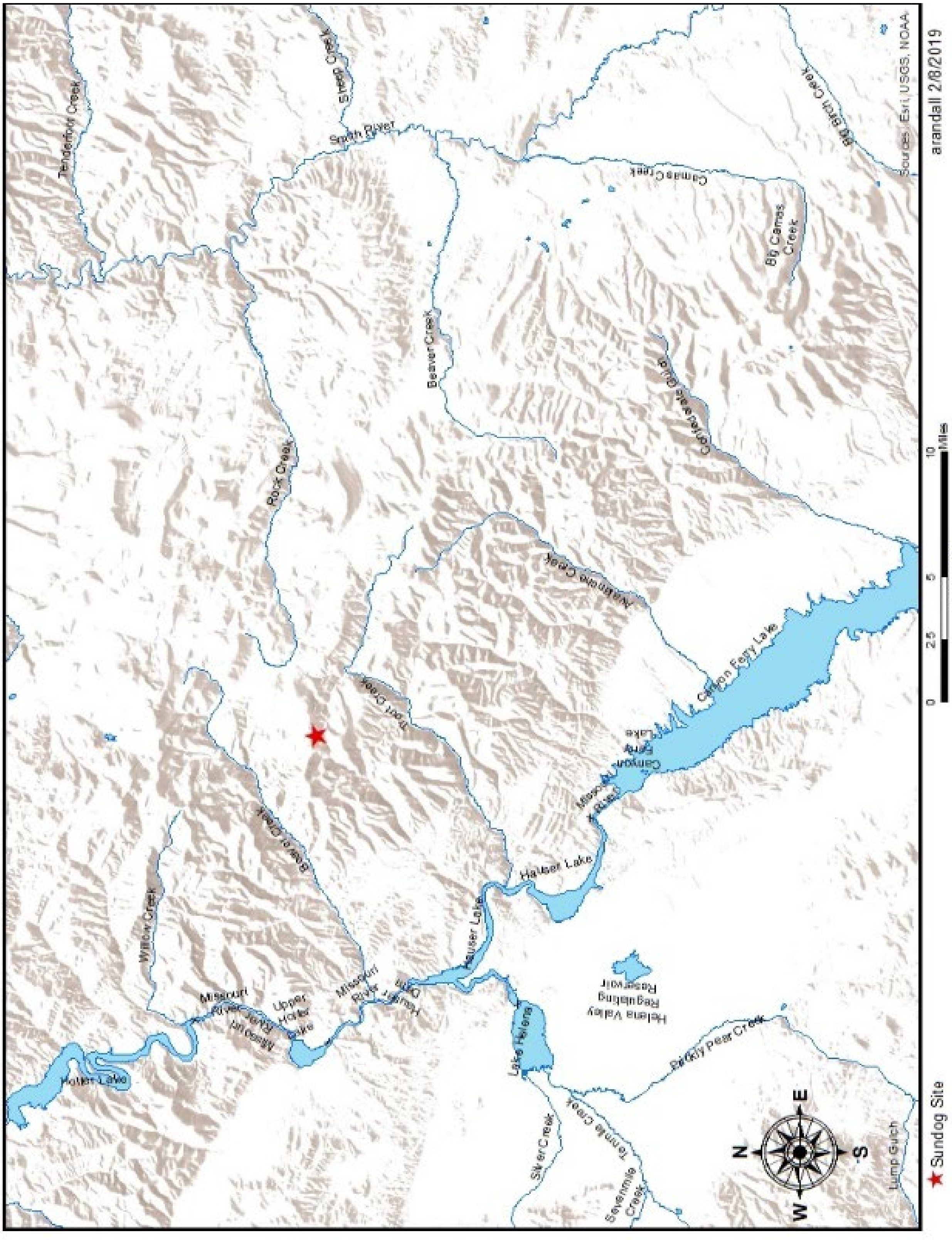
According to Leslie Davis and colleges (2009:6) "the weathering and exposure of the Lodgepole and Mission Canyon members of the Madison Formation created a lithic raw material procurement

opportunity of considerable scale. The highly structurally variable, but knapping-quality cherts served as a major resource attraction to hunter-gather groups”. This Madison Formation also supports abundant spring water sources at high elevations (Davis et al. 2009; Shaffer 1971). These potable water sources, abundant caves and rockshelters, coupled with the lithic raw material sources provide an environment that would be highly desirable to hunter-gather groups (Binford 1980).

The Sundog site occurs in the northern portion of the Big Belt Mountains at 6400ft above sea-level and just off the east edge of the range crest. The Big Belt Mountain environment in this area is characterized as broad, rounded crests with extensive grassy parks and meadows (Davis et al. 2009; Travis 2018). The site is located just below the head of Indian Creek, which originates at a spring, of varying discharge depending on yearly precipitation, and drains southeasterly towards Trout Creek. Trout Creek flows generally southwesterly to the Missouri River. Another unnamed spring is present at the lower portion of the site, which flows into Indian Creek. This spring is surrounded by a small wetland area that extends up the west slope of the bench between Indian Creek and Hogback Mountain.

Northeast of the site is an open grassy saddle that marks the divide between the Missouri River to the west and the Smith River to the east (Figure 5). Just northeast of the saddle is the head of Rock Creek, one of the larger tributaries of the Smith River (Aaberg 2006; Davis et al. 2009). To the east and southeast of the saddle are the upper reaches of Trout Creek, and to the northwest is the upper reaches of Beaver Creek, both are larger tributaries of the Missouri River in the area (Aaberg 2006; Davis et al. 2009).

Figure 5: General site area.



**Vegetation and fauna.** According to the Helena-Lewis & Clark National Forest Plan (USDA, FS 2018), the Big Belt Mountains supports a mosaic of productive grasslands and conifer forests, with most of the mountain range along the Missouri River being characterized as partially forested foothills with large grassland openings (USDA, FS 2018). Mountain mahogany occurs along the Missouri river, providing deer winter range to the west of the Sundog site (USDA, FS 2018). This mountain range also has unique nonforested vegetation communities which include rough fescue-dominated grasslands, horizontal juniper, and high elevation wetlands (USDA, FS 2018). The interior slopes support extensive conifer forests interspersed with higher elevation grass and shrublands, and also include several rocky peaks above treeline (USDA, FS 2018).

The Big Belts are notable for its preponderance of warm, dry vegetation types and potential to promote ponderosa pine, aspen, limber pine, and open savannas, as well as whitebark pine and cold vegetation types at the highest elevations (Aaberg 2006; Davis et al. 2009; USDA, FS 2018). Cool, moist vegetation types and associated species (including lodgepole pine, subalpine fir, and Engelmann spruce) are present but less common in the Big Belts than elsewhere on the Forest (Aaberg 2006; Davis et al. 2009; USDA, FS 2018). Extensive aspen communities are present surrounding the Sundog site area (Aaberg 2006; USDA, FS 2018). In addition, numerous edible and medicinal plants were recorded at the Sundog site: wild onion, spring beauties, arnica, spruce needle tips, willow, yarrow, glacier lily, buttercup, arrow leaf balsam root and grouse whortleberry to name a few.

The Big Belts provides a variety of habitats for a diversity of wildlife species, including mountain goats, bighorn sheep, bald eagles, and cliff-nesting raptors such as peregrine falcons and golden eagles. (Aaberg 2006; USDA, FS 2018). Lewis's woodpeckers, flammulated owls, and Townsend's big-eared bats are also found here in the area of the Sundog site (USDA, FS 2018). The Big Belts are currently notable for their hunting opportunities for a variety of big game species including elk, mule deer, and white-tailed deer, moose and a large population of wild turkeys (Aaberg 2006; USDA, FS 2018). Beaver Creek to the north of the Sundog sites is a blue-ribbon trout stream prized for its abundant Rainbow and

Westslope cutthroat trout (USDA, FS 2018). In addition, the Sundog area supports fauna typical of the front range of the Rocky Mountains, such as black bear, grizzly bear, mountain lion, bobcat, lynx, porcupine, striped skunk, ground squirrels, a variety of chipmunk species, pocket gophers, variety of mice species, mountain cotton tail, snowshoe hare, white-tailed jackrabbit, yellow tailed marmot, badger, weasels, coyote and red fox, to name a few (Aaberg et al. 2006).

**Climate.** The Sundog site is located not far to the east of the continental divide. The Holter Dam recording station, approximately 20 miles to the northwest, has records dating back to 1948, that show the average maximum January temperature was 1.7°C (35.1°F) and the average maximum July temperature was 29.6°C (84.9°F), according to the Western Regional Climate Center. Minimum average temperatures for January and July range from -7.6°C (18.4°F) and 12.4°C (54.2°F), with the annual precipitation averaging 31.5cm (12.4in.). The Climate Center states average snow depth was relatively low at 2.5cm (1in), but daily extremes ranged to 53.3cm (21in) at Holter Dam.

**Paleoclimate.** The Helena-Lewis & Clark National Forest and Dr. Lauri Travis just completed an eight-year research partnership which gathered paleo-environmental data from three ecosystems within the Beaver Creek drainage in the Northern Big Belts. The ecosystems were broken down into high altitude parks (6000-7000ft), mid-altitude conifer forests (4000-5000ft) and low altitude locales (under 4000ft) and the data studied the relationship between human adaption and climate change (Travis 2016, 2018). The Sundog site was one of the sites tested for the high-altitude parks ecosystem.

This long-term research project has produced a fine grain record of environmental change in the Beaver Creek drainage. The evidence from four tested sites shows a significant drought period approximately 2,000 years ago (Travis 2010, 2011, 2012, 2014, 2015b; Travis et al. 2012). This research also shows a shift in "pollen to drier species, a shift to higher sedimentation rates, increases in charcoal, and changes in snail and vertebrate species during drought periods" (Travis 2018:4). However, the paleo-climate evidence gathered at the Sundog site has little support for the drought period 2,000 years ago that

was evident at other sites (Travis 2018). Instead it had a stronger support for a "warm, drying period around 8,000 years ago" (Travis 2018:4).

The 2015 and 2017 pollen analysis from the Sundog site show a decline in forest and sagebrush, with an increase in grasses around 8,450 to 7,970 RCYBP (Cummings 2017; Travis 2018). Cummings (2017) suggests this indicates a drying trend. The pollen also suggests "the forest retreats significantly after 8,900 RCYBP likely leaving a mountain meadow community" (Travis 2018:53). According to Cummings (2017) the pollen above and below 8,000 RCYBP are drastically different which could represent a hiatus period. According to Travis (2018) and Cummings (2017) this could indicate an erosional event that wiped away the surface back to 8,000 RCYBP surface, then stabilized again. This hiatus time period also shows an increase it charcoal, which could indicate more frequent forest fires, or the charcoal could be associated with cultural use (Cummings 20017; Travis 2018).

From approximately 4,500 RCYBP to present the pollen suggests the environment was dominated by pine forests and had less sagebrush and grasses, which indicates more moisture during this time period (Cummings 2017; Travis 2018). By 1,510 RCYBP the forest coverage, like what we see today, was established and the mountain meadow environment was gone (Travis 2018; Cummings 2017).

**Site formation process.** First off, this site location would benefit from a professional geomorphology analysis to fully understand the site formation. But using information from nearby sites and information about mountain environments a general formation can be presented. Testing done at 24LC0099 located ¼ mile north and also located on the west bank of Indian Creek showed several thousand years of deposition appear to be missing (Travis 201). Travis (2014:23) stated "At least 30cm of soil, 30-60cmbs, was placed within a narrow time frame or within a single event about 590 years ago. This stratum lies upon deposits dated to 3,440 years ago". One possible explanation for this missing stratum could be a dramatic flood that moved down the drainage 590 years ago eliminating the topsoil. The Sundog site did not show this dramatic change in stratigraphy 590 years ago, but its location downslope from 24LC0099 would suggest it could have been affected by whatever natural process

occurred at 24LC0099. However, the pollen analysis mentioned above contains evidence of a major depositional event about 8,000 years ago.

Mountain meadows are notorious for rodent activity and this was definitely a problem at the Sundog site. Every morning the test units needed to be cleaned out because of rodent activity and rodent mounds are scattered through the meadow. This type of bioturbation can wreak havoc on a site's stratigraphy by displacing artifacts. To further complicate site dating and site type inferences, cultural sites in open air mountain settings rarely have evidence of cooking hearths, faunal remains, evidence of shelters or cultural organic matter. This could be because of the frequent ground disturbance these types of locations see over time, or wildfire events. Regardless of the reason, this lack of evidence creates a data gap and can make interpreting radiocarbon dates difficult.

It should be noted that the Sundog site is located on three major fault lines, according to the geological data for the area (Travis 2018; USDA n.d.). In addition, U.S. Forest soil data classifies this location as having a moderate erosional hazard on the surface and is surrounded by soil classified as severe erosional hazard (USDA n.d.). Given the soil and geological information it is highly likely this stream terrace has seen active ground movement in the past.

**Cultural Contexts**

Pre-contact use of the Big Belt Mountains covers a broad spectrum of cultural chronologies. Archaeological sites and artifacts span time periods from the Paleoindian through the historic period. Regardless of the long history in this mountain range, I will only be providing a cultural background on the periods relevant to site 24LC2289. It is important to note that the Big Belt Mountains are located near the junction of three major cultural areas, the Northern Plains, Columbia Plateau and the Great Basin (Dickerson 2004; Frison 1992; Kornfeld et al. 2010). Based on the available ethnographic and archaeological data, the Big Belt Mountains and the surrounding area were occupied by groups from all three regions at various points in time (Aaberg et al. 2007; Baumler et al. 1996; Dickerson 2004; Frison 1992b; Kornfeld et al. 2010). This mixing of cultural groups can make modeling cultural chronologies

difficult, due to their widely varying subsistence systems and their broad range of styles and types of artifacts left in the archeological record. Another complication is the sites in the foothills and mountains tend to produce a smaller number of diagnostics than the large kill sites on the Plains, which makes creating typologies problematic (Kornfeld et al. 2010). For this reason and due to the lack of a foothills-mountains chronology, Kornfeld and colleges (2010) chronology will be followed.

**Late Paleoindian (8,000-9,000 RCYBP).** Several complexes occurred during the Late Paleoindian period in Montana, but I will only be focusing on the complexes and traditions that are represented at the Sundog site. Most Late Paleoindian points have the common attributes of being parallel-obliquely flaked and are lanceolate in shape (Kornfeld et al. 2010). Research in southwestern Montana, at the Barton Gulch site, has produced evidence of a Paleoindian occupation that appears different than the typical Paleoindian occupation found on the plains (Kornfeld et al. 2010). Kornfeld et al. (2010) believe the Hardinger complex, which includes the Metzal points, could represent a Foothills/Mountain Paleoindian complex. "The Barton Gulch site 24MA171 is stratified with one component producing a distinctive lanceolate projectile point with a deep basal notch and radiocarbon dates around 8800 years BP" (Kornfeld et al. 2010:97). This distinctive lanceolate is known as the Metzal point (Kornfeld et al. 2010). The Barton Gulch site also produced a deeper component that contained the Ruby Valley point, which has been designated as a diagnostic for the Alder Complex (Kornfeld et al. 2010). Data from the Helen Lookingbill site in Wyoming has validated the Alder Complex (Kornfeld et al. 2010). The Alder Complex "has yielded a series of lanceolate, usually parallel-oblique flaked points with slightly insloping lateral basal edges and convex to straight bases" (Kornfeld et al. 2010:100). More research needs to be done to know for sure, but it is possible that the Helen Lookingbill and Barton Gulch sites are representative of the Alder Complex (Kornfeld et al. 2010).

The Lovell Constricted lanceolate points, which are described as having "crude parallel-oblique flaking, slightly restricted blade edges, and concaved bases" are another Late Paleoindian projectile point type (Kornfeld et al. 2010:101). The Lookingbill site produced a large sample of these fishtail points

located between an Alder Complex and an Early Archaic dated deposit (Kornfeld et al. 2010). The Lovell Constricted points have been radiocarbon dated to 8525 +/- 100 BP (Kornfeld et al. 2010).

Another distinctive Late Paleoindian point is known as the Pryor Stemmed which radiocarbon dates from about 8300 to 7800 BP (Kornfeld et al. 2010). These points are unique because they have a steep beveled edge that is from continually reworking on alternating blade edges (Kornfeld et al. 2010). The Pryor Stemmed points are further described as:

> The archetype was apparently lenticular in transverse cross section and usually but not always characterized by parallel-oblique pressure flaking. They may be lanceolate in outline form or have an expanding, parallel-sided, or slightly contracting stem, usually with a basal concavity. Beveling of the blade edges was a continually repeated process so that, in some cases, the blade edges became narrower than the stem edges. (Kornfeld et al. 2010:102)

Kornfeld et al. (2010) have grouped all the above complexes and points into a Foothills/ Mountain Paleoindian manifestation due to their differences from Plains Paleoindian complexes. However, further research is needed to fully understand these differences. The evidence so far suggests the "Foothill/Mountain complexes favored more hunting and gathering subsistence in foothill and mountain slope areas and were more Archaic in terms of subsistence strategies" (Kornfeld et al. 2010:95).

**Early Archaic (4,500-8,000 RCYBP).** The Early Archaic period saw a sudden change in projectile points (Kornfeld et al. 2010). Projectile points changed from lanceolate and stemmed points to side-notched points (Kornfeld et al. 2010). There appears to be a wide range of variation to these early side notched points, but a few commonalities exist. These side notched points typically have "ground, straight to slightly concaved bases" (Kornfeld et al. 2010:111). In addition to the early side notched points, large corner notched points with both base notches and without, were common (Kornfeld et al. 2010).

Unlike other time periods, the projectile points of the Early Archaic do not have names assigned to most of them and this may be due to our lack of overall understanding of the stratigraphic separation of

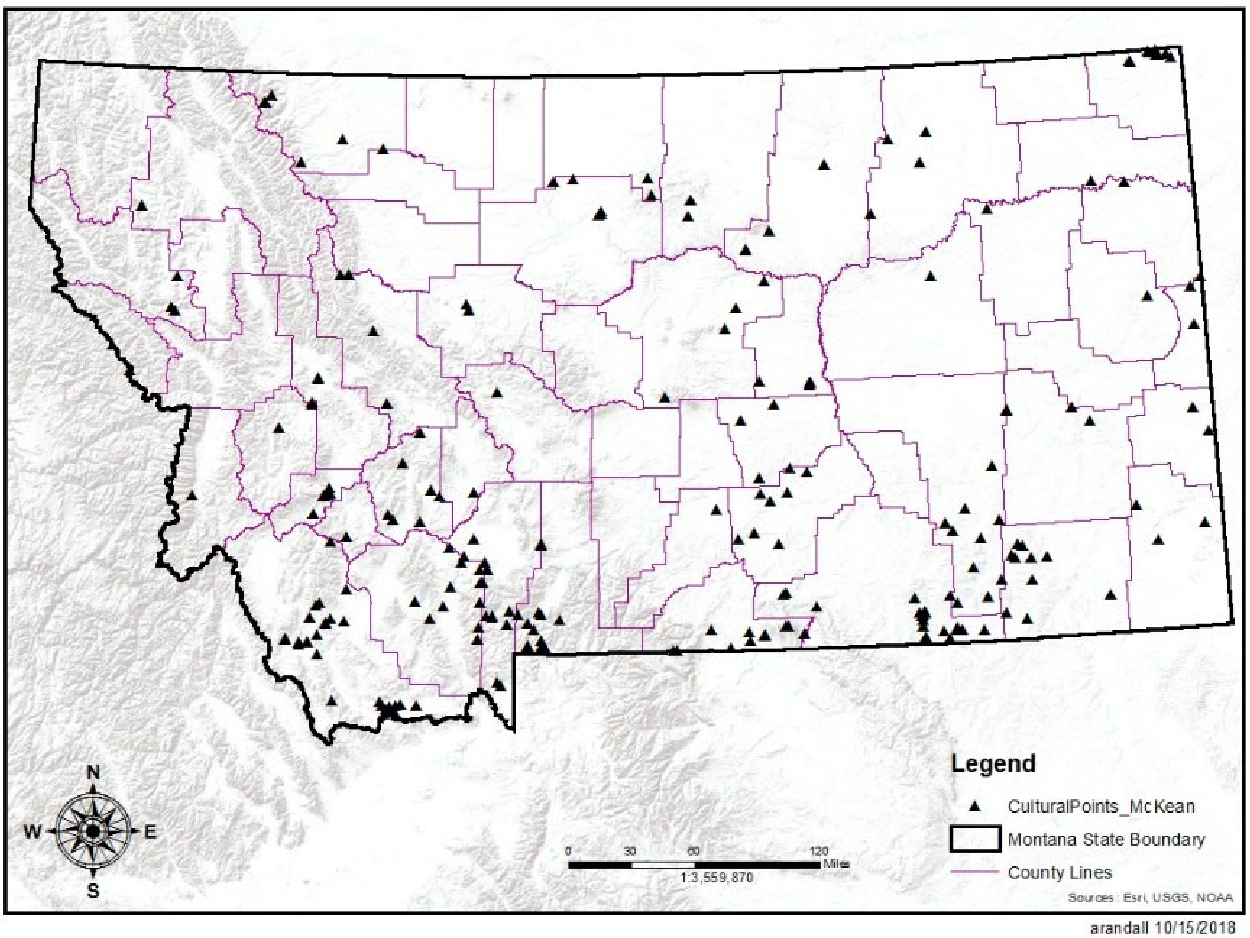
these different points (Kornfeld et al. 2010). Two points from this time period that have been found in Montana are the Bitterroot and Oxbow. The Bitterroot points are more common in Idaho; however, a component has been found in the upper Yellowstone River valley near Livingston, Montana (Kornfeld et al. 2010). One possible Bitterroot point was discovered, by me, on the surface near a high elevation spring south of Helena, MT in 2014. The Oxbow point is a side notched point with a pronounced basal indentation and is well known in northern Montana, Alberta and Saskatchewan (Kornfeld et al. 2010). The Sun River Site in west central Montana has a stratified Oxbow component that suggests a long temporal overlap with the Middle Archaic period (Kornfeld et al. 2010). No Oxbow points were found at the Sundog site; however, the Sun River site is located approximately 50 miles to the north.

**Middle Archaic (McKean) (3,000-4,500 RCYBP).** The Middle Archaic period saw an increase in sites compared to the Early Archaic and evidence suggests an increase in the use of plant foods (Kornfeld et al. 2010). Grinding stones, manos and slabs also become more common during this time period, which could indicate more plant food processing activities (Kornfeld et al. 2010). The McKean site, located in northeast Wyoming, was first discovered in 1954 by Mulloy during investigations for the Keyhole Dam project (Kornfeld et al. 2010). The McKean complex represents the bulk of the points during the Middle Archaic period (Kornfeld et al. 2010). The classic "McKean lanceolate type with indented base and convex blade edges that are slightly narrower at the base than towards the middle" (Kornfeld et al. 2010:116). Two other point forms are commonly found in co-occurrence with the classic lanceolate: "a stemmed form with sloping shoulders and a straight stem has been called Duncan, and a form with distinct shoulders and a slightly expanding stem has been named Hanna" (Kornfeld et al. 2010:116). Research over the years has suggested the McKean lanceolate, the Duncan, and the Hanna points are all part of a technocomplex, with the Duncan and Hanna points slowly replacing the McKean lanceolate (Davis and Keyser 1999; Kornfeld 2003). The last point style included in this complex is the Mallory point. This point is "wide, very thin, with deep side notches placed well forward, and with either

straight, slightly concave, or deeply indented bases…sometimes with a deep narrow basal notch" (Kornfeld 2010:117).

Numerous sites across Montana have components from the McKean complex (Figure 6). The following sites are within the northern Big Belt Mountains and within close proximity to the Sundog site, these sites include Beaver Creek Cave, 24LC0272 (Davis 2010), Crystal Springs, 24ME0073 (Davis et al. 2006), and Bowman Springs, 24LC0294 (Davis et al. 2009).

Figure 6: McKean points across Montana (note: this map does not represent every site with McKean evidence).




**Late Archaic (Pelican Lake) (1,700-3,000 RCYBP).** The Pelican Lake Complex, derived from the Mortlach site in southern Saskatchewan, is typically thought to radiocarbon date to 3,000-1,700BP (Aaberg et al. 2006; Kornfeld et al. 2010; Travis 2010). However, there are a few researchers that

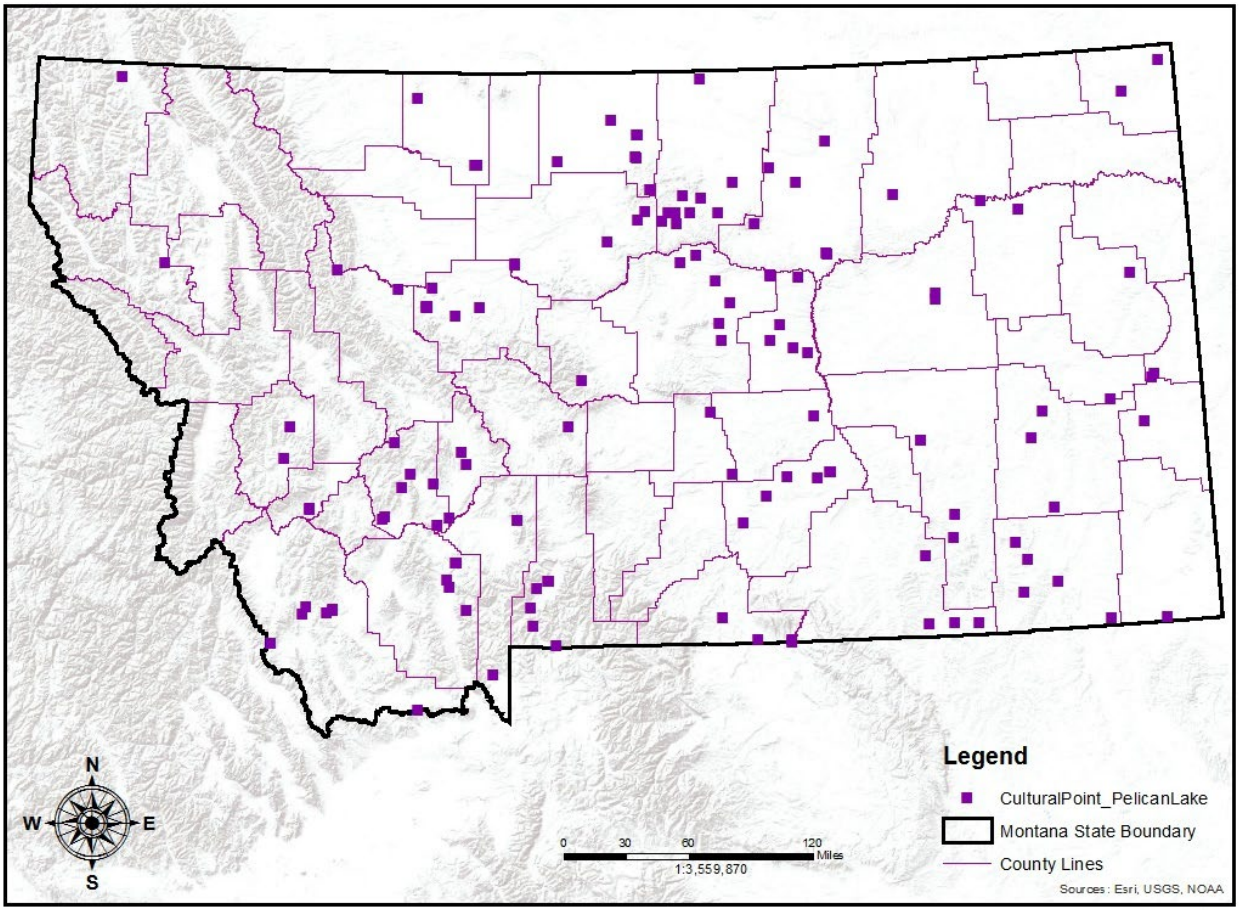
suggests the Pelican Lake Complex show up around the radiocarbon 3,500BP date (Davis and Helmick 1982; Frison 1992). These points are relatively large corner notched points with distinctive barbed shoulders. "Both blade edges and bases may be slightly convex, straight, or very slightly concave" (Kornfeld et al. 2010:124). Attribute variation can be extreme in this complex (Aaberg 2006).

Yonkee is the other common point type during this time period, however it is less widespread in Montana. Some researchers believe Yonkee and Pelican Lake points could have been manufactured by the same cultural group (Aaberg et al. 2006; Ferguson 2003). Both Yonkee and Pelican Lake points are typically found at communal bison hunting sites, which suggests these complexes had an emphasis on bison (Aaberg et al. 2006; Ferguson 2003; Kornfeld et al. 2010). However, research suggests a more generalized big game hunting strategy was also used (Kornfeld et al. 2010). For example, high altitude big horn sheep were the dominant faunal remains during the Pelican Lake period at the Bowman Springs site, located less than a mile to the southeast of the Sundog site (Davis et al. 2009). Other characteristics of this phase include an elaboration of bison killing and processing patterns, extensive stone boiling of food resources, and pit roasting (Aaberg et al. 2006; Kornfeld et al. 2010).

The Pelican Lake Complex is commonly thought to represent a Northern Plains complex. However, several sites in the Montana foothills and mountains have Pelican Lake components; for example, the site 24LC1064 (Aaberg et al. 2006) and site 24LC237 (Deaver 1991) are both located along the Missouri River, approximately 11 miles to the northwest of the Sundog site. The Crystal Springs site (24ME0073) (Davis et al. 2006) is located on the eastern side of the Big Belt Mountains, southeast of the Sundog site, approximately 11 miles away. Beaver Creek Caves 24LC0272 (Davis 2010) is located approximately 10 miles to the west from Sundog and, Bowman Springs 24LC0294 (Davis et al. 2009) is located directly east of the Sundog site, approximately 1 mile away. Two sites located off National Forest System Land on the South Fork of the Smith River, approximately 40 miles to the southeast, are the Moss Agate Site 24ME333 and the nearby Rechannel site 24ME334 (Aaberg et al. 2004). In addition, the Canyon Ferry area has numerous sites that have been documented but are now underwater (Davis and

Helmick 1982; Greiser 1986; Knight 1989). The Canyon Ferry Reservoir is located approximately 14 miles to the south. Besides the sites within the general area of the Sundog site, numerous Pelican Lake components have been found throughout Montana (Figure 7).

Figure 7: Pelican Lake points across Montana (note: this map does not include every site with Pelican Lake evidence).




**Late Prehistoric (300-1,400 RCYBP).** This period saw a dramatic change in projectile point type and size that is generally linked to the appearance of the bow and arrow (Frison 1992; Kornfeld et al. 2010). These points can be described as side notched, corner notched and basal notched (Kornfeld et al. 2010). This cultural period also saw an increase in regional occupations, which some researchers suggests was due to ecological reasons or from people moving into the region (Knight 1989). Data from pollen records indicate the environment during this time period saw an increase in moisture, which in turn

created more foraging opportunities for big game and wider plant resources for humans (Kornfeld et al. 2010; Travis 2018). Some researchers suggest this is why we see an increase in population during this time period (Kornfeld et al. 2010). This can be seen in the large bison kills site associated with the Avonlea cultural group (Kornfeld et al. 2010).

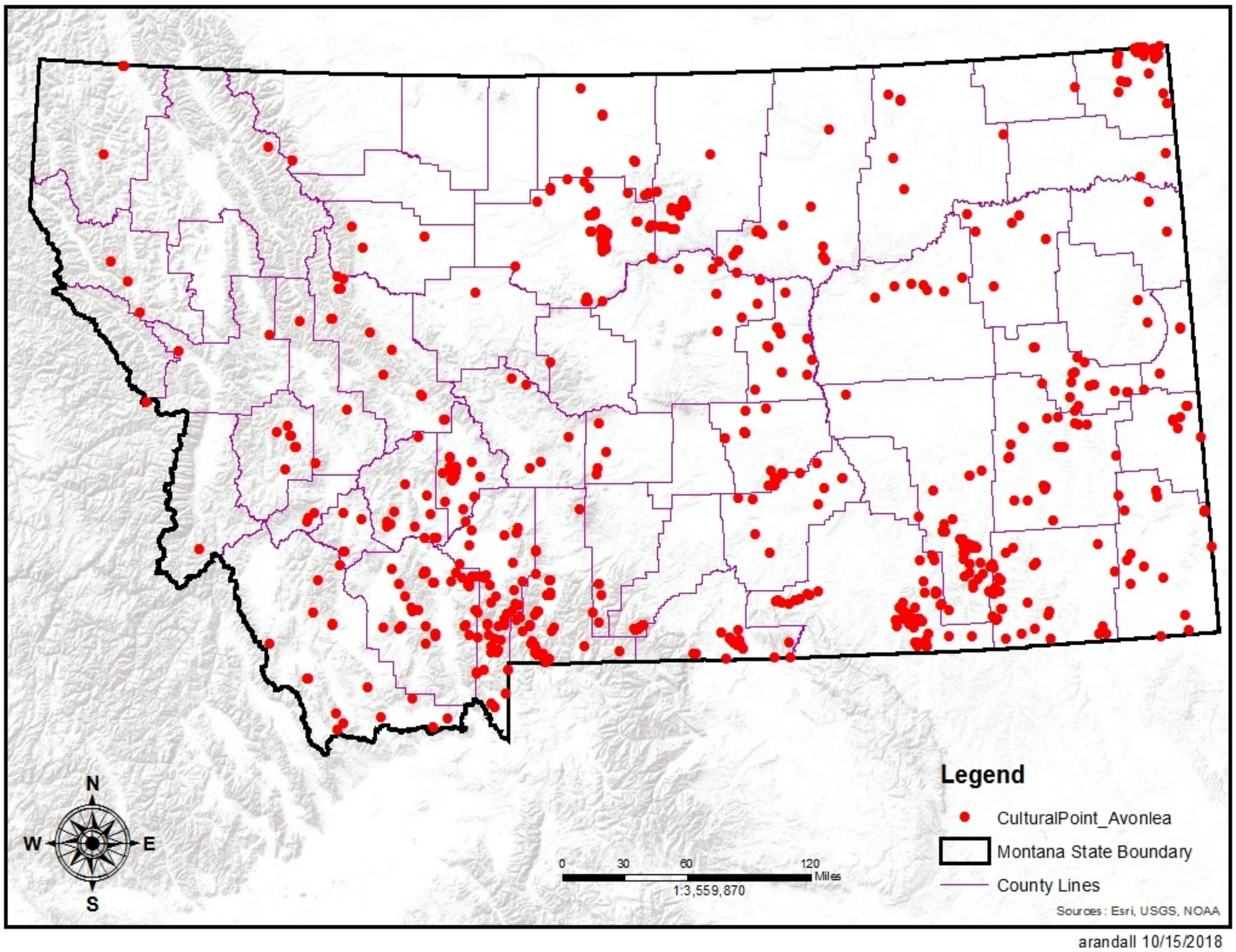
During this time period the Avonlea culture appears. The Avonlea points are a true side notched point, with the notch located close to the base (Kornfeld et al. 2010). These Avonlea points are commonly associated with large bison kill sites (Kornfeld et al. 2010). Kornfeld and colleagues (2010) suggests Avonlea groups favored locations on or around buttes for either defensive reasons or their desire to see long distances to scout for game animals, or for both reasons. These types of sites often have evidence of "large slab lined cooking pits, abundance of debitage, weaponry, tools, decorative items, faunal remains and grinding stones" (Kornfeld et al. 2010:131). Many Avonlea points have been found in Montana (Figure 8), however the sites in the foothills and mountains with these types of points do not typically have the common evidence mentioned above. No Avonlea sites in the Big Belt Mountains contain decorative items or slab lined cooking pits.

In addition to the Avonlea side notched points, small corner notched points are widespread during this time period. These small corner notched points have a wide variety of appearances that are typically attributed to the constraints of working with different raw material types rather than changes through time (Kornfeld et al. 2010). Many researchers also suggest sites with these small points show a relationship to the Great Basin (Kornfeld et al. 2010) and the Besant Complex (Hamilton et al. 2011). The Besant Complex sites are typically associated with bison hunting where they used log corrals and there is evidence that suggests extensive religious activities (Kornfeld et al. 2010). Woodland ceramics are occasionally found at Besant sites (Kornfeld et al. 2010).

The latter part of this time period saw the introduction of the horse. The horse first appeared in the Southern Plains around AD 1600, however they were likely not present in Montana until after the turn of the 18$^{th}$ century (Dickenson 2004). The introduction of the horse lead to increased mobility, which

contributed to greater contact between groups (Dickenson 2004). Smallpox and other epidemics contracted from Europeans caused catastrophic population reduction during the last part of this time period.

Figure 8: Avonlea points across Montana (note: this map does not include every site with Avonlea evidence).



# Chapter III: Methodology

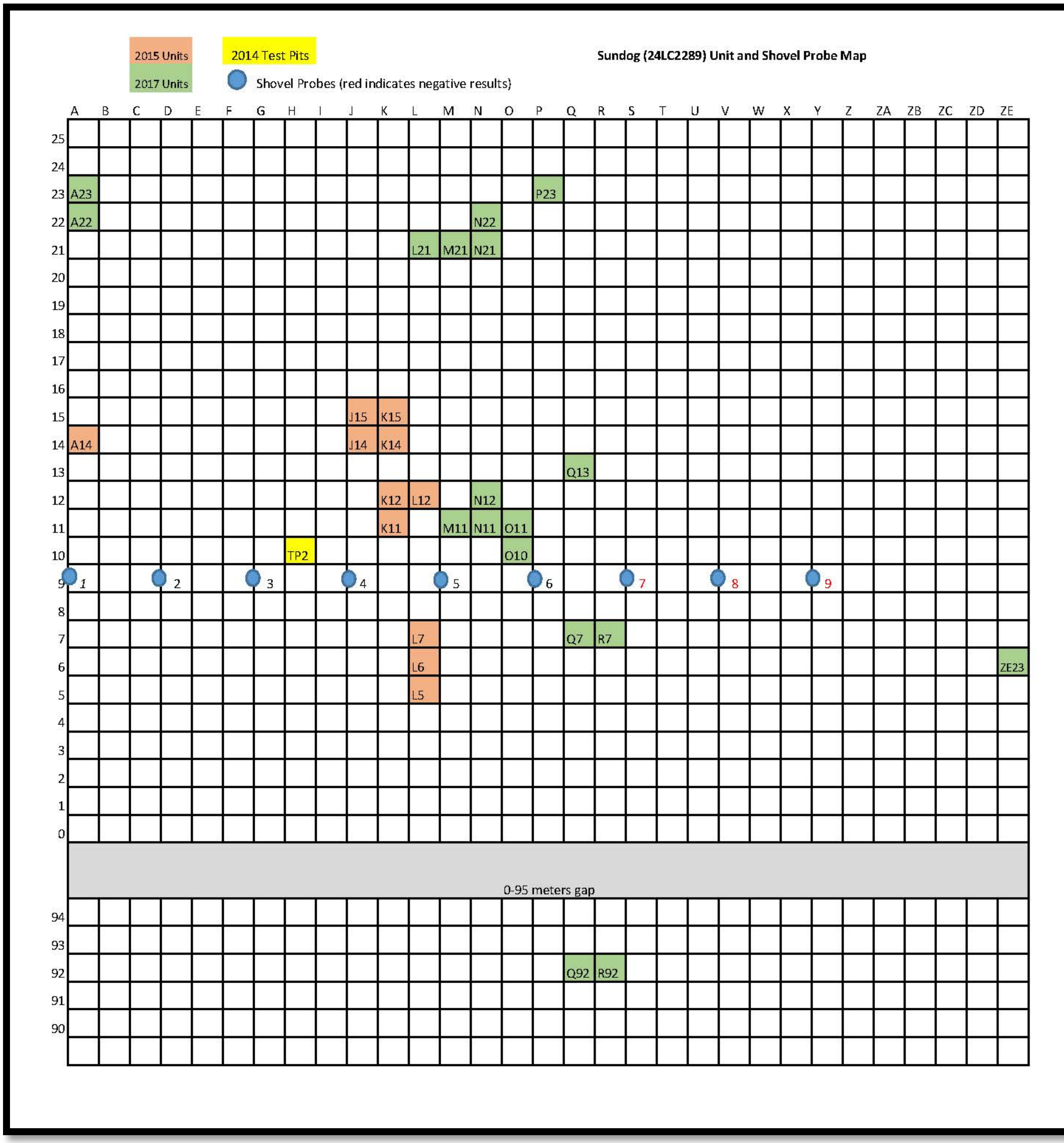
## Research Design

In this chapter I will discuss the methods, procedures and definitions that were used to analyze the dataset relevant to this research. First, I will briefly address subsurface excavation methods. Next I will outline the methods used for the stone tools and the debitage analysis, which includes any categories used to define artifact types. Then I will follow with addressing other artifacts found at the site, such as fire cracked rock, grinding stones and any undetermined items. In addition, lab results for radiocarbon dating, protein residue and tool stone sources will be discussed, as well as clarifying what was determined to be local chert. Finally, I will go through each step that I took in the Mountain Tradition attribute comparison analysis. This analysis is a focus on applying Black's (1991) attributes that he contributes to the Mountain Tradition from analysis he conducted in Colorado.

**Subsurface excavation.** Standard US Forest Service excavation methodology has been followed during the last three years of testing. A site datum was placed in the northwestern corner of the site and two baselines were established from the datum. The south baseline was labeled by numbers and the east baseline labeled by letters, this in turn formed 1 meter x 1 meter test units. Test units were placed on top of surface artifact concentrations and around the positive shovel probes from 2014 (Figure 9). Standard 10-centimeter levels following the site landforms and slopes were used. The only exceptions were in 2015 when one unit (K14) and three in 2017 when three units (A22, A23 and P23) were excavated in 5-centimeter levels to create a finer scale for paleoenvironmental data as part of the larger research design with Dr. Travis. Measurements were taken from a datum in the NW corner of each unit for the surface and each level at all four corners and the center to establish the top and bottom elevations. All sediment was dry screened through ¼ inch mesh screens, except for the northwest corner of each level. The northwest corner of every unit was screened through 1/8-inch mesh screen, creating a 25% sample of the site tested for smaller items. All test units were excavated until culturally sterile soil was found, with most units being excavated one or two levels past the sterile soil. The only exception was one unit (L7) in

2017 was excavated to 110 cmbd to collect a deeper pollen record. However, this bottom level produce one large scraper and could indicate a deep cultural component. But due to time constraints this could not be further explored in 2017.

Figure 9: Unit and shovel probe map.



Photographs were taken throughout the excavations documenting testing, profiles, units, and artifacts. Artifacts were collected, bagged and labeled by unit and level. If artifacts were found *in situ*, they were point plotted, photographed and mapped. A soil control was collected for all tools for protein residue testing. Level forms were filled out for each unit and level. Unit wall profiles were also recorded, once unit excavations were completed.

In 2014, the field crew for the Carroll College (CC) Archaeological Field School and myself with the HLCNF conducted shovel testing along an east-west transect on top of two artifact concentration in the southern portion of the Sundog site. The shovel probes were placed every 5 meters across the terrace, and dug to the approximate depth of 40 cm. This testing resulted in a total of 9 shovel probes, with 6 positive probes and 3 negative probes and the discovery of two projectile points (Pelican Lake and Duncan). Following the shovel testing, two 1m x 1m test units were placed at locations along the east-west transect lines. The test units were placed near positive shovel probes with promising subsurface deposits. The 2014 testing resulted in the recovery of 59 flakes and 4 projectile points. During the 2015 CC field school, a total of 12 1m x 1m test units were opened on top of the lower artifact concentration and on either side of the shovel probe transect. This testing resulted in 839 flakes, 10 projectile points, 7 scrapers, a grinding slab and grinding stone, 9 radiocarbon dates, and pollen analysis. In 2017, 17 1x1 meter units were opened up, which resulted in 706 flakes, 9 projectile points, 8 scrapers, 1 biface, and 1 knife fragment were found, and 13 radiocarbon dates taken. The majority of these test units were placed around surface artifact concentrations and adjacent to the 2015 test units. Two additional units were placed near the spring seep, located several meters to the south of the surface artifact concentrations. This location was chosen because the nearby Bowman Springs site only found earthenwear pottery in test units located near the spring. Unfortunately, we did not have the same results. In addition to the artifacts from 2017, pollen analysis, XRF analysis, charcoal identification and obsidian/dacite sourcing were done.

**Analysis.** Material recovered during the last three years of field research was been taken back to Carroll College and the HLNF Supervisors Office for processing. Dr. Travis and Carroll College students

conducted a preliminary analysis of the material cultural to address five research questions mentioned earlier (Travis 2018). The current research takes a more detailed look at the material cultural of the Sundog site to better understand the site type and use. In addition, a comparison analysis to Black's (1991) Mountain Tradition attributes was done to see if there were any correlations.

For this research, lithics were separated into one of six mutually exclusive categories: 1) formed implements, 2) expedient tools, 3) debitage (also referred to as flakes), 4) cores, 5) fire cracked rock, and 6) grinding stone (Andrefsky 2005; Dickerson 2004). Tools were weighed and attributes measured to create metrics that could be compared to determine if correlations exist with the Mountain Tradition. Below is a list of attributes that were recorded for each artifact:

- Point Type
- Tool Type
- Material
- Weight (grams)
- Length
- Width
- Thickness
- Blade Length
- Blade Width
- Base Length
- Base Width
- Notch Depth
- Notch Width
- Hafting Width
- Basal Concavity Width
- Basal Concavity Depth
- Outline *(leaf, lanceolate, triangular or oval)*
- Portion *(complete, almost complete, blade, base, tip)*
- Blade Shape *(straight, incurvate, excurvate, parallel excurvate, contracting excurvate, or recurved)*
- Cross Section *(plano-convex, plano-concave, bi-plano, bi-convex, bi-concave, or concavo-convex)*
- Retouch Patterns-dorsal side *(random, parallel straight or parallel descending)*
- Retouch Penetration-dorsal side
- Retouch Patterns-ventral side *(metric*
- Retouch Penetration-ventral side *(metric was*

| | | |
|---|---|---|
| • *(marginal >15%, invasive 20-40%, collateral 50% or transverse <60%)* | *was only entered if different from dorsal side)* | *only entered if different from dorsal side)* |

The attributes chosen followed Andrefsky (2005) suggestions for artifact analysis, in addition to a codebook for artifact analysis developed for Ulm Pishkun by Jack Fisher, Tom Roll and C. Bauer in 1994 (this code book was used in the archaeology lab at Montana State University). In addition, all collected artifacts were photographed and cataloged for permanent storage.

All data were entered into an Excel spreadsheet to be quantified and analyzed based on morphological differences or similarities with the Mountain Tradition and to help place points within a cultural component to create a chronology for the Sundog site occupation through time. The scraper attributes will help with determining possible use and site function. According to the microwear analysis that Muñiz (2009) conducted on scrapers from the Hell Gap site he concluded that “side scrapers” functioned more like knives and were used for butchering activities. This was due to the fact that the side scrapers use wear suggested more direct contact with meat and bone (Muñiz 2009). Whereas, the end scrapers use wear suggested they were used almost exclusively for hide processing (Muñiz 2009). For this research it is important to know if projectile points match the attributes that Black (1991) proposes to represent a Mountain Tradition adaption to help determine if this site represents an example of a mountain adaptation. It is also important to know if this adaption is seen through time or if it’s only seen during certain cultural components. If site function can be determined, this could help determine if the Sundog site was a short-term camp, hunting camp or residential camp.

For the purpose of this study, formed implements were considered as flaked artifacts that show significant effort in their production, for example evidence of bifacial reduction techniques (Dickerson 2004). Andrefsky suggests bifaces often represent elements in a reduction continuum rather than

completed tools, therefor manufacturing stages were recorded for all such artifacts following his model (Andrefsky 2005:179-194).

Unlike formed implements, expedient tools should show less effort in their production (Andrefsky 2005; Dickerson 2004). This category consists primarily of modified flakes that were used as is, or with minor edge modification. These modified flakes generally retain evidence of use related edge wear, crushing, or secondary retouching (Andrefsky 2005). In addition, scrapers were under this category and they were classified as either an end scraper or side scraper. All the scrapers varied in size and shape and could be broken down into sub-categories, but I only broke them into two categories. A scraper was classified as an end scraper if it has retouching along one slightly curved side and the shape was oval. A scraper was classified as a side scraper if it has retouching on two or more sides and deliberate flaking on one or both surfaces (Travis 1988). The following bulleted list represent the attributes recorded for artifacts in this category:

- Tool Type
- Material
- Weight (grams)
- Length
- Width
- Thickness
- Tool Edge *(left margin, right margin, proximal end, distal end)*
- Edge Angle *(<30º, 30-60º, >60º)*
- Edge Length
- Distance of Retouch *(clustered or continuous)*
- Retouch Index *(ratio between worked face of scraper edge(F) and maximum thickness(T))*
- Left Margin Outline *(straight, convex, bi-convex, concaved or convex/concaved)*
- Right Margin Outline *(same as left outline)*
- Proximal End Outline *(convex, straight or pointed)*
- Distal End Outline *(same as proximal outline)*

- Portion *(complete, distal end, proximal end, almost complete)*
- Cross Section *(plano-convex, plano-concave, bi-plano, bi-convex, bi-concave, or concavo-convex)*
- Retouch Patterns *(bimarginal or unimarginal)*
- Retouch Penetration *(feathered, stepped or smooth)*
- Made from a Flake *(yes or no)*
- Split Cobble Reduction Technique *(yes or no)*

Debitage was classified into 4 size grades based on the Sullivan and Rozen (1989; 1985) approach: SG1 = greater than 25.4mm; SG2 = 25.4-12.7mm; SG3 = 12.7 – 6.4mm; and SG4 = less than 6.4mm, as well as using a triple cortex typology approach (Andrefsky 2005). Under the triple cortex approach, primary flakes are those with dorsal surfaces with 50% or more of cortex; secondary flakes have less than 50% of their surface covered with cortex; and tertiary flakes lack cortex all together (Rozen and Sullivan 1989). Using this strategy, primary and secondary flakes are typically associated with the initial stages of lithic reduction, while tertiary flakes are likely associated with final stages of biface reduction or tool sharpening and maintenance (Rozen and Sullivan 1989). All flakes were classified in the field and deposited back into test units after excavation, per HLCNF's Tribal Consultation Protocols. In addition to measurements, material type and evidence of heat treatment were documented for all debitage (Andrefsky 2005). Further debitage analysis is somewhat limited, due to the no debitage collection policy on the HLCNF. However, using the already collected data some comparisons and interpretation can be made. A raw count of flake sizes based on size grade was done. This information can indicate if tool production or tool retouching was done at the site. Research suggests a greater number of larger size flakes would indicate tool production, whereas a greater number of smaller flakes would indicate tool retouching (Andrefsky 2005). In addition to flake size analysis, an analysis of material type was done. This can help determine if local material versus non-local material is being used.

These data will be useful considering the Mountain Tradition suggests an emphasis on local toolstone (Black 1991).

Nodules or fragments of lithic raw material from which flakes were removed for use of manufacturing of tools will fall into the core category (Andrefsky 2005). Fire cracked rock (FCR) will represent stone that was fractured as a result of intentional heating. FCR was not collected during excavation but was noted when encountered and number of pieces were recorded. FCR is still important to note since it can represent domestic activities such as fire hearth preparation or cooking (Dickerson 2004). FCR could also be associated with stone filled or stone lined cooking pits that Frison (1991) notes during the Late Archaic and Late Prehistoric periods. One grinding slab and stone was recovered in 2015. The length, width and thickness, and stone type were recorded, as well as polished surfaces analysis (Travis 2018).

**Lab analysis.** The following lab analysis were submitted by Dr. Travis during the field school site analysis. Obsidian sourcing was submitted to Geochemical Research Laboratory. This laboratory uses "energy dispersive x-ray fluorescence analysis" to determine the obsidian source (Travis 2018:42). In addition, dacite was sourced using the same approach (Travis 2018). This lithic sourcing will aid in determining people movement or trade through time.

Radiocarbon dating analysis was done through Woods Hole Oceanographic Institution. Woods Hole used standard radiometric analysis on the charcoal samples submitted. These radiocarbon dates will be used to determine site age, if possible.

Lastly, Dr. Travis submitted pollen and protein to PaleoResearch Institute. PaleoResearch uses "a chemical extraction technique based on flotation" to recover pollen from sediment (Cummings and Kovacik 2017:1). An in-depth discussion of the pollen analysis will not be done in this thesis. The information gathered from the pollen analysis will help in understanding the environment throughout the different cultural components. Protein residue analysis was also done through this lab using counter immunoelectrophoresis (CIEP) analysis (Clark and Cummings 2019). "This method is based on an

antigen-antibody reaction, where a known antibody (immunoglobulin) is used to detect an unknown antigen" (Clark and Cummings 2019:1).

**Local chert.** The chert in this area is a Madison Limestone formation chert that can be found throughout the Big Belt Mountains. This chert can be classified as medium grade quality with many limestone inclusions (Travis 2018). The chert that forms in this limestone formation in the Big Belts has a wide variety of colors and is typically fine grained, however granularity can vary widely from different outcrops (Aaberg et al. 2006). In the research that Dr. Travis has done, she combined all tan, brown and red cherts into a classification called Oregon Chert, due to its similarity to chert from a quarry found between Clark's Gulch and Oregon Gulch (24LC0688) located approximately 6 miles southeast of the Sundog site. Other researchers have called this Madison Formation Chert (Davis et al. 2009) and Mississippian-age chert (Davis 2010).

I decided to re-classify Oregon Chert to North Belts Chert (NBC) to clarify that this tool stone is a local material and comes from the Northern Big Belts and not from the state of Oregon. For this research all tan, red, caramel, opaque, orange, and yellow were combined into the NBC classification. Some colors such as white, black and grey cherts are more commonly found in the middle or southern Big Belts, therefore they were kept separate. All flakes classified in the field as Oregon Chert were changed to NBC.

**Mountain tradition attributes.** Analysis for the Mountain Tradition will focus on the attributes that Black (1991) determined as indicators of a separate adaption to mountain settings. Research in these mountain setting suggests cultural groups used the foothills, montane sub-alpine and alpine zones year round, rather than only during warm seasons (Baumler et al. 1996; Benedict 1992; Bender and Wright 1988; Black 1991; Frison 1992; Kornfeld et al. 2010). For each of these ecological zones I will use the HLCNF standard biotic setting breakdowns: foothills (1,000-5,600ft), montane (5,600-9,500ft), sub-alpine (9,000-11,000ft) and alpine (11,000ft+). These ecological zones will be used when considering the physical setting of the Sundog site. Unfortunately, there is no archaeological evidence that would point to

seasonal use from the Sundog site. However, some assumptions about seasonal use can be made when using Black's (1991) upland site types. According to Black (1991) the following define the settlement patterns of the upland setting:

- Warm-season base camps–level landforms in proximity to water, vantage points, and tool stone outcrops, within or near major mountain valleys.
- Shorter-term seasonal camp–at higher elevations on low prominences, benches and terraces adjacent to streams and cirque lakes, or on level landforms at or immediately below mountain passes.
- Chipping stations and other special activity–found on high knolls, ridges and benches overlooking but not adjacent to water sources.
- Winter residential bases–include rockshelters and other protected settings at the foot of the mountains both east and west of the Continental Divide, and in warmer interior mountain valleys where average snowpack is relatively low, and not coincidentally where big game animals congregate.

Black's (1991) settlement patterns will be used to help determine if the Sundog site is a warm-season camp, short term seasonal camp, special activity site, or a winter base camp. In addition, a basic unit plan view map for each cultural component will be created to show the location of artifacts throughout the site. These maps will be done using a color-coded system to display which units produced projectile points, scrapers, flakes and FCR. If a unit only has one color, for example green which indicates flakes, that will mean only flakes were found in that unit. But it if has multiple colors that will indicate which artifacts were recovered from that unit. These plan view maps can aid in determining activity areas which could help determine site type.

Black (1991) suggests a split cobble reduction strategy was commonly used when making scrapers. Therefore, this reduction technique will be analyzed to determine the frequency of use when making scrapers. Black (1991) also suggests microtools were used frequently in this adaptation, so

evidence of microtools will be assessed. Projectile points have the largest number of attributes that Black (1991) believes points to a separate adaptation. The following Mountain Tradition specific projectile point attributes were analyzed:

- Local Material
- Un-stemmed
- Stemmed
- Bi-convex
- Collateral flaking pattern
- Moderate to Good flaking pattern
- Reworking Evidence
- No evidence of grinding
- Make from a flake
- Biface reduction strategy

Initially, a simple yes or no answer was given for the presence or absence of these attributes on projectile points. With this information I can see if the Mountain Tradition model fits the data from the Sundog site.

## Chapter IV: Results

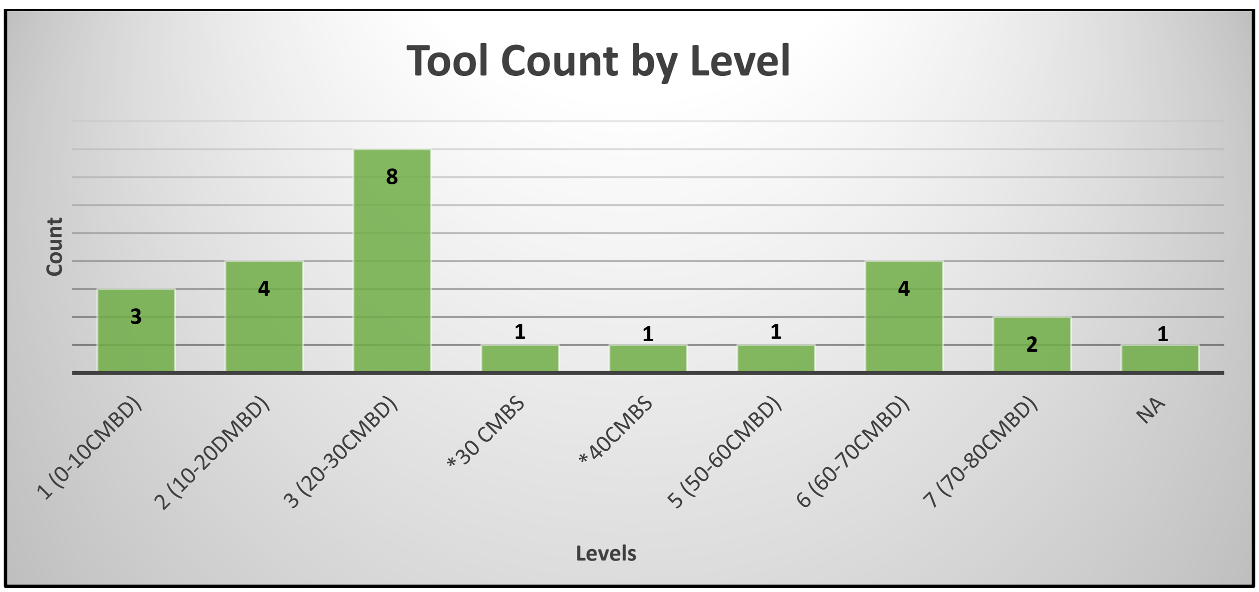
### Formed Implements

A total of 25 formed tools were found during excavations. The material used to create these tools were dominated by NBC totaling 8, followed by 5 obsidian tools, 5 dacite, 3 tan quartzite, 2 white chert, 1 black chert and 1 black quartzite.

One preform was found in level 2. This preform is made from a fine-grained tan quartzite or grainy chert. This artifact was categorized as a preform due to its lack of hafting elements, use wear and retouching evidence (Andrefsky 2005). One knife base fragment was recovered from level 2. This knife has distinct shoulders, a wide hafting width and a concaved base.

Level 3 (20-30cmbd) had by far the most formed tools at a total of 8 found in units and 2 found in shovel probes (Figure 10). Levels 2 and 4 each had four total formed tools, followed by level 1 with 3, level 7 with two and level 5 with only one (Figure 10).

Figure 10: Tool count by level.




**Shovel Probe (SP)*

The formed tools in level 3 (including 1 shovel probe) are dominated by the local material, NBC, with a total of 5 tools made from this material. It is interesting that also in level 3, three tools were made

from obsidian, which would have been imported. The North Belts Chert was not the dominate material in the other levels, except for the shovel probe at 40cmbs which would fall within level 4 (Table 1).

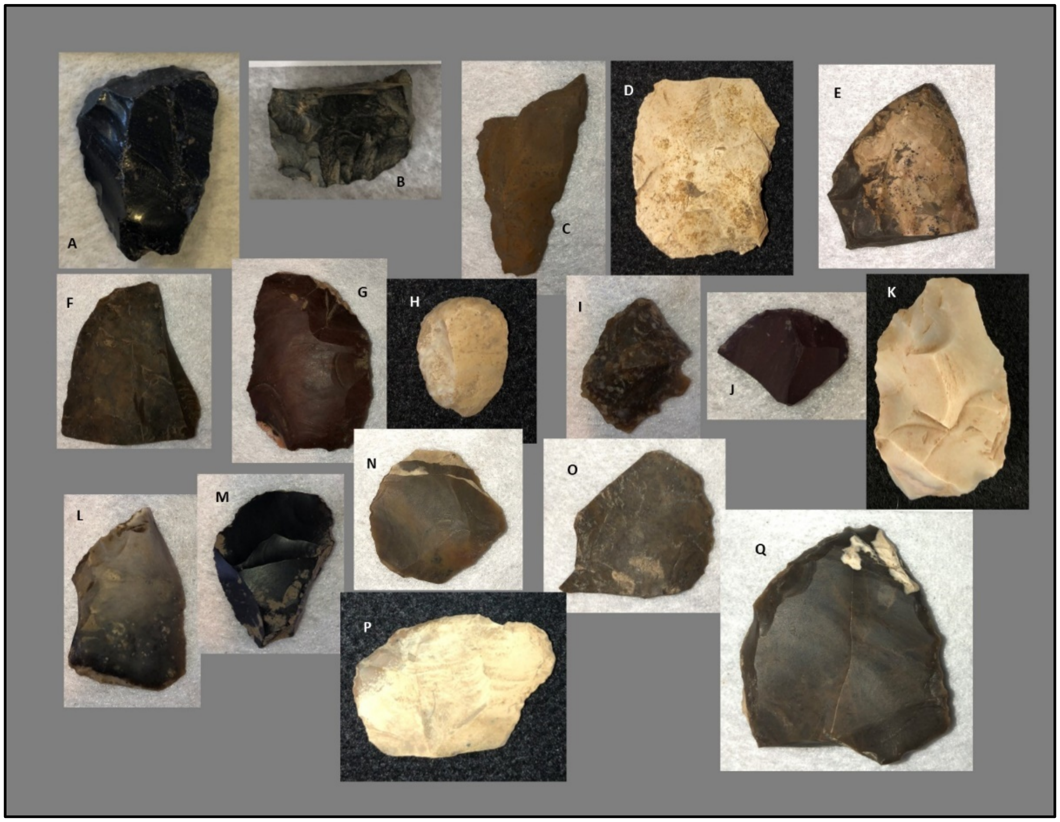
Table 1: Tool material count by level.

| | 1 (0-10cmbd) | 2 (10-20cmbd) | 3 (20-30cmbd) | SP (30cmbs) | SP (40cmbs) | 5 (50-60cmbd) | 6 (60-70cmbd) | 7 (70-80cmbd) | na | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **Black Chert** | - | - | - | - | - | - | 1 | - | - | **1** |
| **Black Quartzite** | - | - | 1 | - | - | - | - | - | - | **1** |
| **Dacite** | - | 2 | - | - | - | - | 1 | 2 | - | **5** |
| **North Belts Chert** | 1 | - | 4 | 1 | 1 | - | - | - | 1 | **8** |
| **Obsidian** | - | 1 | 3 | - | - | 1 | - | - | - | **5** |
| **Tan Quartzite** | 1 | 1 | - | - | - | - | 1 | - | - | **3** |
| **White Chert** | 1 | - | - | - | - | - | 1 | - | - | **2** |
| Grand Total | **3** | **4** | **8** | **1** | **1** | **1** | **4** | **2** | **1** | **25** |

**Expedient Tools**

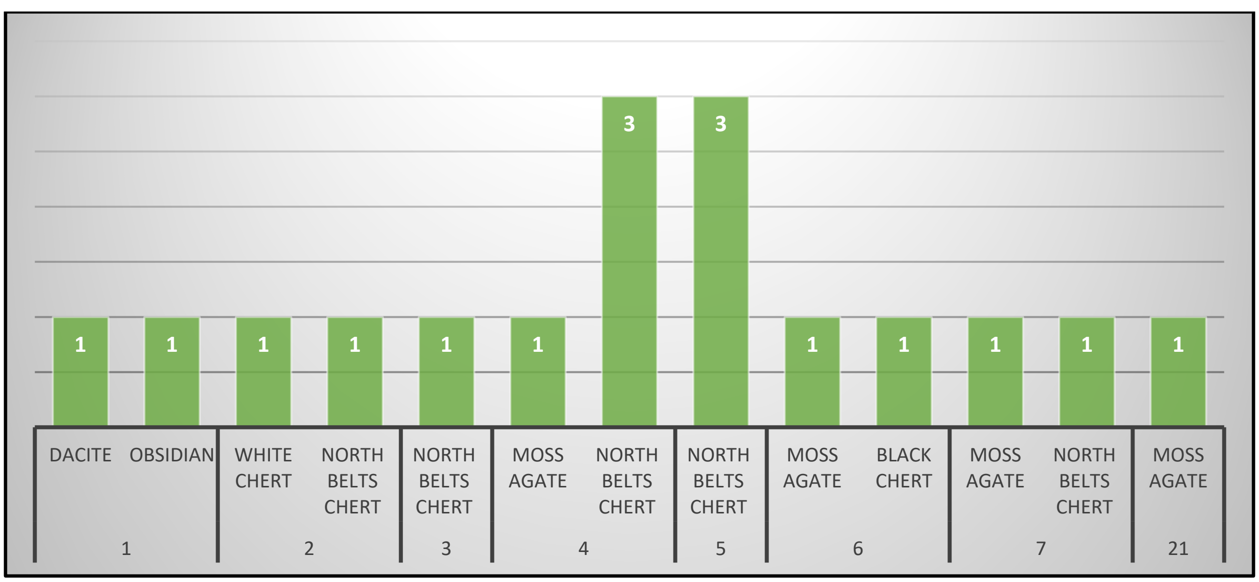
I placed scrapers in this category. A total of 17 scrapers were recovered; 9 NBC, 1 dacite, 4 Moss Agate, 1 Obsidian, 1 White Chert and 1 Black Chert. The local material appears to be a chosen material for scrapers (Figure 11). These scrapers are dominated by side scrapers at 11 and the remaining 5 are end scrapers. Six of the side scrapers are NBC, followed by 2 moss agate, then 1 obsidian, white chert and black chert material. There are 3 NBC, 1 moss agate and 1 dacite end scrapers. It is interesting to note that the most scrapers were found between 30-50 cmbd (F-L above) (Figure 12). These scrapers came from units K15, M11, N22, O10, Q7, and R92, with R92 having two scrapers whereas the rest only had one. It's also interesting that scrapers were found on every level from 1-7, then no scrapers until level 21.

Figure 11: Scrapers (not to scale).




*Obsidian (A), Dacite (B), White Chert (D), Moss Agate (F, N-O, & Q), Black Chert (M), North Belts Chert (C, E, G-L, & P)*

Figure 12: Scraper material by level.

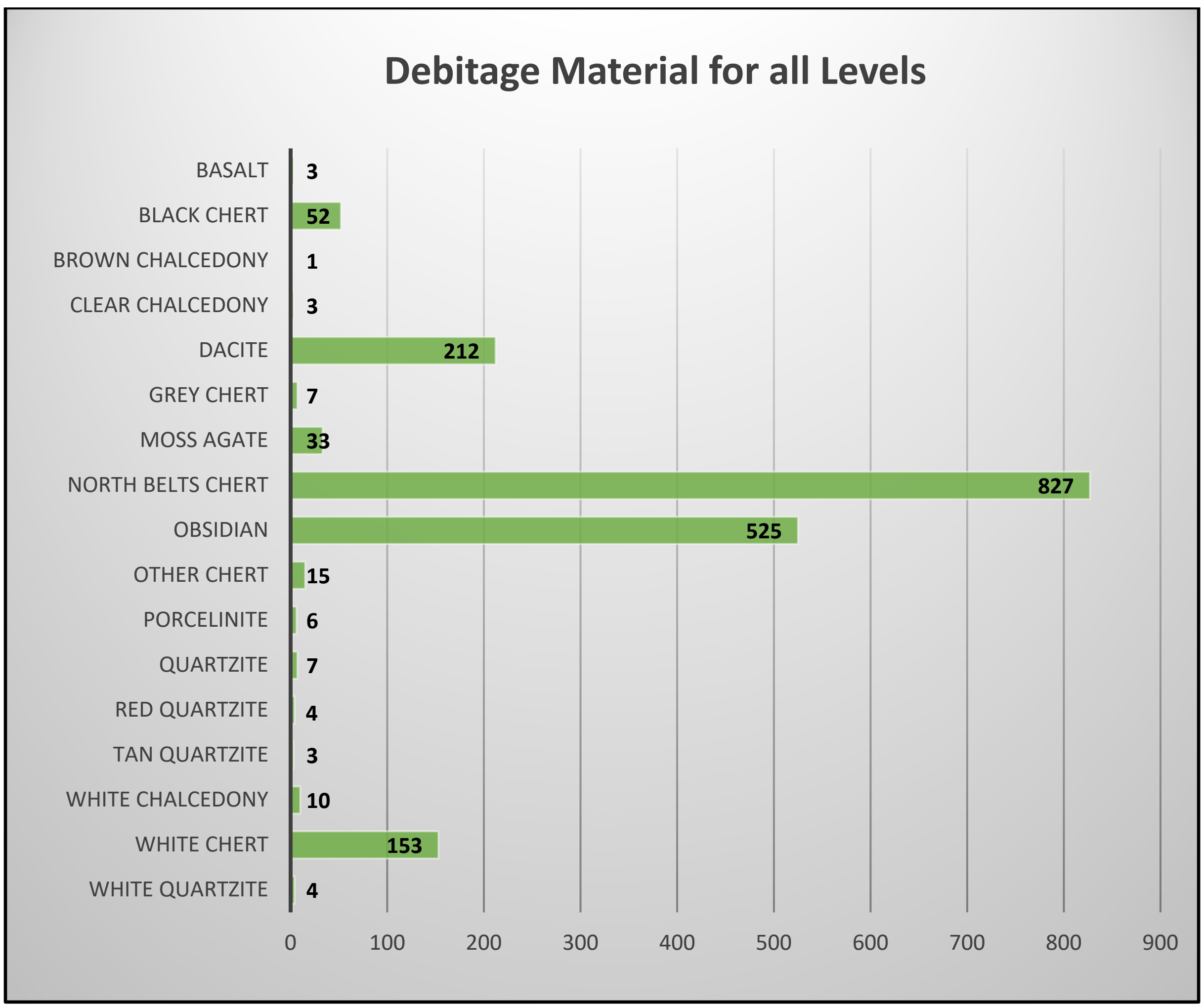


**Debitage**

Debitage (flakes) excavated during the 2015 and 2017 testing were returned to test pits before back filling as requested during Tribal consultation. Therefore, flakes were examined in the field at the end of each day. They were examined for use wear, heat treatment, cortex, and material, then measured and recorded. A total of 1,874 flakes were recovered during testing.

The flakes were dominated by NBC (44%), followed by obsidian (28%), dacite (11%), white cert (8%), black chert (2%), moss agate (1%), and various other colored cherts, quartzite, chalcedony, porcelanite and basalt, each totaling less than 1% each (Figure 13).

Figure 13: Debitage material type.



The following table (Table 2) shows the count of debitage material by level. All units done at 5cm levels were corrected to match cementers below datum for units done at 10cm levels. Also, lithics with poor provenience are not included in this Table 2. Of all the units, A23 had by far the most flakes at 155, with J15 being the unit with the second largest count of flakes at 111 (Figure 14).

Table 2: Summary of debitage material by level.

| cmbd | Basalt | Black Chert | Brown Chalcedony | Clear Chalcedony | Dacite | Grey Chert | Moss Agate | North Belts Chert | Obsidian | Other Chert | Porcelinite | Quartzite | Red Quartzite | Tan Quartzite | White Chalcedony | White Chert | White Quartzite | Total Count | % of Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0-10** | 1 | 10 | 1 | 1 | 35 | - | 8 | 173 | 123 | 2 | - | 1 | 2 | - | 5 | 43 | 1 | **406** | **21.77** |
| **10-20** | - | 6 | - | - | 41 | 1 | 9 | 177 | 101 | 7 | 4 | 2 | 1 | 1 | 1 | 26 | - | **377** | **20.21** |
| **20-30** | - | 13 | - | 1 | 45 | - | 4 | 132 | 104 | 4 | - | 3 | - | 1 | 2 | 25 | - | **334** | **17.91** |
| **30-40** | 2 | 5 | - | - | 25 | - | 1 | 113 | 78 | 1 | - | - | - | - | - | 14 | - | **239** | **12.82** |
| **40-50** | - | 3 | - | - | 18 | - | 4 | 63 | 43 | - | 1 | 1 | - | - | - | 10 | - | **143** | **7.67** |
| **50-60** | - | 3 | - | 1 | 13 | 1 | 3 | 58 | 25 | 1 | 1 | - | 1 | - | 1 | 13 | 2 | **123** | **6.60** |
| **60-70** | - | 2 | - | - | 14 | 4 | 2 | 47 | 25 | - | - | - | - | - | - | 4 | - | **98** | **5.25** |
| **70-80** | - | 3 | - | - | 3 | 1 | - | 22 | 10 | - | - | - | - | 1 | - | 8 | - | **48** | **2.57** |
| **80-90** | - | 2 | - | - | 6 | - | - | 8 | 3 | - | - | - | - | - | 1 | 5 | 1 | **26** | **1.39** |
| **90-100** | - | 1 | - | - | 5 | - | 1 | 5 | 2 | - | - | - | - | - | - | 1 | - | **15** | **0.80** |
| **100-110** | - | 1 | - | - | 1 | - | - | 9 | 3 | - | - | - | - | - | - | 2 | - | **16** | **0.86** |
| **110-120** | - | 2 | - | - | 4 | - | 1 | 5 | 3 | - | - | - | - | - | - | 1 | - | **16** | **0.86** |
| **120-130** | - | - | - | - | 1 | - | - | 5 | 1 | - | - | - | - | - | - | - | - | **7** | **0.38** |
| **130-140** | - | - | - | - | - | - | - | 3 | 1 | - | - | - | - | - | - | - | - | **4** | **0.21** |
| **140-150** | - | 1 | - | - | - | - | - | 2 | - | - | - | - | - | - | - | - | - | **3** | **0.16** |
| **150-160** | - | - | - | - | 1 | - | - | 1 | 2 | - | - | - | - | - | - | - | - | **4** | **0.21** |
| **160-170** | - | - | - | - | - | - | - | 2 | 1 | - | - | - | - | - | - | 1 | - | **4** | **0.21** |
| **170-180** | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | **1** | **0.05** |
| **180-190** | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | **1** | **0.05** |
| Total Count | **3** | **52** | **1** | **3** | **212** | **7** | **33** | **827** | **525** | **15** | **6** | **7** | **4** | **3** | **10** | **153** | **4** | **1865** | **-** |
| **% of Total** | **0.1** | **2.7** | **0.0** | **0.1** | **11.3** | **0.3** | **1.7** | **44.3** | **28.1** | **0.8** | **0.3** | **0.3** | **0.2** | **0.1** | **0.5** | **8.2** | **0.2** | **-** | **100.0** |

Flakes were classified into four categories based on the amount of cortex present to help determine what part of the core the flake came from. Tertiary flakes dominated the assemblage with 1,778 flakes being assigned to this category, followed by 37 secondary flakes, 21 primary flakes and only 6 were classified as shatter (Figure 15). These tertiary flakes were dominated by the SG-3 size classification at 950 flakes, followed by 446 flakes in the SG-2 category, 279 flakes in the SG-4, and 10in the SG-1 category (Figure 16).

Figure 14: Flake count by unit.

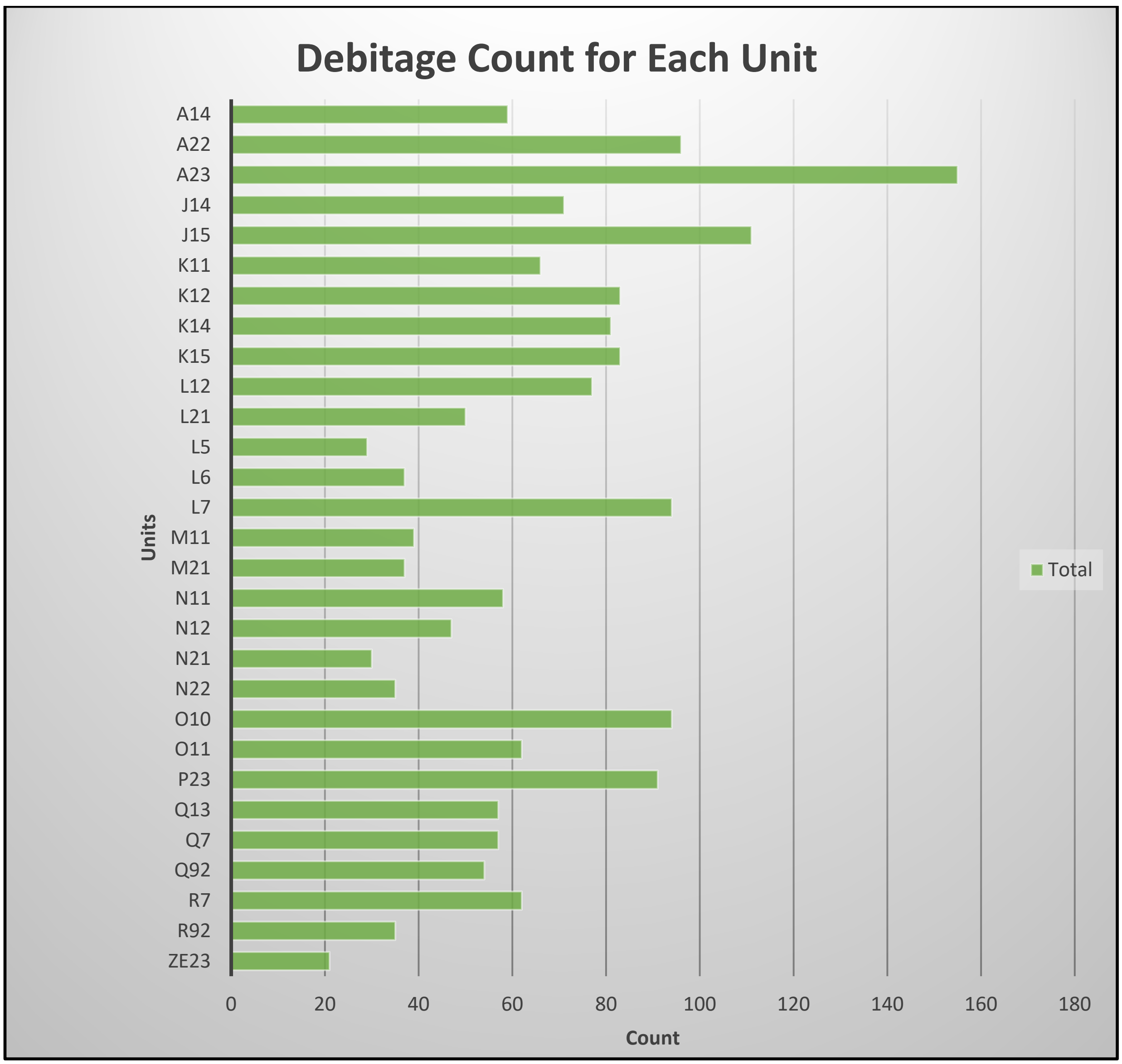


Figure 15: Reduction category. (T = Tertiary, S = Secondary and P = Primary).

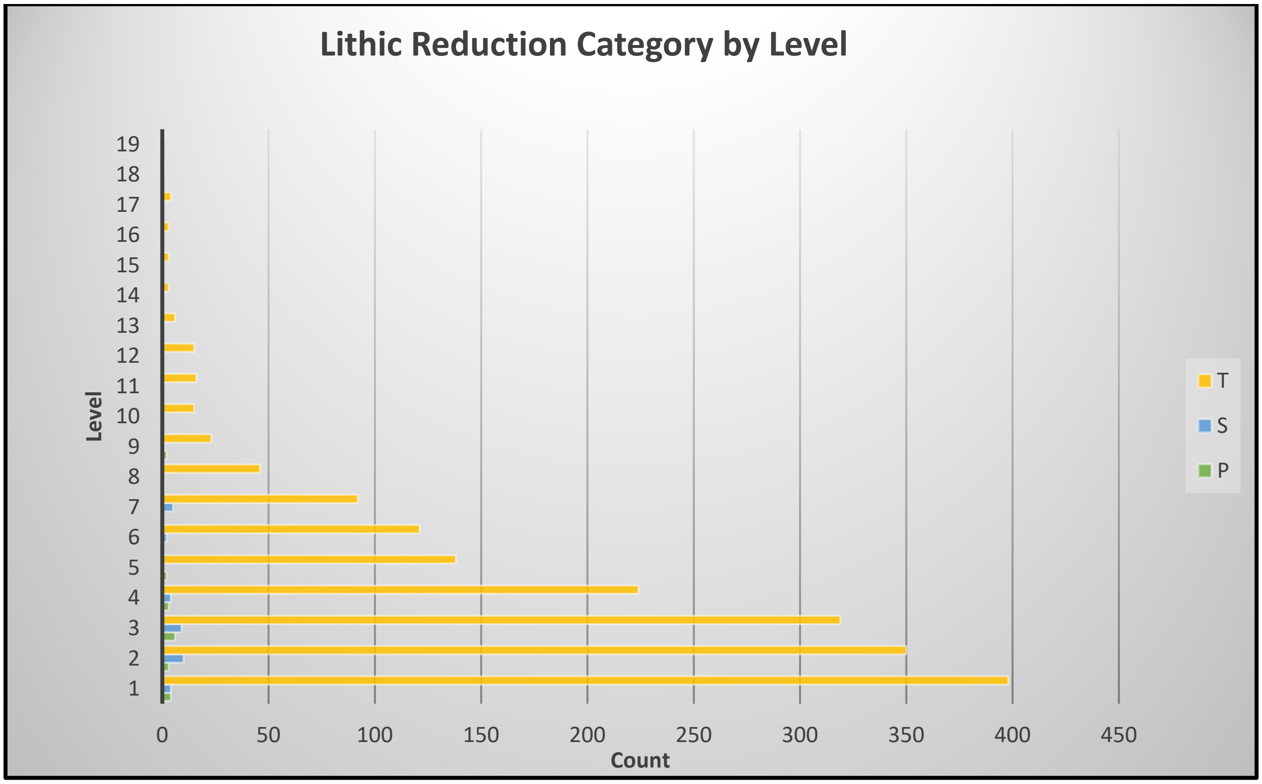
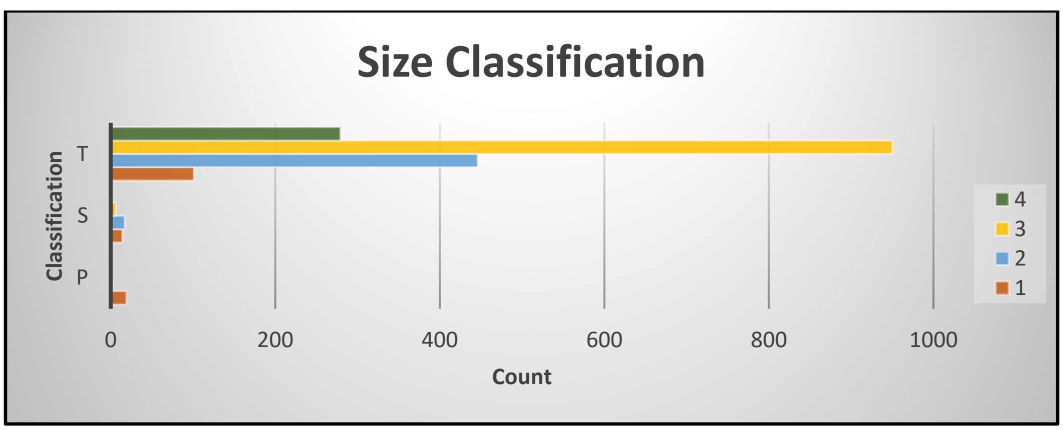


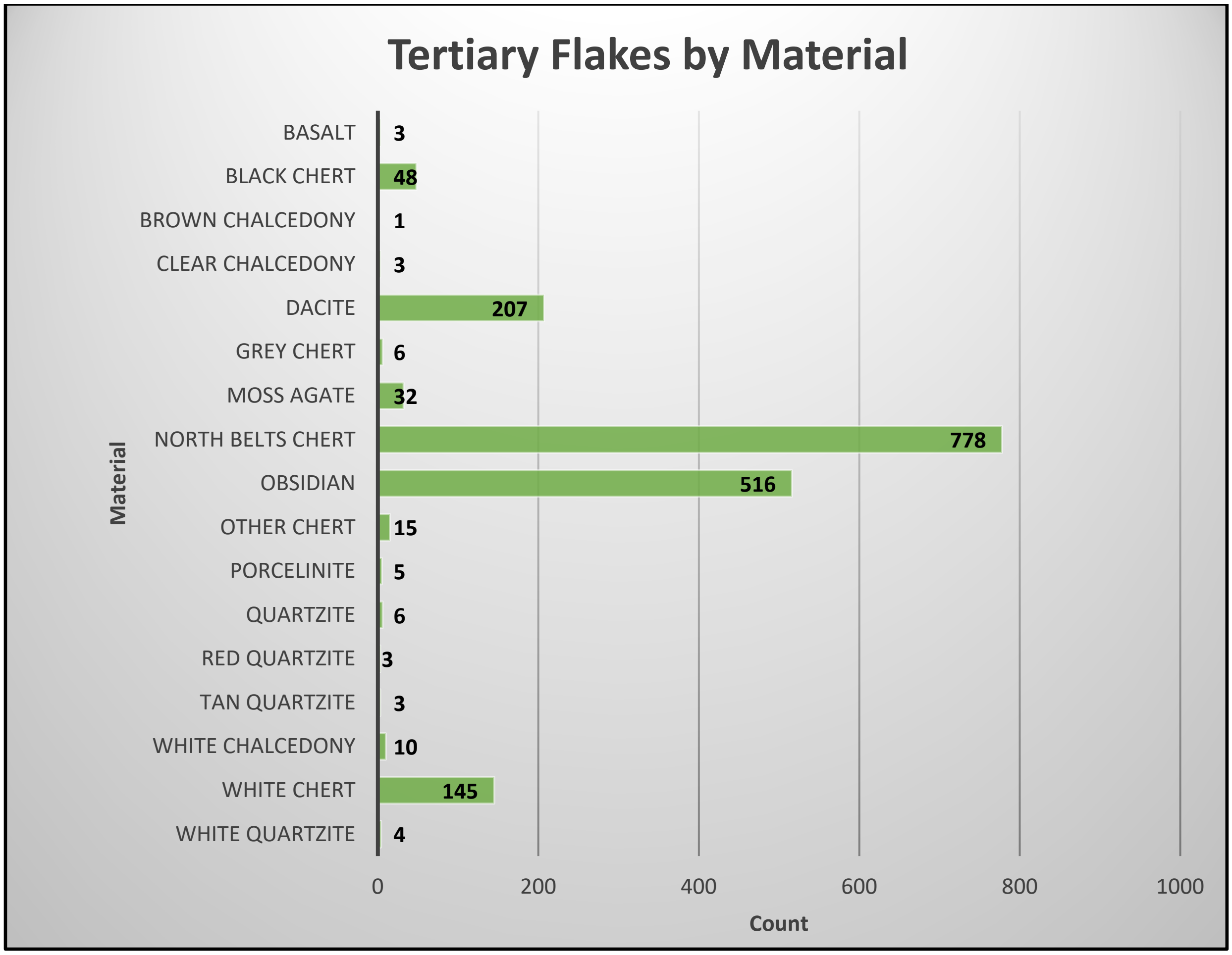

Figure 16: Sullivan and Rozen size classification.




Primary flakes were mostly NBC with 14 total, followed by 5 white chert flakes and 1 flake each of obsidian and black chert. Secondary flakes were again dominated by 24 NBC, followed by 3 flakes each of white chert, black chert and obsidian and 1 flake each of grey chert, red quartzite, moss agent, and

dacite. For the tertiary flakes it's interesting that NBC and obsidian are the highest material source. The breakdown of tertiary flakes by material can be found in the graph below (Figure 17).

Figure 17: Tertiary flakes by material.




**Heat Treatment**

There is evidence of heat treatment, but it's minor at only 10%. The NBC material was heat treated the most, with a total of 142 flakes showing treatment, Table 3. Those 142 flakes were dominate by 66 flakes in the SG-2 size category and 60 in the SG-3 size categories, followed by SG-1 with 14 flakes and SG-4 with only 3 flakes.

Table 3: Total heat-treated flakes.

| cmbd | Black Chert | Dacite | North Belts Chert | Porcelinite | White Chert | Total Count | Percent of Total |
|---|---|---|---|---|---|---|---|
| **0-10** | 2 | - | 24 | - | 8 | **34** | **17.53%** |
| **10-20** | - | 2 | 28 | 2 | 5 | **37** | **19.07%** |
| **20-30** | 2 | 1 | 21 | - | 9 | **33** | **17.01%** |
| **30-40** | 1 | - | 22 | - | 2 | **25** | **12.89%** |
| **40-50** | - | - | 8 | - | 3 | **11** | **5.67%** |
| **50-60** | 1 | - | 14 | - | 5 | **20** | **10.31%** |
| **60-70** | - | - | 10 | - | 1 | **11** | **5.67%** |
| **70-80** | 2 | - | 4 | - | 1 | **7** | **3.61%** |
| **80-90** | - | - | - | - | 2 | **2** | **1.03%** |
| **90-100** | - | - | 1 | - | - | **1** | **0.52%** |
| **100-110** | 1 | - | 1 | - | - | **2** | **1.03%** |
| **110-120** | - | - | 1 | - | 1 | **2** | **1.03%** |
| **120-130** | - | - | 2 | - | - | **2** | **1.03%** |
| **130-140** | - | - | 1 | - | - | **1** | **0.52%** |
| **140-150** | - | - | 1 | - | - | **1** | **0.52%** |
| **150-160** | - | - | 1 | - | - | **1** | **0.52%** |
| **160-170** | - | - | 1 | - | 1 | **2** | **1.03%** |
| **170-180** | - | - | 1 | - | - | **1** | **0.52%** |
| **180-190** | - | - | 1 | - | - | **1** | **0.52%** |
| **Total Count** | **9** | **3** | **142** | **2** | **38** | **194** | **-** |
| **Percent of Total** | **4.64%** | **1.55%** | **73.20%** | **1.03%** | **19.59%** | **-** | **100.00%** |

**Cores**

One small multidirectional white chert core was recovered from 40-50cmbd. This core weighs 110.3 grams and has a maximum length of 54mm. No other cores were recovered.

**Fire Cracked Rock**

Fire cracked rock (FCR) was not recorded consistently during excavations. This is mainly due to the field school students having a difficult time distinguishing FCR from unmodified rocks. However, after reviewing level forms and field notes the following units and levels noted FCR, Table 4.

Table 4: FCR by level and unit.

| Units | 0-10 cmbd | 10-20 cmbd | 20-30 cmbd | 30-40 cmbd | 40-50 cmbd | 50-60 cmbd | 60-70 cmbd | 70-80 cmbd | 80-90 cmbd | 90-100 cmbd | 100-110 cmbd | 110-120 cmbd | 120-130 cmbd | 130-140 cmbd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A22** | - | - | - | - | - | - | + | - | - | - | - | - | - | - |
| **A23** | - | - | - | + | - | - | - | - | + | + | - | - | - | + |
| **K14** | - | - | - | - | - | - | - | - | - | - | + | - | - | - |
| **K15** | - | - | - | - | + | - | - | - | - | - | - | - | - | - |
| **L6** | - | - | - | + | + | + | - | - | - | - | - | - | - | - |
| **L7** | - | - | - | + | + | + | + | - | + | + | - | - | - | - |
| **Q13** | - | + | - | + | + | + | - | - | - | - | - | - | - | - |

*Note: Not all level forms noted how much FCR was found, therefore the totals are not included. + indicates level forms that indicated FCR.

**Grinding Stone**

One grinding stone was found in the south-west corner of unit J15 between 30-40 cmbs and grinding slab found at level 5. The following analysis by Travis was done:

> The grinding slab, 33cm x 22cm x 5cm, is made from tabular, naturally fractured sandstone. The slab appears to be unifacially used with a smooth, polished surface. The polish suggests a back-and-forth motion rather than a rocking motion…The single grinding stone was broken in half and discovered about 5cm above the grinding slab…The complete grinding stone is 142mm x 84mm x 49mm and constructed from fine grained sandstone. The grinding stone exhibits a single grinding surface (ventral) as well as a ground edge on a single long axis and a single short axis. The ventral surface has extensive exfoliation creating heavy damage to the grinding surface. The dorsal surface displays pecking which formed the tool. (Travis 2018:27)

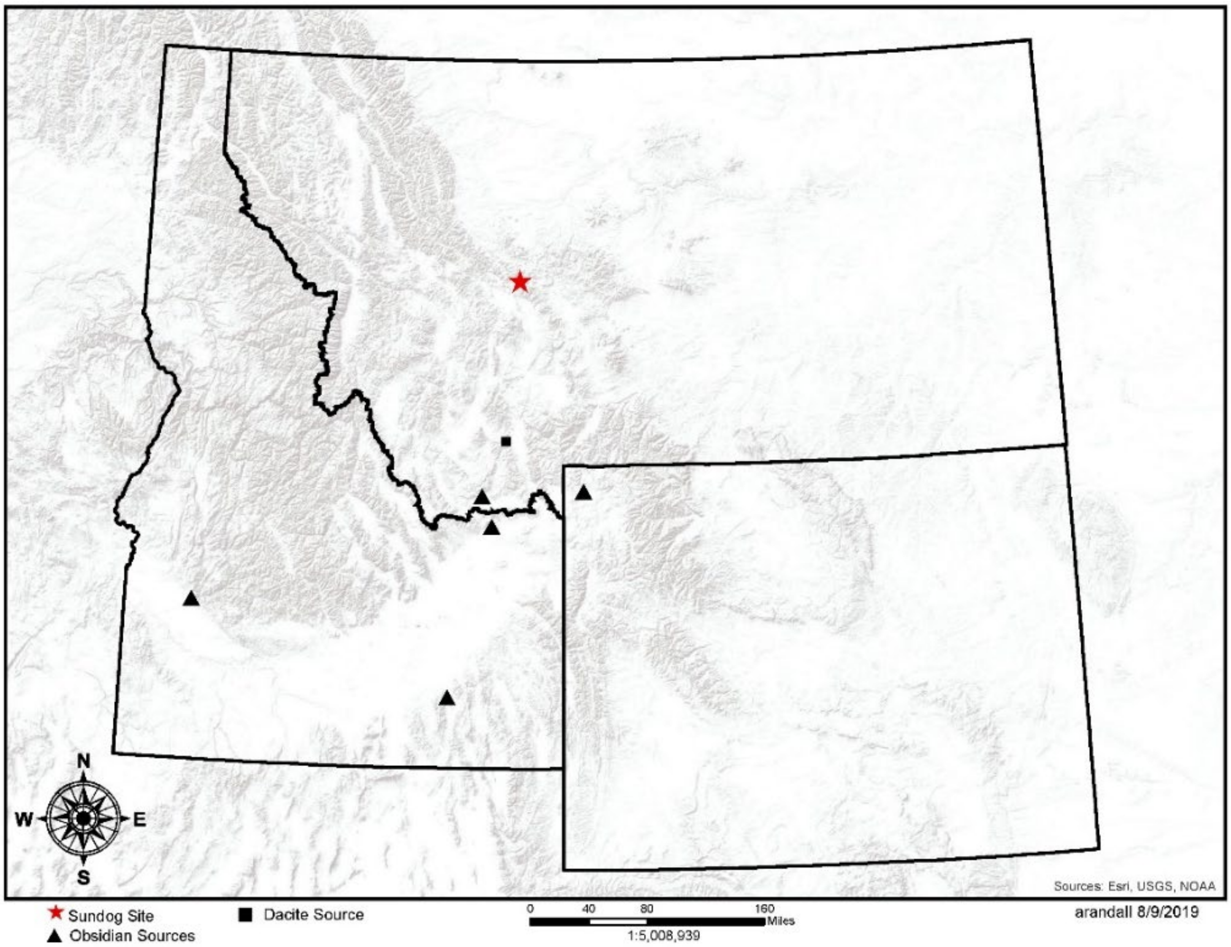
PaleoResearch Institute conducted a pollen and starch analysis on the grinding stone, but unfortunately it appears the stone was thrown into a fire after use, since the sample was dominated by microscopic charcoal (Travis 2015).

**Obsidian and Dacite Sourcing**

Five projectile points (Pelican Lake and McKean) and 42 flakes of obsidian were sent for x-ray fluorescence (XRF) analysis at Geochemical Research Laboratory. The source of the samples were dominated by Bear Gulch in southern Idaho (Travis 2015, 2018). All five projectile points and a total of 35 flakes were sourced to Bear Gulch. Five obsidian flakes came from Obsidian Cliff in northwestern Wyoming and two flake samples came from Mud Lake in southwestern Montana (Travis 2015, 2018). It is interesting to note that one obsidian flake came from Timber Butte in western Idaho and one came from American Falls in southern Idaho (Travis 2018).

Dacite samples were also sent into Geochemical Research Laboratory for XRF analysis. A total of 12 flakes were sent (Travis 2018). Five of the flakes could not be linked to any known source. But 7 flakes were sourced to the Cashman Quarry in southwestern Montana (Travis 2018). In 2019, 10 samples were submitted for sourcing. The majority of these were also sourced to the Cashman Quarry. See Figure 18 for a map showing source locations in relation to the Sundog Site.

Figure 18: Map showing dacite and Obsidian sources from the Sundog site.




**Radiocarbon Dates**

In both 2015 and 2017 charcoal was sent to Woods Hole Oceanographic Institution for radiocarbon analysis (Travis 2018). From the 2015 samples five of the dates followed the expected stratigraphic sequences, but two of them are out of sequence, Table 5 (Travis 2018). The radiocarbon dates for the upper levels are relatively good.

Table 5: 2015 radiocarbon dates pulled from the 2017 field school report.

| Sample | Conventional Age (BP) | Unit | cmbd | 10cm Level Numbers | 5cm Level Numbers |
|---|---|---|---|---|---|
| **2289-3** | 1510+/-20 | K14 | 5-10 | 1 | 2 |
| **2289-6** | 1490+/-15 | K14 | 10-15 | 2 | 3 |
| **2289-11** | 1550+/-15 | K14 | 25-30 | 3 | 6 |
| **2289-13** | 7970+/-30 | K14 | 30-35 | 4 | 7 |
| **2289-16** | 1560+/-20 | K14 | 35-40 | 4 | 8 |
| **2289-19** | 8190+/-25 | K14 | 45-50 | 5 | 10 |
| **2289-21** | 8450+/-35 | K14 | 50-55 | 6 | 11 |
| **2289-1** | 2070+/-20 | J14 | 50-60 | 6 | Null |
| **2289-22** | 7050+/-25 | L7 | 100-110 | 11 | Null |

The samples from 2017 show the same inconsistent stratigraphy, Table 6. These discrepancies could be from human error during the collection process, bioturbation from rodents or roots, soil or geological instability, or a combination (Travis 2018). As noted in the site formation process section, the Sundog site is located on three major fault lines, according to the geological data for the area (Travis 2018; USDA n.d.). In addition, Forest soil data classifies this location as having a moderate erosional hazard on the surface and is surrounded by soil classified as severe erosional hazard (USDA n.d.). Given this soil and geological information it is highly likely this stream terrace has seen active ground movement in the past, which would jumble the stratigraphy. To add to this conclusion Dr. Travis found that the pollen record supported a major depositional event stating, “It appears as though these changes are due to stabilization after an erosional event that eroded the surface back to approximately 8,000RCYBP” (Travis 2018:58).

Table 6: 2017 radiocarbon dates pulled from the 2017 field school report.

| Unit A23-Sample # | Woods Hole Date | cmbd | 10 cm Level Numbers | 5cm Level Numbers |
|---|---|---|---|---|
| **3** | 2030+/-20 | 10-15 | 1 | 3 |
| **5** | 1260+/-15 | 20-25 | 3 | 5 |
| **6** | 415+/-15 | 25-30 | 3 | 6 |
| **8** | 2480+/-25 | 35-40 | 4 | 8 |
| **10** | 1940+/-20 | 45-50 | 5 | 10 |
| **12** | 1040+/-15 | 55-60 | 6 | 12 |
| **14** | 1270+/-15 | 65-70 | 7 | 14 |
| **16** | 3550+/-15 | 75-80 | 8 | 16 |
| **19** | 1780+/-20 | 90-95 | 10 | 19 |
| **21** | 8630+/-30 | 100-105 | 11 | 21 |
| **23** | 8680+/-30 | 110-115 | 12 | 23 |
| **24** | 9000+/-30 | 115-120 | 12 | 24 |
| **27** | 8240+/-35 | 130-135 | 14 | 27 |

**Protein Residue Analysis**

A total of 13 tools and soil controls were submitted to PaleoResearch Institute for protein residue analysis. The goal of this analysis was to identify what type of animals were either hunted or processed with these tools. Five of those tools tested positive for protein, Table 7. Two Late Prehistoric points and one McKean Complex point tested positive for fish, which Clark and Cummings suggests this to be “drum or another member of the Perciforms including perch” (Clark and Cummings 2019:9). Unfortunately, the fish protein could not be narrowed down to a family or genus “a positive reaction to any of antisera for individual Perciformes is interpreted to represent the presence of any member of this large group of fish” (Clark and Cummings 2019:6). Another late Prehistoric point tested positive for rabbit (Clark and Cummings 2019:9). The most interesting results came from two points from the Late Archaic/Late Paleoindian level, Level 7 that tested positive for elephant antiserum, with one of them also testing positive to cat antiserum (Clark and Cummings 2019:9). One of the soil controls also tested positive for elephant/mammoth, so it is possible the tool was contaminated and not actually used on a member of the elephant family, according to (Clark and Cummings 2019). For this reason, we sent in two

additional tools (scrapers) from the same level to help determine if the soil was contaminated or if additional tools tested positive. The scrapers did not test positive for elephant/mammoth, but the soil controls did not either. Clark and Cummings could not say for certain if Sample 41 was actually used on elephant/mammoth, but since only one of the soil controls out of four from that level had a weak positive, it is possible that this point was used on mammoth during the Late Archaic/Paleoindian period at the Sundog site. Regardless, we have one point that tested positive for mammoth and prehistoric cat, which is very interesting. However, there is always the possibility of lab contamination and these positive results should be taken with caution until further research can be done.

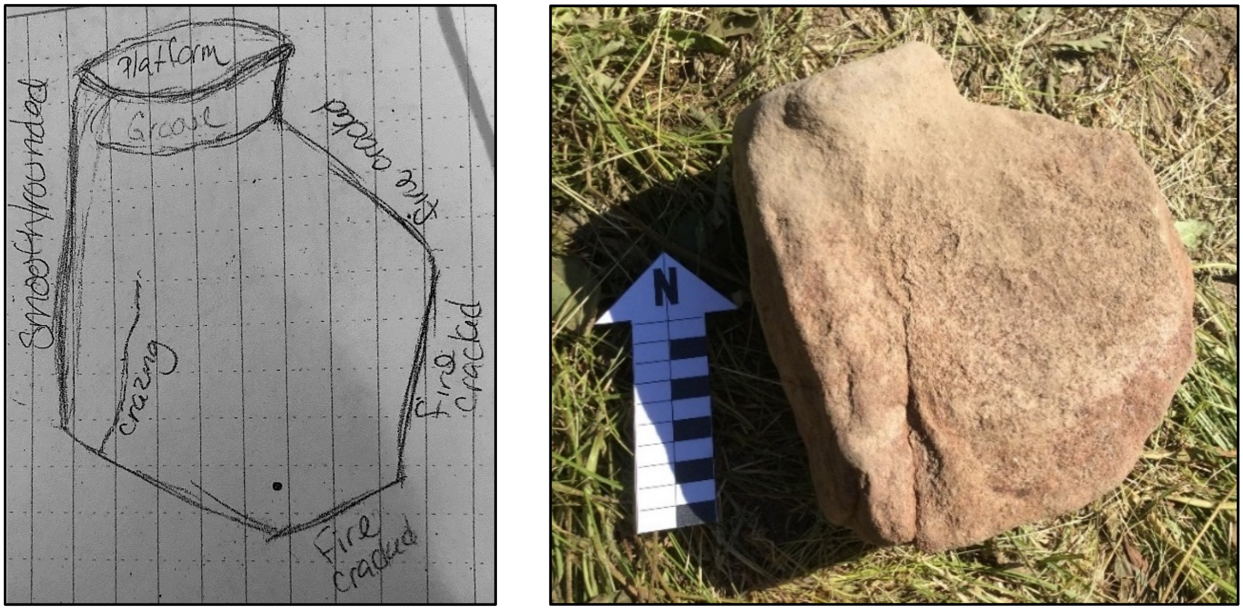
Table 7: Positive protein residue results from PaleoResearch report 2019-091.

| Sample No. | Description | Dilution | Positive Result (Antiserum Type) | Possible Animal(s) Represented | Reaction Strength |
|---|---|---|---|---|---|
| 8 | Late Prehistoric point | 1:5 | Weakfish | Freshwater drum, croakers, hardheads | Positive |
| | | 1:10 | | | Weak positive |
| 11 | Late Prehistoric point | 1:5 | Rabbit | Eastern cottontail, mountain cottontail, desert cottontail, white-tailed jackrabbit | Questionable positive |
| | | 1:10 | | | Positive |
| 16 | McKean complex point | 1:5 | Atlantic croaker | Trout-perch, other Perciformes | Very weak positive |
| | | 1:10 | | | Very weak positive |
| 41 | Late Archaic/ PaleoIndian point | 1:5 | Elephant | Mammoth | Probable positive |
| | | 1:10 | | | Positive |
| 41 SC | Soil control for Sample 41 | 1:10 | Elephant | Mammoth | Weak positive |
| 20 | Late Archaic/ PaleoIndian point | 1:5 1:10 | Cat | Mountain lion, cougar, bobcat, sabertooth cats, domestic cat | Positive |
| | | 1:5 | Elephant | Mammoth | Probable positive |
| | | 1:10 | | | Very weak positive |

**Other**

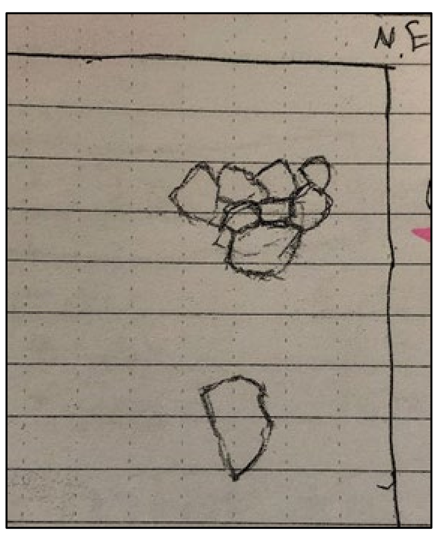
An unusual stone with an un-natural looking groove on one end and fire cracked on two edges was found at 43cmbd, unfortunately the unit number was not noted (Figure 19). This rock measured 19cm x 20cm x 10cm and there was a crust of charcoal underneath the rock. It had black staining on the back side and one side was very smooth but doesn’t seem to be polished. A very smooth and almost polish platform is located above the groove. The groove is very rough, and half of the groove has broken off.

Figure 19: Sketch and image of unusual grooved rock.




In Unit A22 a cluster of rocks were uncovered that ran from level 10 to level 14. This rock cluster was pedestaled during excavation, but it had no clear evidence of oxidation, charcoal flecking or staining and no clear evidence of cultural use beside the un-natural pile (Figure 20). This rock cluster could have been a fire pit clean out pile or a simple rock pile to clear a camp spot. Or it could have no cultural relation at all.

Figure 20: Sketch of rock cluster.



A large chunk of yellow ocher was found in unit L5 between 50-60 cmbd. This ocher measured 13 cm x 9 cm x 7 cm. No other ocher or similar rock was found during excavation.

**Mountain Tradition and the Foothills-Mountains Complex Comparative Results**

One of the key aspects of the Mountain Tradition and the Foothills-Mountain Complex is the use of upland settings. Black (1991:4) states the settlement system range from the "margins of the foothills zone up into the montane, subalpine and alpine areas" and the seasonal rounds took place year-round in these locations rather than only during the warmer seasons. Evidence also supports a more Archaic subsistence strategy that focused more on hunting and gathering rather than large communal hunting of bison (Baumler et al. 1996; Benedict 1992; Black 1991; Frison 1992, 1997; Kornfeld et al. 2010). Frison (1997:91) suggests people living in the foothills-mountain "adapted to a broad-spectrum hunting and gathering economy during bad years and cached some food to allow for bad winters". But he goes on to clarify that humans have more than one subsistence strategy that they use when the environment changes (Frison 1997).

The Sundog site sits at 6400ft which puts it within the montane/high altitude park ecological zone. When considering the physical setting of this site it checks all the boxes of an upland setting that would be desirable to a group that was adapted to this environment. The site is located just below the crest of the ridge that separates two major river drainages, the Smith River and Missouri River. When looking at the topography of this location, it is entirely possible it functions as a trail over the pass between these two rivers (Baumler et al. 1996). Currently this area is home to a large population big game, such as elk and deer. Historically, mountain sheep were in the area, according to the archaeological evidence from Bowman Spring (24LC0294) located a mile away. In addition, there is currently an abundance of edible plants at or near the site, which would be desirable to humans occupying the area (Baumler et al. 1996).

Since there is no evidence that points to seasonal use at the Sundog site some assumptions about site type using Black's (1991) Mountain Tradition criteria need to be made. Using Black's (1991) site

types, the Sundog site could be classified as either a shorter-term seasonal camp or a winter residential base. The site is located at a higher elevation on a level stream terrace that is immediately below a mountain pass. It is also located on the east slope in a somewhat protected area, which has relatively low snowpack and is located adjacent to broad grassy meadows were big game currently congregate.

As Benedict (1992:9) states, "the general lack of evidence for dwelling structures at high-altitude campsites should be interpreted as indicating…their shelters were too ephemeral to leave an archaeological record". The majority of structure evidence most likely has been lost to time or fire events (Benedict 1992). This could be the case for the Sundog site since no dwelling evidence has been found.

**Split cobble technology.** The split cobble reduction strategy typically "involves breaking an unmodified nodule or cobble in half, and either using the broken surface as the platform for removing flakes…or trimming the broken edge of the split cobble for use in heavy scraping tasks" (Black 1991:7). With this reduction technique the scrapers are typically much larger and less formally shaped than the ones found on the plains (Black 1991). The ten of the 16 (57.68%) scrapers from the Sundog site showed a split cobble reduction strategy. The average weight of split cobble scrapers that show this strategy was 21.29g, while the average thickness was 9.8mm. The scrapers that do not show a split cobble reduction strategy were significantly lighter at only 6.31g as the average weight and the average thickness being 6.75mm. The split cobble scrapers are dominated by the local material of the NBC at 50%, with the remainder being spread evenly between dacite, moss agate, obsidian, white and black chert.

Under Black's interpretation the Mountain tradition existed in the Southern Rockies during the Early Archaic period (4,500–9,500 RCYBP), so when looking at the two scrapers that were used during the Early Archaic period at the Sundog site, they do not show the split cobble reduction technique. However, when looking at the scrapers from the Middle and Late Archaic, 6 of the 10 scrapers were made using the split cobble technique. During the Late Prehistoric both scrapers were made using this technique.

**Microtools.** Black defines microtools as "small chipped stone tools–some less than 1cm long–used for a variety of delicate scraping, cutting and perforating tasks, and too small to be manipulated as hand-held tools" (Black 1991:8-9). Unfortunately, no microtools were identified. This could be due to their small size and they could have been identified as sharpening flakes which only received a quick field analysis. Of the flakes that were analyzed a total of 15.03% of them fell into the SG4 (less than 6.4mm) category, so it is entirely possible that some of those flakes could have been classified as microtools if additional analysis was done.

**Projectile point styles.** According to Black, sites that fall under the Mountain Tradition category typically have "large unstemmed, stemmed, serrated and side-notched projectile points" (Black 1991:9). It is interesting that he states side notched points with straight bases are not common in these mountain sites (Black 1991). Kornfeld and colleagues are hesitant to state a full projectile point typology since they believe the sample size is too small (Kornfeld et al. 2010). However, the few point types they do classify into this complex are large unstemmed and stemmed points, which are typically found in the Late Paleoindian or Early Archaic period (Kornfeld et al. 2010). Frison (1997:90) goes on to say the "late Paleoindian groups are characterized by a number of lanceolate, laterally restricted, and stemmed projectile points with a variety of basal forms that existed between about 10,000 and 8,000 years B.P. and which were replaced quite abruptly by side-notched or corner-notched projectile points". So, when looking at the points from the Sundog site 17 of the 24 points meets the above point typology. At the Sundog site a total of three unstemmed points (levels one, two and seven) and four stemmed points (levels one, three and six) were collected. In addition, one stemmed point was collected but the level was not recorded. Four serrated points (levels one through four and level six) and six side notched points (levels one, three through six) were collected. However, only one of these points was found in a Late Paleoindian-Early Archaic level (level 7), but the majority of them did occur throughout the Archaic period.

## Chapter V: Interpretations and Conclusions

The nature of mountain settings makes the stratigraphic separation difficult at the Sundog site and there is no clear line between cultural components. To further complicate things is the active ground movement that this location has seen over time. The radiocarbon dates ended up being a little mixed up and for this reason looking at other data sources is needed to determine clearer cultural components stratigraphically. Below are two wall profiles that show the breakdown of soil types and associated radiocarbon dates (Figures 21 and 22).

Figure 21: Unit K14 east wall profile, 2015 (Travis 2016).

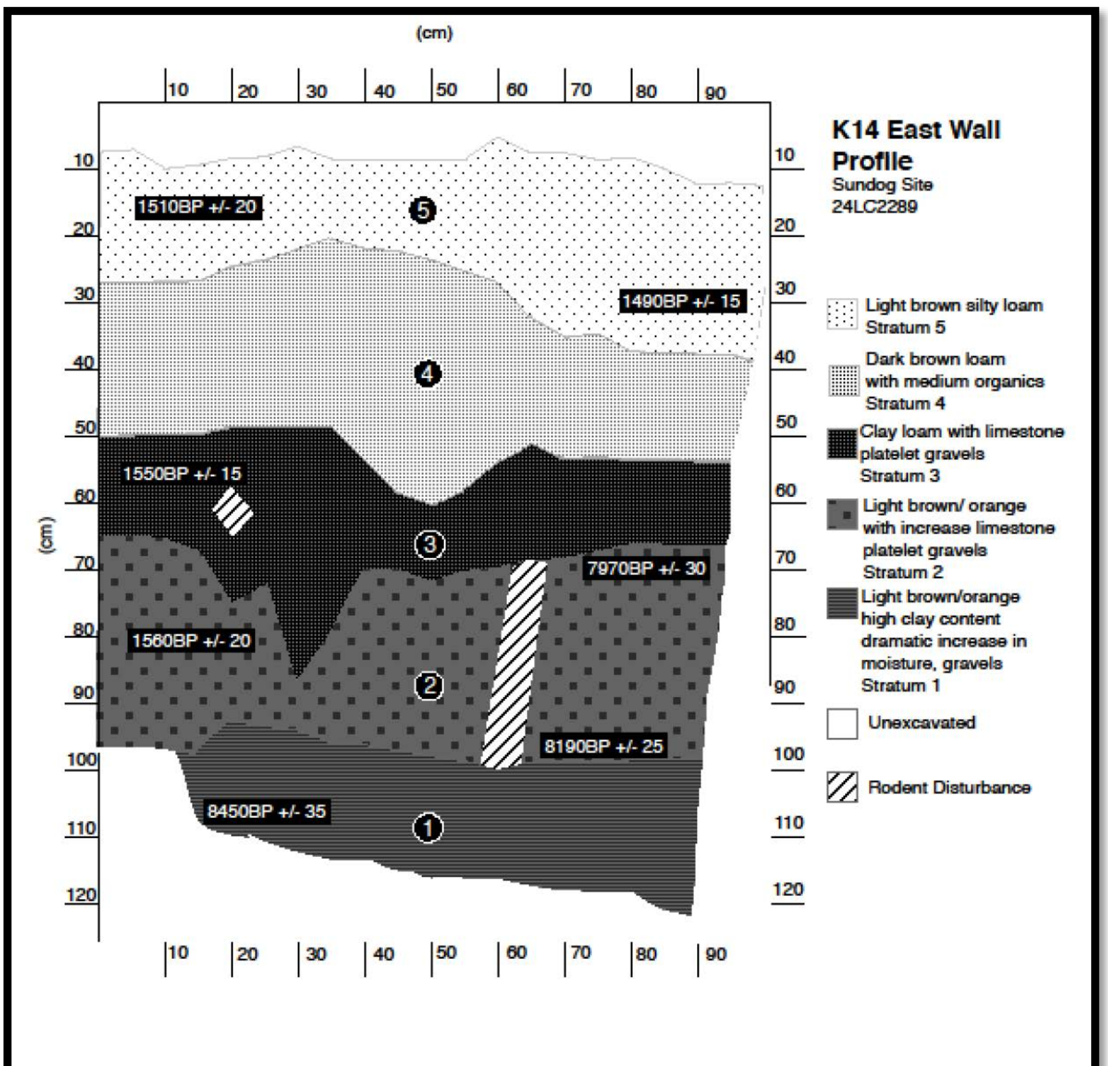
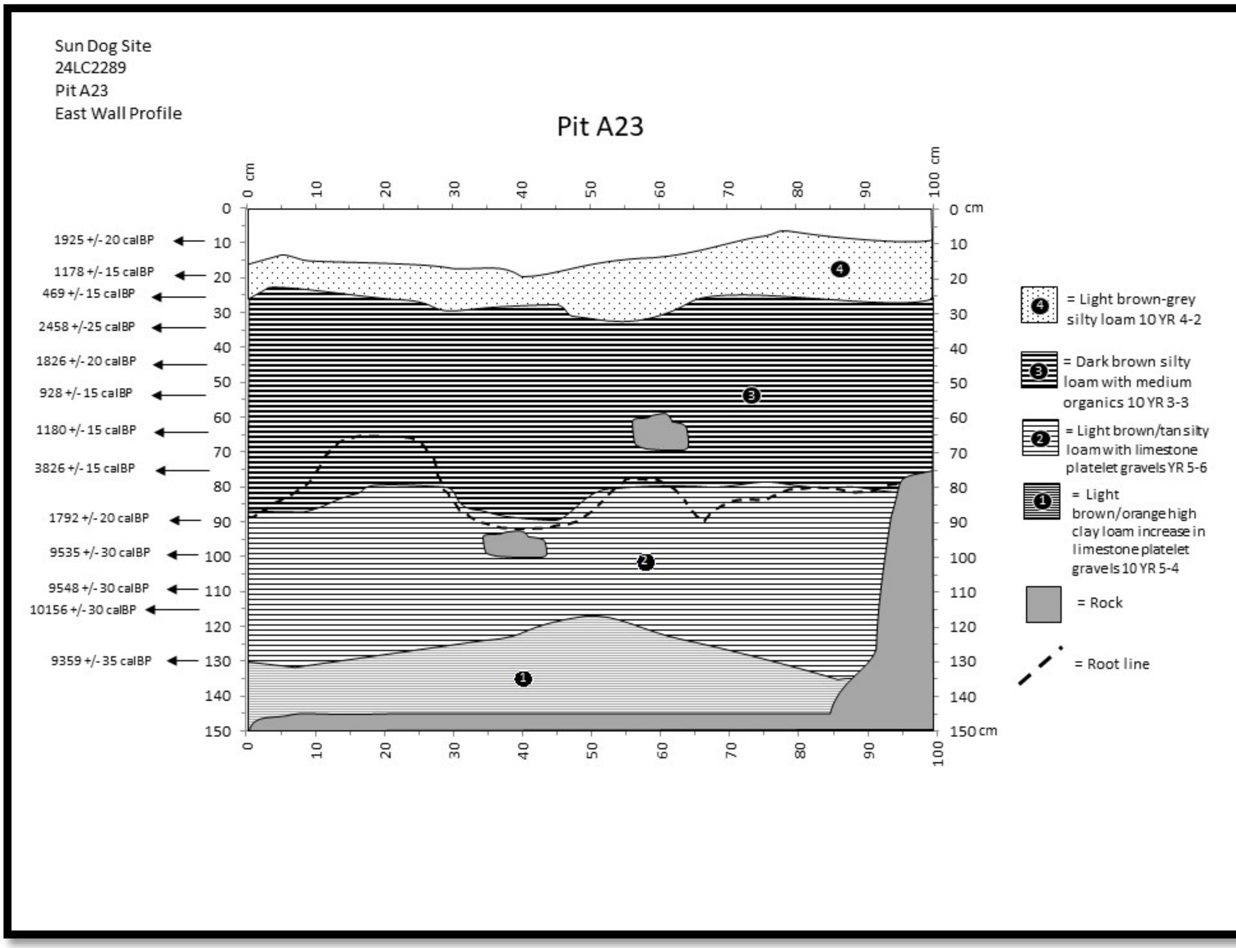


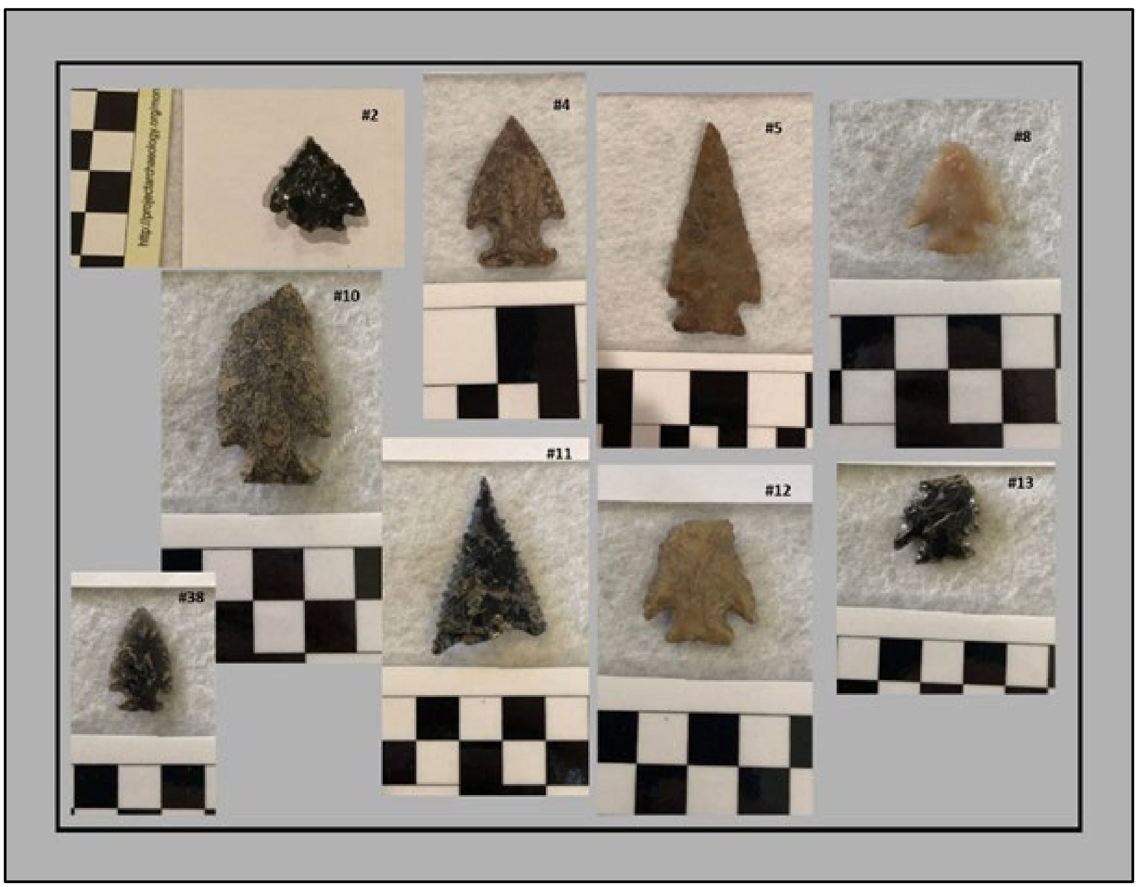
Figure 22: Unit A23 east wall profile, 2017 (Travis 2018).




Dr. Travis reviewed artifact clusters, grain size analysis and pollen analysis to determine cultural chronologies (Travis 2018). With these data Dr. Travis suggested the Late Prehistoric period was represented by six projectile points and was between 0-30cmbd (Travis 2018). Dr. Travis and I originally disagreed on this clustering slightly. The six points she classified as representing Late Prehistoric or Hogback varieties, I felt were examples of Late Archaic Pelican Lake points (Artifact #'s 2, 8, 11, 12, 13 and 38) (Figure 23). One of the main reasons Dr. Travis believes these are similar to the Hogback point style is the serration that is present. This serration is common in the Hogback points and are similar to ones she has found in Colorado (Travis 1988). Another reason, Dr. Travis places these serrated points in the Late Prehistoric or Hogback category is because of the lack of evidence that Pelican Lake points were

serrated and serration is more commonly found during the Late Prehistoric time period (Travis, personal communication). However, research done by Des Planques (2001) found serration evidence on Early Archaic Mountain Tradition points and Middle Archaic points from the Closed Basin area of the San Luis Valley, Colorado. This leads me to believe that serration could have occurred during the Late Archaic period as well. To further complicate placing these unnamed points into a typology is the observation they are similar to Avonlea contemporary points from Wyoming and southern Montana (Frison 1988). Frison referred to similar points as Beehive points, from the Beehive site (48BH346) in the foothills of the eastern Big Horn Mountains and the Irvine site (48CO302) in central Wyoming (Frison 1988). Frison (1988:160) even states that "finely serrated blade edges occur on about 5% of the projectile points."

Figure 23: Pelican Lake or Late Prehistoric variants.



Further research is needed to know for certain if the points mentioned above fall in either the Late Prehistoric or the Late Archaic time period and to fully understand the occurrence of point serration. However, when looking at the radiocarbon dates from the upper levels of the Sundog site, the serrated points correspond with the Late Prehistoric dates. So, even though they look like Pelican Lake style points, the radiocarbon dates cannot be discounted, and I chose to leave them in the Late Prehistoric cultural component. Dr. Travis and I agree with the remaining artifact clustering (Table 8). For the purpose of this discussion, the chronology laid out in Table 11 will be followed.

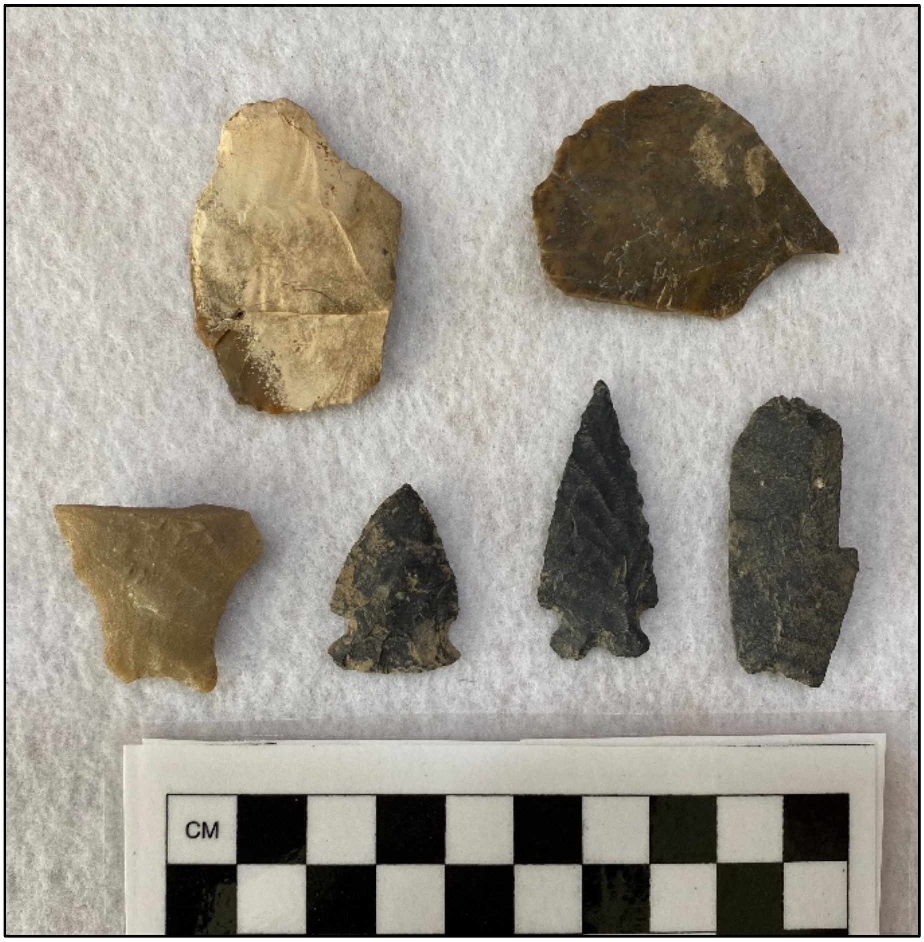
Table 8: Cultural chronologies.

| Cultural Occupation | Level | Centimeters below datum | Dates RCYBP |
|---|---|---|---|
| **Late Prehistoric** | 1-3 | 0-30 | 300-1,400 |
| **Late Archaic (Pelican Lake)** | 4 | 30-40 | 1,700-3,000 |
| **Middle Archaic (McKean)** | 5-6 | 40-60 | 3,000-4,500 |
| **Early Archaic** | 7 | 60-70 | 4,500-8,000 |
| **Late Paleoindian** | 7-8 | 60-80 | 8,000-8,500 |

**Interpretation of Late Paleoindian and Early Archaic Components**

The Late Paleoindian component was the least abundant at the Sundog site but was still present and worth noting. This cultural component is represented between 60-80 cmbd with a single Pryor Stemmed (Figure 24), projectile point, which was found at the very bottom of level 6 and a lanceolate point (artifact #20) from 60-70 cmbd (Kornfeld et al. 2010; Travis 2018) (Figure 24). An Early Archaic side notch style point made from black chert was also found in level 6 (artifact #39). The thin stratigraphic separation or human excavation error could account for the placement of this point being out of sequence.

Figure 24: Levels 6 and 7 tools. (Artifact #s left to right. Top: #36 and #35. Bottom: #18, #39, #41 and #20).




In addition, a point that resembles a McKean complex style (artifact # 41) was found in level 7. Artifact #41 was placed in the Middle Archaic component cluster originally, due to it being cataloged as a Duncan-Hanna style point from the McKean Complex, but it is also very similar to a Yonkee point. However, after the results of the protein residue analysis, I wonder if this point represents the abrupt replacement of stemmed points with side notched or corner notched point that Frison (1997) talks about near the end of the Late Paleoindian period. This Duncan-Hanna or Yonkee point tested positive to elephant antiserum, which could indicate mammoth protein, but mammoth would not have been around during the Middle Archaic period (Clark and Cummings 2019; Lange 2017). Granted, this positive result could be from contamination. The lanceolate point (#20) also produced a positive to elephant antiserum,

as well as prehistoric cat. Unfortunately, the two scrapers from this level did not have any protein residue. Artifact #41 is very thin and is made from a dacite flake and it has a twisted cross-section. Artifact #20 on the other hand is about the same size, but it is thick and robust and fits in with the Paleoindian style lanceolate.

When trying to interpret the flakes it is hard to separate the cultural components since there is a very thin stratigraphic separation. For this discussion the Late Paleoindian and Early Archaic will be grouped together. The two scrapers mentioned earlier (#35 and 36) and 98 flakes were also found between 60-70 cmbd. Whereas 70-80 cmbd had 48 flakes and no scrapers. Ninety-five percent of these flakes were tertiary, which suggests tools maintenance or the final stages of lithic reduction. These flakes sizes are dominated by sizes 2 (44%) and 3 (33%), which points to later stage reduction activities rather than tool maintenance or sharpening. When also looking at the material, the people at Sundog preferred obsidian and the local NBC for their lithic reduction activities. Of the size 2 and 3 tertiary flakes, a total of 47% were NBC, 22% were non-local obsidian, and 12% were non-local dacite. The remaining tertiary flakes in these size categories were evenly distributed among other types of chert.

The archaeological record from the Late Paleoindian and Early Archaic period suggests the people at the Sundog site were hunting prehistoric cats and possibly mammoth, taking advantage of the local tool stone sources, but also transporting non-local tool stone. They were not preforming heavy tool maintenance while on site, but they were reducing their tool stone into more useable forms. While also on site they were doing some domestic activities since two scrapers were found. Scraper #35 can be described as an end scraper since it has retouching along one side (Andrefsky 2005; Travis 1988). While scraper #36 has retouching on all sides, which would classify it as a side scraper (Andrefsky 2005; Travis 1988). However, this scraper has a graver like projection on one edge, which is unique to any other scrapers found at this site. No protein was recovered from either scraper so, that evidence is not available to help determine what these scrapers were used for. But using Muñiz's (2009) results from the Hell Gap

scraper analysis, the scrapers suggests the people at the Sundog site could have been butchering an animal and processing the hide while on site during the Late Paleoindian or Early Archaic period.

Table 9 shows the Mountain Tradition attributes for each projectile point. Scrapers are not included in this table because they only have the split cobble reduction attribute that is indicative of this tradition. The two scrapers from this cultural component do not show split cobble reduction strategy. Several of Black's Mountain Tradition attributes were seen on the artifacts, which could point to a Mountain Tradition adaptation during this time period when considering this evidence coupled with the upland setting and the Pryor Stemmed point. But I think the sample size is too small to say for certain when using the Mountain Tradition model.

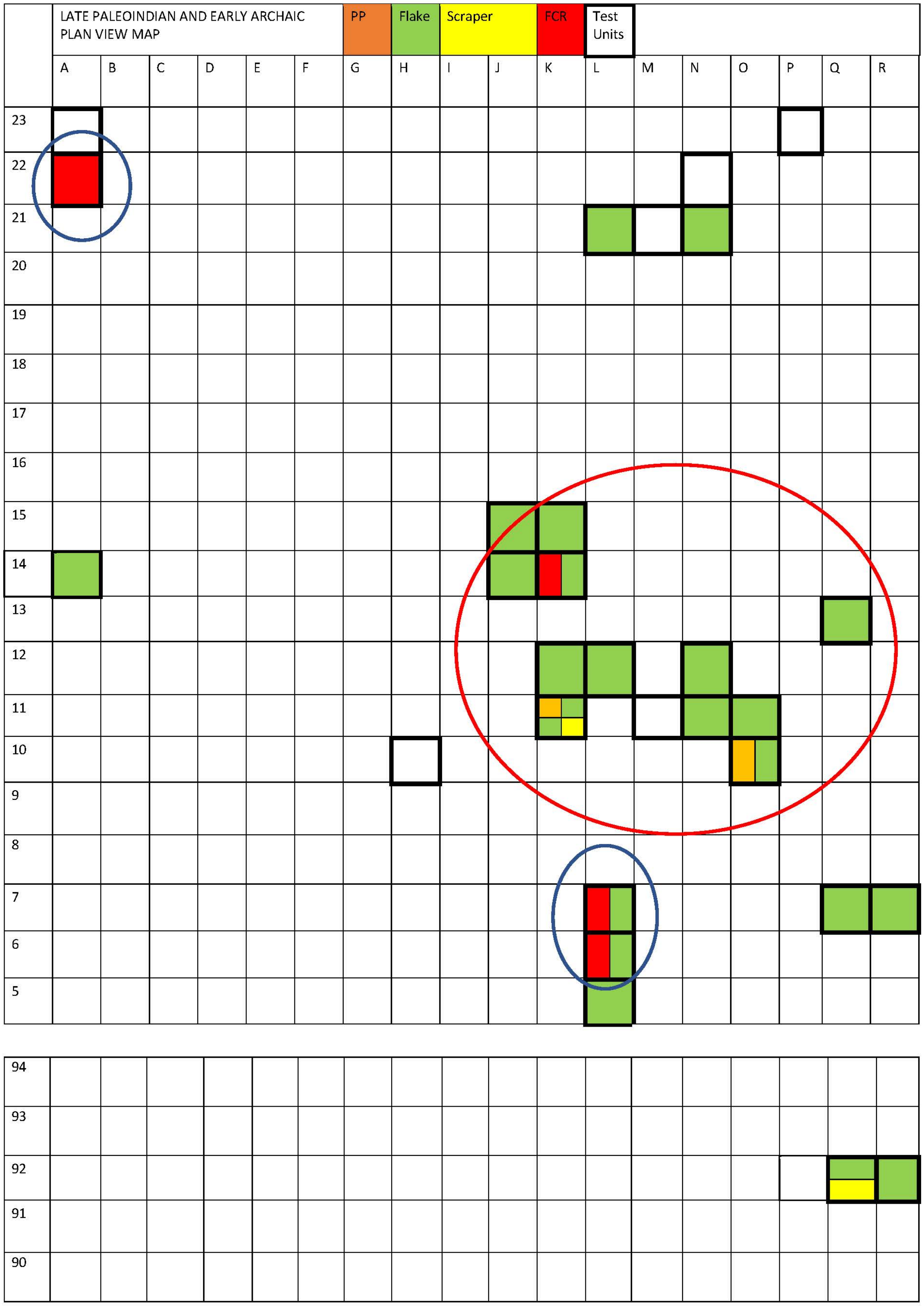
Even though Black's (1991) Mountain Tradition model does not fit perfectly with the data from the Late Paleoindian and Early Archaic cultural components, I still believe the data suggest a mountain adaptation, at least during the Late Paleoindian period. The simple fact that a Pryor Stemmed point was recovered and this point style is commonly found in the foothills and mountains and not typically found on the Plains suggest a mountain adapted people (Frison 1992, 1997). This projectile point coupled with the site location strongly suggests a mountain adaptation for the people at the Sundog site during Late Paleoindian period.

Table 9: Mountain Tradition Attributes for projectile points.

| **Artifact Catalog Number** | **Local Material** | **Un-Stemmed** | **Stemmed** | **Serrated** | **Side Notched** | **Thick** | **Biconvex** | **Collateral Flaking** | **Moderate/Goo d Flaking** | **Reworking Evidence** | **No Evidence of Grounding** | **Made from Flake** | **Bifacial Reduction** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **18** | no | no | yes | no | no | yes | yes | no | yes | no | no | no | yes |
| **20** | no | yes | no | no | no | yes | yes | yes | yes | yes | no | no | yes |
| **39** | no | no | no | no | yes | yes | yes | no | yes | yes | yes | yes | yes |
| **41** | no | no | no | no | no | no | yes | no | yes | yes | yes | yes | yes |

The paleoclimatic data do point to a drought during this time frame which would suggests lower snowpack at this elevation, which in turn would make it easier to have a winter residential camp. But without seasonal use data, this is inconclusive. When looking at the artifact distribution throughout the site, it is hard to determine activity areas or site type (Figure 25). Artifacts are concentrated near the center of the site and could represent a work area (inside red circle) with the occupants camping around this area where the FCR is located (inside blue circle). But I think a more detailed spatial analysis would need to be done to say for sure. However, the evidence does support a short term seasonal camp, with a possible family group or multiple family groups utilizing the mountain environment.

Figure 25: Late Paleoindian and Early Archaic unit plan view map. (Circles indicate activity area as discussed in text).



**Interpretation of the Middle Archaic Component**

The next clear cultural component appears to be the Middle Archaic between 40-60 cmbd, with McKean complex points being present. One complete Hanna style point (artifact #16) was found, as well as an almost complete McKean style point (artifact #17). The Hanna point is made of obsidian that was sourced to Bear Gulch and tested positive for Perciformes protein. According to Clark and Cummings (2019) native members of Perciformes present in the Northern Rocky Mountains include freshwater drum, sauger, bass, sunfish, crappies, perch, northern pike, and others. The McKean style point is made of fine grain dacite and was sourced to the Cashman quarry, but did not have any protein residue. A white chert point tip was also found in this cultural component. In addition, four complete scrapers and one broken scraper were found in this cultural component (Figure 26). One McKean point was found in a shovel probe at approximately 30cmbd but could have been from a deeper deposit (Figure 27).

Figure 26: Middle Archaic Tools. (Artifact #'s from left to right. Bottom: #31, 19, 17, 16. Top: #32, 30, 33, 34).


Figure 27: McKean point from shovel probe. (Artifact #3).

Three of them are classified as side scrapers (artifact #'s 30, 33 and 34) and two are classified as end scrapers (artifact #'s 31 and 32). The abundance of scrapers found in this Middle Archaic component coupled with the grinding slab found suggests various domestic activities were taking place. In addition, the large chunk of yellow ocher was found in this cultural component. This could suggest some sort of cultural decoration was taking place at this occupation. But without additional evidence it is hard to say for certain.

Of the 263 flakes in levels 5 and 6, 98% of them were tertiary. These tertiary flakes were dominated by NBC at 44%, then followed by obsidian at 25%, dacite at 12% and the remaining at 3% or less of the total recorded. Similar to the Late Paleoindian and Early archaic period, these tertiary flakes were dominated by the size 2 and 3 categories. It is interesting that NBC was the primary material for the size 2 flakes, while obsidian (15%) and NBC (22%) were close to evenly split in the size 3 category.

This location appears to be a place for longer term camp, where domestic activities and tool stone reduction are being done during the Middle Archaic. Three units indicate FCR during this cultural component, which lends additional support for domestic activities or a long-term camp. It is interesting that Perciformes fish order protein was found on the McKean complex point #17. According to the PaleoResearch Institute technical report, these two antisera cross-react with other members of the same fish order, which means this point could have been used on any member of the Perciformes fish order (Clark and Cummings 2019). Even without knowing for certain which type of fish this point was used on, it still indicates a wider diet then just large game (Aaberg et al. 2006; Binford 1978; Travis 2018). In addition, this same point was made from Bear Gulch obsidian which is located to the south on the Montana-Idaho border in the Centennial Mountains, which is part of the Rocky Mountain Range (Travis 2018). So, when looking at the obsidian source one could infer that the Middle Archaic people at Sundog where either traveling south through the Rocky Mountains or trading with people to the south.

When looking at the Mountain Tradition attributes each point met some of Black's criteria for an upland adaption. In addition to the data in Table 10, 3 of the 5 scrapers were reduced using the split

cobble reduction strategy. Three of these scrapers are side scrapers and two are end scrapers. The assortment of tool types found within this cultural component indicates multiple activities were taking place, from game hunting, butchering, and hide processing to plant food processing. This, with the FCR and grinding slab could indicate a residential camp. Unfortunately, without seasonal data I cannot infer that it was used in the winter. Regardless, the occupants are using the mountain environment and could indicate a mountain adaption.

Table 10: Middle Archaic Mountain Tradition Attributes for points.

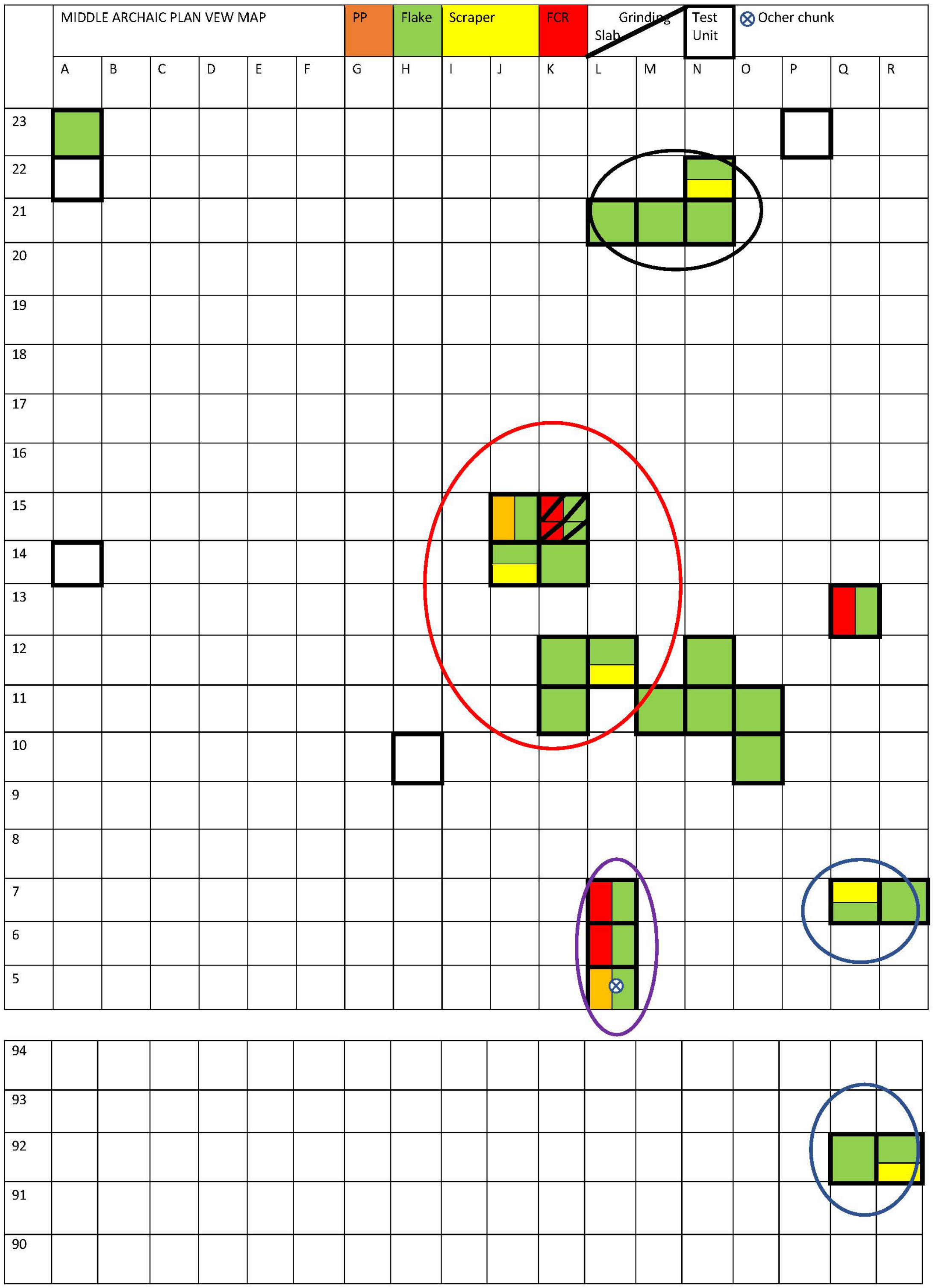
| Artifact Catalog Number | Local Material | Un-Stemmed | Stemmed | Serrated | Side Notched | Thick | Biconvex | Collateral Flaking Pattern | Moderate/Good Flaking Pattern | Reworking Evidence | No Evidence of Grounding | Made from Flake | Bifacial Reduction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3** | yes | no | no | no | yes | no | yes | yes | yes | yes | yes | yes | yes |
| **16** | no | no | no | no | yes | yes | yes | yes | yes | yes | no | no | yes |
| **17** | no | no | yes | no | no | yes | yes | yes | yes | yes | no | no | yes |
| **19** | no | no | no | no | - | yes | yes | yes | yes | yes | - | no | yes |

When reviewing the artifact distribution throughout the site a similar pattern to the Late Paleoindian and Early Archaic period can be seen. However, since the sample size is larger the artifacts are a little more spread out, but they are still concentrated around the middle, as indicated inside the red circle (Figure 28). The two end scrapers were found in R92 and Q7 in the lower part of the site which could indicate hide processing areas (inside blue circle). It is interesting that the point tip was found in L5, located just a few meters away from the hide processing area. It is possible this projectile point broke off in an animal during impact, then was brought back to the camp and lost during the hide processing or during cooking since FCR was recovered from the adjacent units (inside the purple circle). This is per speculation and would need to be investigated further to know for certain. Protein analysis on this point tip could shed some light on this possibility. The large chunk of ocher was also found in L5, near a

possible hearth since FCR was recovered from the adjacent units (inside purple circle). It is possible the family unit using this location of the camp was practicing some sort of decorative activity.

Two side scrapers are in the central part in J14 and L12 which happened to be around the same location of projectile points, FCR, and the grinding slab (inside red circle). This could represent animals being butchered in this area as well as plant foods being processed. The last side scraper was in N22 in the upper part of the site, with flakes being recovered from the surrounding area (inside black circle). However, only 19 flakes were recovered from that area, so I don't think it is significant enough to indicate a work area. Overall, the central part of the site seems to be the main hub where the numerous domestic activities were taking place for the Middle Archaic people occupying this site.

Figure 27: Middle Archaic plan view map. (Circles indicate activity area as discussed in text).



**Interpretation of the Late Archaic Component**

The Middle Archaic is followed by a clear Late Archaic component between 30-40 cmbd. The hallmark of the Late Archaic points found at the Sundog site are the Pelican Lake points (Figure 29). A total of three Pelican Lake style points were found. Two of these Pelican Lake points are made of NBC (artifact # 4 and 5) and one is made from a black quartzite (artifact #10). This cultural component also had three side scraper (artifact # 23, 27 and 28) and one end scraper (artifact # 29). Scraper number 28, I would further classify as a thumb scraper due to is very small size. This is the first cultural component that has clear evidence of frequent reuse of tools. Artifact #4 appears to have been modified several times throughout its life.

Figure 28: Late Archaic tools. (Artifact #'s from left to right.
Bottom: #10, 5, and 4. Top: #26, 28, 29 and 27).

As for flakes, there are a total of 239 flakes found in this cultural component, with them being dominated by 47% NBC, 33% obsidian and 10% dacite. Again, these flakes are dominated by tertiary flakes at 97%, in the size two, three and four categories. The tertiary flakes are mostly size three at 45%, then followed by 25% of size two, and 15% of size four. These tertiary flakes are close to evenly split between NBC at 46% and obsidian at 33%. It is interesting that primary and secondary flakes are almost exclusively cherts. Which would make sense since they are a local tool source. But it also shows that people were not transporting large obsidian with cortex. It appears they were only working smaller, already flaked pieces into more formed tools.

The three projectile points and the four scrapers suggests domestic activities were being practice at the Sundog site during the Pelican Lake period. All scrapers from this cultural component, except for one, are side scrapers. This lends further support that the domestic activity of butchering animals was taking place at this site. The unusual grooved rock (Figure 19) was also found in this cultural component, which makes me wonder if it is associated with domestic activities. However, further research needs to be done to know if this stone has been culturally modified and what it could have been used for. The final stages of tool reduction were taking place as well but due to the limited size 4 tertiary flakes it suggests heavy tool maintenance was not occurring as frequently. In addition, the grinding stone was found within this cultural component, while the grinding slab was found in the McKean period. This could suggest plant food processing or other domestic activities.

When looking at Black's Mountain Tradition attributes, two of the scrapers show split cobble reduction strategy and a few of the projectile point attributes were met (Table 11). It is obvious the people during the Late Archaic period were using mountain environments for either short term or long-term camps. But whether these are Pelican Lake people from the Plains using the mountains or a Mountain Tradition group using a Plains projectile point cannot be said for sure.

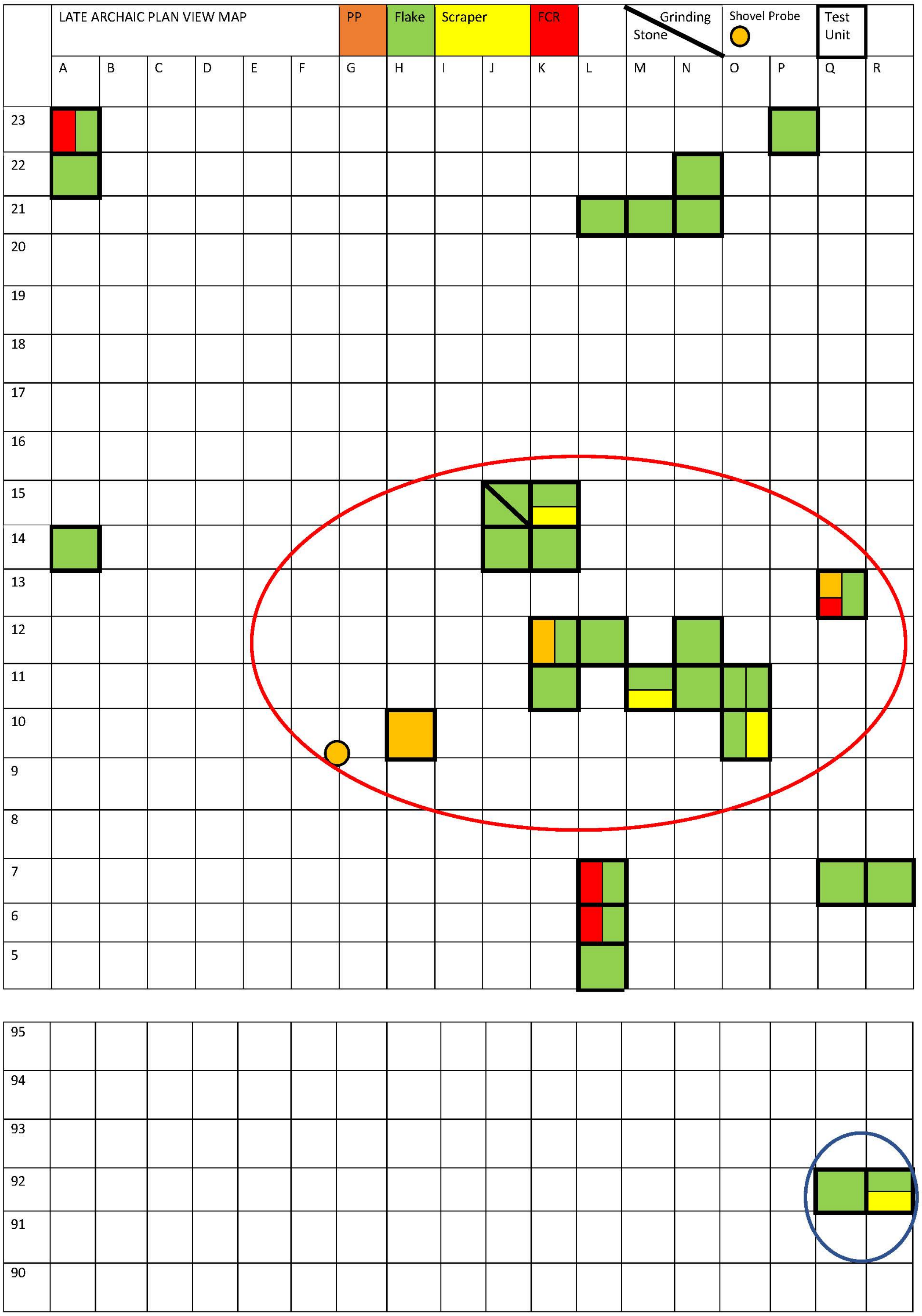
Table 11: Late Archaic Mountain Tradition Attribute for points.

| Artifact Catalog Number | Local Material | Un-Stemmed | Stemmed | Serrated | Side Notched | Thick | Biconvex | Collateral Flaking Pattern | Moderate/Good Flaking Pattern | Reworking Evidence | No Evidence of Grounding | Made from Flake | Bifacial Reduction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4** | yes | no | no | no | yes | yes | no | no | yes | yes | no | no | yes |
| **5** | yes | no | no | yes | no | yes | yes | no | yes | yes | no | no | yes |
| **10** | no | no | no | no | no | yes | no | yes | yes | yes | no | no | yes |

According to Dr. Travis, the paleoclimate record in this area "suggests a dry, warming trend at the end of the Pelican Lake period, near 2,000 years ago" (Travis 2018:70). This change in climate could suggest a more stressed environment during the Late Archaic (Travis 2015b, 2018). When looking at the tool stone sources during this time period, the local chert was highly used which lends more support to limited mobility during a stressed environment. Or it could be a simple mountain adaptation when the Pelican Lake people were utilizing the mountains.

When looking at the artifact distribution throughout the site, some possible activities are present. Like the other cultural components, the central location (inside red circle) of the site seems to have the most activity (Figure 30). This central location has the grinding stone, three side scrapers, and the three projectile points. The only end scraper from this cultural component is found in the lower portion of the site (inside blue circle). Throughout time this area has been where the end scrapers have been located. To me this suggests a hide processing area that is located several meters away from the main camp area. This area is also the location of the spring that is currently very wet and drains into Indian Creek.

Figure 29: Late Archaic plan view map. (Circles indicate activity area as discussed in text).



**Interpretation of the Late Prehistoric Component**

This cultural component has significantly more tools compared to the other components at the Sundog site (Figure 31). This cultural component has a single Avonlea (artifact #38) point made from Bear Gulch obsidian (Travis 2018) and several unamed projectile points. These unnamed points are similar to points Frison referred to as Beehive points from Wyoming and southern Montana (Frison 1988). Four side scrapers (artifact # 21-25) and one dacite end scraper (artifact #22) were also found. This cultural component also has one dacite knife fragment and one preform. Weakfish protein from artifact #8 and rabbit protein from artifact #11, were the only protein found on tools analyzed from this cultural component. According to Clark and Cummings (2019) the Weakfish antiserum could represent Freshwater drum, croaker or hardhead fish protein. It is interesting that artifact #11 is a heavily serrated obsidian point which was used on rabbit (Clark and Cummings 2019). The time investment of transporting this tool stone and forming this point is very high (Travis 2018). The protein provided by a rabbit is relatively low, but the rabbit would have also provided fur and fat sources for the occupants (Benedict 1992; Binford 1978; Travis 2018).

In this cultural component there were three projectile points recovered that were out of cultural sequence. Artifact #6 is a McKean lanceolate, #7 is Lovell Constricted style point and #40 looks like a Paleoindian lanceolate. How these Late Paleoindian and Middle Archaic points made their way to levels 1 and 2 is unknown. However, this meadow has heavy rodent activity, so it is entirely possible bioturbation brought these points closer to the surface.

Figure 30: Late Prehistoric tools. (Artifact #s from left to right. Bottom: #12, 2, 8, 11, 42, 9. Second row: #22, 15, 14, 38, and 13. Third row: #25, 24, 23, and 21. Top row: #6, 7, and 40).


In this level, at total of 1,117 flakes were recovered. Like the other cultural components, tertiary flakes are the dominant debitage at 96%. This cultural component differs slightly compared to the others as the class size is more evenly disturbed. The tertiary flakes have the greatest size 3 (53%), followed by size 2 (22%), then size 4 (16%). This would suggest more tool maintenance and re-sharpen was taking place during the Late Prehistoric, compared to the other time periods. In particular, the Late Prehistoric people were re-sharpen their obsidian tools, since the size 4 tertiary flakes are dominated by obsidian. The NBC was still the dominant flake material, but these people were using obsidian more frequently, than the other time periods.

This is the first cultural component that has clear evidence of serration on projectile points, which Black attributed to a Mountain Tradition adaptation (Table 12). However, local material was not the dominant material for the tools. A non-local material was favored for tools during this time period. The use of more non-local tool stone compared to the other cultural components could suggest more mobility or trade by the Late Prehistoric people. The tool variety indicates domestic activities and a possible residential camp. While the occupants were here, the four side scrapers indicate they butchered animals and processed the hide of an animal, with the one end scraper. These data suggest the Late Prehistoric occupants had a mountain adaptation while utilizing this environment.

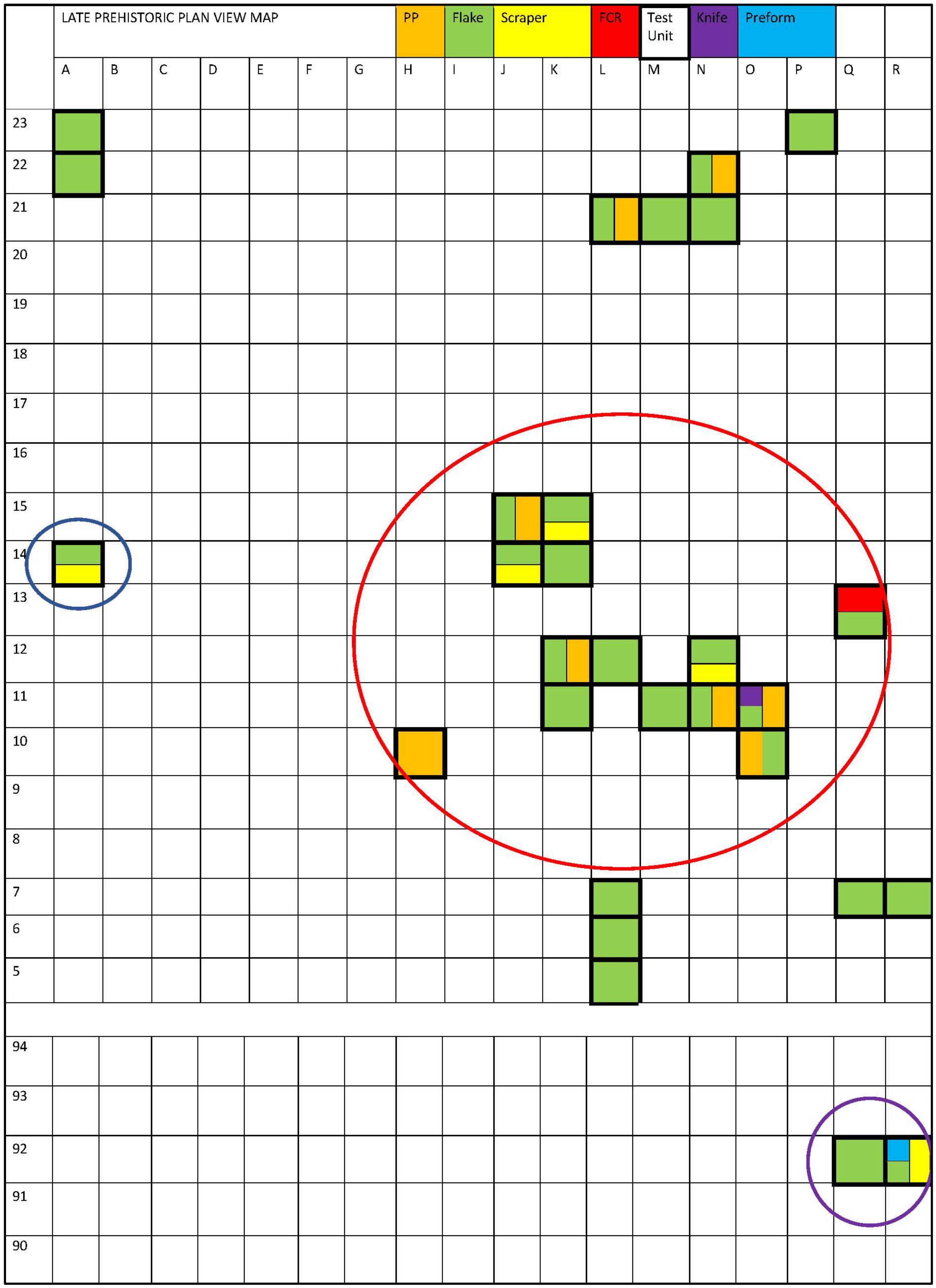
Table 12: Late Prehistoric Mountain Tradition Attributes for points.

| **Artifact Catalog Number** | **Local Material** | **Un-Stemmed** | **Stemmed** | **Serrated** | **Side Notched** | **Thick** | **Biconvex** | **Collateral Flaking Pattern** | **Moderate/Good Flaking Pattern** | **Reworking Evidence** | **No Evidence of Grounding** | **Made from Flake** | **Bifacial Reduction** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | no | no | no | yes | no | yes | yes | no | yes | yes | no | no | yes |
| **5** | yes | no | no | yes | no | yes | yes | no | yes | yes | no | no | yes |
| **8** | no | no | no | yes | no | no | no | yes | yes | yes | no | no | yes |
| **9** | no | - | - | no | no | yes | yes | no | yes | no | yes | yes | no |
| **11** | no | no | no | yes | no | yes | yes | yes | yes | yes | yes | no | yes |
| **12** | yes | no | no | no | no | yes | yes | yes | yes | yes | yes | no | yes |
| **13** | no | no | no | no | no | yes | no | no | yes | yes | yes | no | yes |
| **14** | yes | no | yes | no | no | yes | no | no | yes | yes | no | no | yes |
| **15** | yes | no | no | no | no | no | yes | yes | yes | no | - | no | yes |
| **38** | no | no | no | no | no | yes | yes | yes | yes | yes | yes | no | yes |
| **42** | no | no | no | no | no | yes | no | - | yes | no | yes | no | yes |

When looking at the plan view map a similar pattern emerges (Figure 32). Like other occupation levels the central part of the site has the side scraper, projectile points, and a knife which could indicate the butchery area (inside red circle). The end scraper was found on the far-left side of the site, which had limited artifacts during the other cultural components (inside blue circle). The preform and one side scraper were found in the lower part of the site near the spring seep (inside purple circle). Limited FCR

was recorded during this cultural component, but the FCR that was recorded is located near the butchery area in the center. This could indicate a hearth was located near this area, but additional subsurface testing would be needed to know for sure.

Figure 31: Late Prehistoric plan view map. (Circles indicate activity area as discussed in text).



**Conclusion**

The archaeological evidence from the Sundog site suggests this location was a desired camp location used throughout time. The final stages of tool reduction were a major activity that occurred on site during all cultural components. People took advantage of local tool stone sources and made new tools to replace worn or broken ones. Non-local material was brought to the site as preforms, rather than raw nodules, then reduced to the finished product. It is interesting that cultural groups had access to obsidian during all time periods and it appears they were bringing obsidian with them from the south. Black (1991) suggested the Mountain Tradition in Colorado had a connection with the Great Basin and the obsidian sources from the Sundog site might suggest a similar connection.

It is interesting that the central part of the site had the most tool diversity in all cultural components and this is not because it is the only flat spot on the site. So, why does this location have the most tool diversity? Maybe this represents an activity area in the middle of a larger camp, or it might represent a sampling error. In addition, scrapers were routinely found in the lower part of the site near the spring and water would have been crucial when tanning hides. Was this a prime spot for hide working activities, or is this because a sampling error again? I think additional subsurface testing would be needed to know for sure and to fully understand the cultural site use.

Whether this location was a short-term camp or a residential camp cannot be determined conclusively. However, the wide variety of tool types in all time periods, suggests this location was a camp were domestic activities took place. Both end scrapers and side scrapers were found in all cultural components, however they increase in frequency during and after the Middle Archaic period. In addition, the Middle and Late Archaic cultural components had evidence of plant processing with the grinding slab and stone. This could also suggest the presence of family groups, which further indicate a residential campsite. Unfortunately, with the stratigraphy being very thin between some cultural components some assumptions about the cultural chronology had to be made, which could skew the results. But as Frison (1992:330) states, a very important distinction for a site with an upland adaption is that sites with a heavy

occupation are almost always close to raw material sources and there is very little stratigraphic separation between occupations (Frison 1992:330). It is not totally clear what Frison means by heavy occupation, but I assume he means several cultural components being present at one site. This is definitely true for the Sundog site, since multiple limestone uplifts in the area have chert deposits and the stratigraphic separation is hard to distinguish between the different cultural components. The Sundog sites also has some similarity to what Benedict (1992) saw in the Front Range in regards to camps being located near passes, tools typically brought into the mountains as flaked preforms and then further reduced, and domestic activities such as hide working and grinding tools being common at these site types.

While we may not know the exact reason of the use of this location, I believe the evidence suggests the decision to use the Sundog camp spot was based on prior knowledge of the area and it was a familiar location in the Big Belt Mountains, evident by the multiple occupation levels. The Sundog location would have provided a wide variety of resources, such as water, timber, fauna, flora and raw tool stone. These resources would have made this location desirable for a base camp (Baumler et al. 1996). Unfortunately, the wide variety of artifacts did not fit nicely into Black's (1991) Mountain Tradition model. However, I think the Mountain Tradition concept is a viable option for explaining cultural use of the Big Belts Mountains (Black 1991; Frison 1992; Kornfeld et al. 2010). But additional measures or attributes need to be better defined to be able to separate a Mountain adaption from a Plains adaption. And for this reason, I think looking at a mountain adaptation under the terms of a Complex would be more appropriate, rather than trying to define different groups of people by point typology. For example, groups of people utilizing a shared lifestyle in the mountains, which could be seen in the archaeological record as evidence of toolkits, technological skill sets and subsistence strategies would represent a mountain adaptation complex. Looking for a mountain adaptation complex could account for the variation in assemblages that might change geographically or seasonally. So, when looking at the Sundog data through the lens of a cultural complex, I believe the evidence points to a mountain adapted people utilizing the site. The fact that possible family groups were residing at this montane meadow and utilizing

the local resources throughout time, shows a mountain adaptation and it should not matter if typical Plains projectile points are recovered, especially at a site that is located in a transition zone between the Great Plains and the Rocky Mountains.

I personally do not think a certain projectile point should define a cultural group or establish a boundary between groups. I think people move throughout the landscape and utilize different adaptive strategies in different environmental locations, which in turns creates different archaeological records. So, this stance differs from Frison's (1992) Foothills-Mountain Complex where he states the foothills-mountain groups and the plains groups are separate cultural groups, and Black's (1992) Mountain Tradition, which is focused on a separate cultural group in the Mountains. But both concepts were focused on the Paleoindian and Early Archaic periods and during those time periods it is possible the two groups were mutually exclusive from one another, since there are distinct projectile points that are only found in one ecological location, for example the Pryor Stemmed. Or, it is possible the same cultural group used different projectile points in different locations because of different subsistence strategies. More research on this topic is needed to fully flush out the human land use in areas like the Big Belt Mountains which are located in ecological transition zones.

Additional research is needed to define a Mountain Adaptation Complex, and I would like to propose a perspective that should be explored when creating this definition. Many researches describe people either leaving the Plains for the Mountains or moving from the Mountains to the Plains during harsh climatic periods (Bender and Wright 1988; Black 1991). But that does not completely make sense when you consider ethnographic studies tell us that "hunters and gatherers favor patterns of economic exploitation in areas they are familiar with, since locating and procuring animal or plant resources in unfamiliar territory is a difficult and unpredictable task" (Kornfeld et al. 2010:43). With this information, would not it make sense that human groups moved north-south and stayed within their familiar environment, rather than leaving an environment they are familiar with to enter an unfamiliar environment? For example, human groups living in the mountains of Montana would move north or

south, but stay in the mountains, since ecological environments would be geographically different but contain a familiar set of resources. Benedict (1992) explored this perspective along the Front Range in Colorado and I think this needs to be explored further because humans are creatures of habit and we constantly repeat patterns. As suggested by Bender and Wright's broad spectrum pattern, these mountain environments are not marginal and the archaeological data suggest heavy utilization throughout time (Bender and Wright 1988). More research in these areas will continue to force a rethinking of cultural components. For example, it is commonly thought that the landscape during the Early and Middle Archaic period saw an increase in population, which in turn created groups of people that created their own projectile points, or the point styles diverged more rapidly (Bush 2009; Des Planques 2001; Travis 2018). However, groups of people never live in isolation and they don't tend to reinvent technology when there is already a usable form present that they can alter for their needs. So, this would support the exchange of point types back and forth from the plains and the mountains but would also account for slight differences in technology. Taking this into account a broader research design is suggested when exploring the Mountain Adaptation Complex. Projectile point attributes should be collected from all sites within a geographic area, and compared between plains and mountain settings, but also ignoring the names assigned to each point or their geographic boundary. As researchers we tend to assign multiple names to the same technology due to slight differences or geographic location. As I discovered doing this research, the different names assigned to similar looking points made finding good comparative information on point attributes difficult (Pelican Lake points versus Hogback points). Husted (2002) ran into this same problem during his research in the Rocky Mountains. Therefore, I think when looking at the archaeological data without geographic boundaries we might see patterns that support groups of people moving back and forth from the plains and mountains but utilizing different adaptive strategies at each location. Or we might see three different groups of people, for example a Great Plains group, a Mountain group, and a group the moves between the two locations. These patterns might create a Great

Plains Adaptation Complex and a Mountain Adaptation Complex that support the same groups of people moving around the landscape.

In conclusion, the archaeological data from the Sundog site did not conclusively point to a residential camp with a Mountain Tradition adaptation using Black's (1991) model. However, I still believe the archaeological evidence from the Sundog site supports a mountain adaptation. The evidence from the Middle Archaic, Late Archaic and Late Prehistoric support a residential camp with multiple people taking advantage of the mountain resources. Once more research is done, as suggested above, I believe the evidence will create a broader definition for a Mountain Adaptation Complex and the Sundog site would fit nicely into that definition.

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## Appendix A: Projectile Point Attributes

| Artifact # | Unit | Level | Point Type | Material | Weight (grams) | Length (L) |
|---|---|---|---|---|---|---|
| **1** | C1 | - | lanceolate | North Belts Chert | 10.9 | 49 |
| **2** | Test Pit 2 | 2 | Pelican Lake/Hogback | Obsidian | 2 | 24 |
| **3** | Shovel Probe 2-4 | 30 cmbs | McKean | North Belts Chert | 1.2 | 26 |
| **4** | Test Pit 2 | 3 | Pelican Lake | North Belts Chert | 4.3 | 40 |
| **5** | Shovel Probe 2-1 | 40cmbs | Pelican Lake | North Belts Chert | 15.7 | 73 |
| **6** | L12 | 1 | McKean | North Belts Chert | 2.8 | 39 |
| **7** | M21 | 1 | Lovell Constricted /Middle Archaic | Tan Quartzite | 4.5 | 34 |
| **8** | K12 | 1 | Pelican Lake/Hogback | White Chert | 1.1 | 21 |
| **9** | R92 | 2 | Preform | Tan Quartzite | 7.8 | 44 |
| **10** | Q13 | 47 cmbd | Pelican Lake | Black Quartzite | 5.3 | 40 |
| **11** | O11 | 3 | Pelican Lake /Late Prehistoric | Obsidian | 3.5 | 39 |
| **12** | N11 | 3 | Pelican Lake/Late Prehistoric | North Belts Chert | 2.8 | 25 |
| **13** | N22 | 3 | Pelican Lake/Late Prehistoric | Obsidian | 2 | 20 |
| **14** | L21 | 3 | - | North Belts Chert | 1.2 | 14 |
| **15** | J15 | 3 | - | North Belts Chert | 0.1 | 10 |
| **16** | J15 | 5 | McKean-Hanna | Obsidian | 3.8 | 39 |
| **17** | L5 | 6 | McKean | Dacite | 3.9 | 40 |
| **18** | J14 | 6 | Pryor Stemmed | Tan Quartzite | 5.8 | 27 |
| **19** | L5 | 6 | - | White Chert | 0.3 | 15 |
| **20** | K11 | 7 | lanceolate | Dacite | 4.7 | 42 |
| **38** | O10 | 3 | Avonlea/Pelican Lake/Late Prehistoric | Obsidian | 1.1 | 24 |
| **39** | Q7 | 6 | Early Archaic | Black Chert | 2.4 | 27.5 |
| **40** | L21 | 2 | lanceolate/late paleo | Dacite | 4.3 | 31 |
| **41** | O10 | 7 | McKean-Hanna | Dacite | 2.5 | 41 |
| **42** | O11 | 2 | - | Dacite | 6.4 | 30.5 |

| Artifact # | Width (W) | Thickness | Blade L | Blade W | Base L | Base W | Notch Depth | Notch W | Hafting W | Basal Concavity Width |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 29 | 7 | 47 | 29 | 11 | 16 | 1 | 17 | - | - |
| **2** | 22 | 5 | 23 | 22 | 3 | 10.5 | 2.5 | 4 | 11 | 5 |
| **3** | 14 | 3.5 | 20 | 14 | 7 | 13.5 | 1.5 | 3.5 | 10.5 | 9 |
| **4** | 25 | 5 | 30 | 25 | 12 | 20 | 7 | 8 | 11 | - |
| **5** | 33 | 8 | 65 | 33 | 12 | 25 | 6 | 19 | 8 | - |
| **6** | 19 | 4 | 39 | 19 | - | 13 | - | 9 | - | 8 |
| **7** | 23 | 7 | 23 | 23 | 12 | 16 | 4 | 7 | 13 | 7.5 |
| **8** | 18 | 3 | 18 | 18 | 5 | 13 | 4.5 | 4 | 9 | - |
| **9** | 25 | 7 | 42 | 25 | - | 22 | - | - | - | - |
| **10** | 23 | 6 | 32 | 23 | 9 | 16 | 5 | 7 | 12 | - |
| **11** | 26 | 6 | 39 | 26 | - | - | - | - | - | - |
| **12** | 23 | 6 | 22 | 23 | 6 | 8.5 | 6 | 4 | 11 | - |
| **13** | 21 | 5 | 17 | 21 | 5 | 14 | 5 | 5 | 11 | 3 |
| **14** | 14 | 5 | 7 | 14 | 6 | 9 | - | - | - | - |
| **15** | 9 | 3 | 10 | 9 | - | - | - | - | - | - |
| **16** | 20 | 5 | 30 | 20 | 10 | 14 | 3 | 9 | 11.5 | 4 |
| **17** | 23 | 5 | 32 | 23 | 10 | - | 2 | 5.5 | - | - |
| **18** | 29 | 8 | 11 | 29 | 14 | 16 | - | - | 16 | 10 |
| **19** | 10 | 4 | 15 | 10 | - | - | - | - | - | - |
| **20** | 21 | 6 | 40 | 21 | - | 8.5 | - | - | - | 9 |
| **38** | 15 | 4 | 21 | 15 | 4 | 11 | 3 | 3 | 8 | - |
| **39** | 19 | 5 | 21 | 18.5 | 6 | 19.5 | 3 | 4 | 14 | - |
| **40** | 22 | 6 | 31 | 22 | - | 16 | - | - | - | 9 |
| **41** | 18 | 3 | 34 | 18 | 6 | 14.5 | 2 | 4 | 11 | 3.5 |
| **42** | 33 | 6 | 18 | 18 | 15 | 32 | 3 | 7 | 28 | 10 |

| Artifact # | Basal Concavity Depth | Outline | Portion | Blade Shape | Cross Section | Retouch Patterns |
|---|---|---|---|---|---|---|
| **1** | - | lanceolate | almost complete | contracting excurvate | bi-convex | random |
| **2** | 0.5 | triangular | almost complete | excurvate | bi-convex | parallel descending |
| **3** | 2 | triangular | complete | contracting excurvate | bi-convex | parallel descending |
| **4** | - | triangular | complete | excurvate | plano-convex | parallel descending |
| **5** | - | triangular | complete | straight | bi-convex | random |
| **6** | 3 | leaf | complete | contracting excurvate | plano-convex | random |
| **7** | 4 | lanceolate | almost complete | contracting excurvate | bi-convex | random |
| **8** | - | triangular | almost complete | straight | bi-plano | random |
| **9** | - | lanceolate | complete | contracting excurvate | bi-convex | random |
| **10** | - | triangular | almost complete | excurvate | plano-convex | parallel straight |
| **11** | - | triangular | blade | straight | bi-convex | parallel straight |
| **12** | - | triangular | almost complete | straight | bi-convex | parallel straight |
| **13** | 1 | triangular | base | straight | plano-convex | random |
| **14** | - | lanceolate | base | parallel excurvate | plano-convex | parallel straight |
| **15** | - | triangular | tip | straight | bi-convex | parallel descending |
| **16** | 1 | triangular | almost complete | straight | bi-convex | parallel descending |
| **17** | - | lanceolate | almost complete | contracting excurvate | bi-convex | parallel straight |
| **18** | 2 | lanceolate | base | contracting excurvate | bi-convex | parallel straight |
| **19** | - | triangular | tip | straight | bi-convex | parallel straight |
| **20** | 1 | lanceolate | almost complete | contracting excurvate | bi-convex | random |
| **38** | - | triangular | complete | contracting excurvate | bi-convex | parallel straight |
| **39** | - | triangular | complete | excurvate | bi-convex | random |
| **40** | 20 | lanceolate | base | straight | bi-convex | parallel straight |
| **41** | 1.5 | triangular | complete | straight | bi-convex | random |
| **42** | 4 | oval | base | contracting excurvate | bi-plano | random |

| Artifact # | Retouch Penetration | Retouch Patterns (other side) | Retouch Penetration (other side) |
|---|---|---|---|
| **1** | transverse | - | - |
| **2** | transverse | - | - |
| **3** | collateral | - | - |
| **4** | invasive | random | transverse |
| **5** | transverse | - | - |
| **6** | collateral | - | - |
| **7** | invasive | - | - |
| **8** | invasive | - | - |
| **9** | marginal | - | - |
| **10** | invasive | - | - |
| **11** | invasive | - | - |
| **12** | marginal | - | - |
| **13** | invasive | - | - |
| **14** | invasive | - | - |
| **15** | invasive | - | - |
| **16** | collateral | - | - |
| **17** | invasive | - | - |
| **18** | transverse | - | - |
| **19** | marginal | - | - |
| **20** | marginal | - | - |
| **38** | marginal | - | - |
| **39** | invasive | - | - |
| **40** | transverse | - | - |
| **41** | invasive | - | - |
| **42** | - | - | - |

**Appendix B: Scraper Attributes**

| Artifact # | Unit | Level | Tool Type | Material | Weight (grams) | Length (L) | Width (W) |
|---|---|---|---|---|---|---|---|
| **21** | K15 | 1 | Side scraper | Obsidian | 19.9 | 52 | 40 |
| **22** | A14 | 1 | End scraper | Dacite | 6.8 | 22 | 21 |
| **23** | R92 | 2 | Side scraper | North Belts Chert | 19.7 | 67 | 33 |
| **24** | J14 | 2 | Side scraper | White Chert | 19.3 | 46 | 39 |
| **25** | N12 | 3 | Side scraper | North Belts Chert | 15.1 | 42 | 37 |
| **26** | O10 | 4 | Side scraper | Moss Agate | 36.1 | 58 | 50 |
| **27** | M11 | 4 | Side scraper | North Belts Chert | 37.8 | 72 | 45 |
| **28** | K15 | 4 | Thumb Side scraper | North Belts Chert | 2.6 | 24 | 19 |
| **29** | R92 | 4 | End scraper | North Belts Chert | 7.4 | 36 | 29 |
| **30** | N22 | 5 | Side scraper | North Belts Chert | 38 | 69 | 41 |
| **31** | R92 | 5 | End scraper | North Belts Chert | 2.7 | 19 | 26 |
| **32** | Q7 | 5 | End scraper | North Belts Chert | 14.6 | 50 | 32 |
| **33** | J14 | 6 | Side scraper | Black Chert | 5.6 | 37 | 28 |
| **34** | L12 | 6 | Side scraper | Moss Agate | 7.8 | 34 | 35 |
| **35** | K11 | 7 | End scraper | Moss Agate | 10.5 | 37 | 37 |
| **36** | O92 | 7 | Side scraper | North Belts Chert | 6.9 | 46 | 31 |
| **37** | L7 | 21 | End scraper | Moss Agate | 30 | 56 | 50 |

| Artifact # | Thickness | Left Margin | Right Margin | Proximal End | Distal End | Edge Angle | Edge length | Distance of Retouch | Retouch Index |
|---|---|---|---|---|---|---|---|---|---|
| **21** | 11 | no | yes | yes | no | >60 | 90 | clustered | 0.72 |
| **22** | 8 | yes | yes | broken | yes | 30-60 | 70 | continuous | 0.62 |
| **23** | 9 | yes | yes | yes | broken | >60 | 105 | continuous | 0.77 |
| **24** | 10 | no | yes | broken | yes | <30 | 72 | continuous | 0.05P/.23D |
| **25** | 9 | yes | yes | yes | broken | 30-60 | 75 | continuous | 0.44 |
| **26** | 10 | yes | no | no | broken | 30-60 | 74 | clustered | 0.88 |
| **27** | 10 | no | yes | yes | no | <30 | 110 | continuous | 0.3 |
| **28** | 6 | yes | no | yes | no | >60 | 37 | continuous | 0.83 |
| **29** | 10 | yes | yes | yes | broken | 30-60 | 48 | continuous | 0.5 |
| **30** | 14 | yes | yes | yes | no | >60 | 120 | clustered | .64 L/.35 R |
| **31** | 6 | broken | broken | yes | broken | 30-60 | 32 | continuous | 0.66 |
| **32** | 10 | no | yes | yes | yes | <30 | 45 | clustered | 0.4 |
| **33** | 7 | yes | yes | yes | no | <30 | 80 | clustered | 0.14 |
| **34** | 6.5 | no | yes | no | no | <30 | 34 | clustered | 0.15 |
| **35** | 7 | yes | broken | yes | yes | <30 | 101 | continuous | .28R /.85 D |
| **36** | 5 | yes | yes | yes | no | <30 | 102 | continuous | 0.6 |
| **37** | 14 | yes | yes | yes | no | >60 | 123 | continuous | 0.42 |

| Artifact # | Left Margin Outline | Right Margin Outline | Proximal End outline | Distal end outline | Portion | Cross Section |
|---|---|---|---|---|---|---|
| **21** | straight | convex | convex | concave | complete | plano-convex |
| **22** | straight | straight | - | convex | distal end | plano-convex |
| **23** | straight | convex | pointed | broken | proximal end | plano-convex |
| **24** | concaved | convex | convex | convex | almost complete | bi-convex |
| **25** | convex | straight | pointed | - | proximal end | bi-convex |
| **26** | convex | bi-convex | - | convex | distal end | bi-convex |
| **27** | convex | straight | convex | straight | complete | concavo-convex |
| **28** | straight | convex | convex | convex | complete | plano-convex |
| **29** | convex | straight | pointed | - | distal end | bi-convex |
| **30** | convex | convex | convex | straight | complete | plano-convex |
| **31** | - | - | convex | - | proximal end | plano-convex |
| **32** | convex | convex | pointed | straight | complete | plano-convex |
| **33** | convex | convex | convex | straight | complete | plano-convex |
| **34** | straight | convex | convex | straight | complete | plano-convex |
| **35** | convex | concaved | convex | straight | almost complete | plano-convex |
| **36** | convex/concave | convex | convex | convex | almost complete | bi-convex |
| **37** | straight | convex | pointed | straight | complete | concavo-convex/distal end - bi-convex |

| Artifact # | Retouch Patterns | Retouch Penetration | Made from Flake | Split Cobble Reduction |
|---|---|---|---|---|
| **21** | unimarginal | feathered | yes | yes |
| **22** | unimarginal | feathered | yes | yes |
| **23** | bimarginal | feathered | yes | yes |
| **24** | unimarginal | smooth | yes | yes |
| **25** | bimarginal | feathered | yes | yes |
| **26** | unimarginal | feathered | yes | yes |
| **27** | bimarginal | feathered | yes | yes |
| **28** | bimarginal | feathered | yes | no |
| **29** | bimarginal | feathered | no | no |
| **30** | bimarginal | feathered | no | yes |
| **31** | unimarginal | feathered | yes | no |
| **32** | bimarginal | feathered | yes | yes |
| **33** | bimarginal | smooth | yes | yes |
| **34** | unimarginal | smooth | yes | no |
| **35** | bimarginal | feathered and smooth | yes | no |
| **36** | bimarginal | feathered | yes | no |
| **37** | bimarginal | feathered | yes | yes |

## Appendix C: Mountain Tradition Attributes

| Artifact # | Local Material | Un-Stemmed | Stemmed | Serrated | Side Notched | Thick | Biconvex | Collateral Flaking Pattern |
|---|---|---|---|---|---|---|---|---|
| **1** | yes | no | yes | no | no | yes | yes | yes |
| **2** | no | no | no | yes | no | yes | yes | no |
| **3** | yes | no | no | no | yes | no | yes | yes |
| **4** | yes | no | no | no | yes | yes | no | no |
| **5** | yes | no | no | yes | no | yes | yes | no |
| **6** | yes | yes | no | no | no | yes | no | yes |
| **7** | no | no | yes | no | yes | yes | yes | no |
| **8** | no | no | no | yes | no | no | no | yes |
| **9** | no | yes | - | no | no | yes | yes | no |
| **10** | no | no | no | no | no | yes | no | yes |
| **11** | no | no | no | yes | no | yes | yes | yes |
| **12** | yes | no | no | no | no | yes | yes | yes |
| **13** | no | no | no | no | no | yes | no | no |
| **14** | yes | no | yes | no | no | yes | no | no |
| **15** | yes | no | no | no | no | no | yes | yes |
| **16** | no | no | no | no | yes | yes | yes | yes |
| **17** | no | no | yes | no | yes | yes | yes | yes |
| **18** | no | no | yes | no | no | yes | yes | no |
| **19** | no | no | no | no | - | yes | yes | yes |
| **20** | no | yes | no | no | no | yes | yes | yes |
| **38** | no | no | no | no | no | yes | yes | yes |
| **39** | no | no | no | no | yes | yes | yes | no |
| **40** | no | yes | no | no | no | yes | yes | no |
| **41** | no | no | no | no | no | no | yes | no |
| **42** | no | no | no | no | no | yes | no | - |

| Artifact # | Moderate/Good Flaking Pattern | Reworking Evidence | No Evidence of Grounding | Made from Flake | Bifacial Reduction |
|---|---|---|---|---|---|
| **1** | yes | yes | yes | no | yes |
| **2** | yes | yes | no | no | yes |
| **3** | yes | yes | yes | yes | yes |
| **4** | yes | yes | no | no | yes |
| **5** | yes | yes | no | no | yes |
| **6** | yes | no | yes | yes | yes |
| **7** | yes | yes | no | no | yes |
| **8** | yes | yes | no | no | yes |
| **9** | yes | no | yes | yes | no |
| **10** | yes | yes | no | no | yes |
| **11** | yes | yes | yes | no | yes |
| **12** | yes | yes | yes | no | yes |
| **13** | yes | yes | yes | no | yes |
| **14** | yes | yes | no | no | yes |
| **15** | yes | no | - | no | yes |
| **16** | yes | yes | no | no | yes |
| **17** | yes | yes | no | no | yes |
| **18** | yes | no | no | no | yes |
| **19** | yes | yes | - | no | yes |
| **20** | yes | yes | no | no | yes |
| **38** | yes | yes | yes | no | yes |
| **39** | yes | yes | yes | yes | yes |
| **40** | yes | no | yes | no | yes |
| **41** | yes | yes | yes | yes | yes |
| **42** | yes | no | yes | no | yes |