THESIS

PREHISTORIC LAND USE, SITE PLACEMENT AND AN ARCHAEOLOGICAL LEGACY ALONG THE FOOTHILLS OF THE COLORADO NORTHERN FRONT RANGE

Submitted by

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ABSTRACT

PREHISTORIC LAND USE, SITE PLACEMENT AND
AN ARCHAEOLOGICAL LEGACY ALONG THE FOOTHILLS OF THE
COLORADO NORTHERN FRONT RANGE

This research takes place in the Colorado Front Range foothills in Northern Colorado. Previous artifact collections were recovered in past decades from sixty-six prehistoric sites and isolated finds within a bounded geographical area that includes the Dakota and Lyons hogbacks west of the city of Loveland in Larimer county. The first part of this thesis presents the artifact collections used in this analysis of Edison Lohr (1947), Lauri Travis (1986; 1988), Calvin Jennings (1988), and the work of the Center for Mountain and Plains Archaeology (2015-2017). The second part of this thesis explores the cultural chronology of the region and that of the study area. The study area reflects mostly the ephemeral behavior of indigenous groups along with small diverse activity sites that date between the Folsom period and Protohistoric era, with most sites dating between the Early Archaic and the Early Ceramic periods. Environmental variables that could have played a role in indigenous settlement and mobility patterns are evaluated, such as desirable raw material used for grinding tools. Only eight sites illustrate long-term intensive reoccupation of the foothills. The data shows that this landscape is a temporary exploitation space for indigenous groups passing through to access the Southern Rocky Mountains to the west or the Great Plains to the east.

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CHAPTER 1: INTRODUCTION AND STATEMENT OF OBJECTIVES, METHODS AND THEORY

It is assumed that the Colorado Front Range foothills were a beneficial, seasonal refuge for plains hunting and gathering populations for annual transhumance expeditions into the Rocky Mountains. It provided a stable and predictable food source by way of migrating deer and elk, as well as offered a dependable variety of edible and medicinal plants. Permanent and semi-permanent springs that form from the water gaps of the steep hogback uplifts were a reliable source of freshwater, and vast views of the surrounding landscape enabled scouting for wildlife and for other hunter-gatherer groups.

The high utilization of the Front Range by prehistoric populations is evidenced by prehistoric campsites and focal activity sites, where subsistence operations (plant and animal processing, lithic procurement, and toolmaking) took place. These actions are found in the archaeological record through dispersed artifact concentrations of projectile points, ground stone, and broken pottery. The remains along the steep uplifts of the hogback formations are presented in the presence of semi-permanent habitation remains such as stone rings.

A literature review of previous archaeological investigations of the Colorado Front Range dating back to the 1920s illustrates studies on prehistoric settlement patterns associated with foothills ecological conditions. Examined sites in the Indian Peaks Wilderness area, the foothills west of Denver, and in Roberts Ranch at Livermore, Colorado, provide the bulk of academic efforts in the western margins of the South Platte River Basin (Buckner 2020; Irwin-Williams and Irwin 1959; Johnston 2016; Lohr 1947; Meeker 2017; Perlmutter 2015; Yelm 1935). High elevation archaeological research in the Rocky Mountains and along the Continental Divide have also recognized the importance of the Front Range foothills to the movement of peoples, ideas, and goods (Benedict 1978, 1979; Brunswig 2016).

Many of these previous studies that have occurred in the foothills had gone unpublished, or their significance was lost. The following research works to address this issue and provides a methodological framework for future studies on understanding prehistoric lifeways in the Front Range foothills. In many ways, this thesis confirms previous interpretations of prehistoric use of the foothills. There have been many more discoveries made on interpreting foothills use in the archaeological record. For example, comparison of several site and survey datasets in the same geographic area allows exploration of foothills utilization as one analytical unit rather than at the individual site scale. This culmination of datasets improves upon the research studies that have occurred previously within the project area.

This thesis allows for all assemblage tools and site features to be operationalized as key components of a toolkit diversity index, and provides a radiocarbon date where, geographically, no radiocarbon dates have previously been reported. Finally, an environmental analysis is completed to determine the ecological factors that have contributed to the short-term occupational pattern that is demonstrated.

Thesis Objectives

The study of settlement patterns of prehistoric populations allows for a broad and holistic understanding of past cultural lifeways (Gilmore et. al 1999:46). Spatial distribution of sites and where they are in the environment provides significant insight into considerations on group mobility and occupation of specific landscapes, and what environmental influences may have led to such choices and decisions. This thesis addresses the following questions and objectives:

1. When were the foothills used? Was the area used during certain times and not others?
2. How intensively was it used?
3. What are some of the different ways it was used? How did the space function for hunter-gatherer groups?
4. Do any of the differences in time or intensity associate with certain environmental characteristics of the foothills?
5. To illustrate the value of applying new research methods and analytic tools to older collections, and to provide a synthesized version of archaeological information and inventories that have been underreported in studies related to foothills transition zones, especially for the South Platte River Basin.

Theoretical Framework

Prehistoric use of the foothills is evidenced through activity sites and isolated artifacts that have been reported throughout the years along the northern Front Range. Exploration of this land use is important in recognizing how people have utilized this ecological transition zone through time. By analyzing site artifact assemblages, one can discern the level of activity or occupation taking place at a site scale or at a larger landscape scale. Artifact assemblages have the potential to exhibit the rate of utilization at sites and what each site could have been used for. Single occupations or short-term use assemblages will look differently in the archaeological record compared to assemblage reflected at palimpsests of reoccupations or persistent places.

I will explore how and why prehistoric populations were drawn to the Northern Front Range continuously for thousands of years. To analyze this topic, legacy archaeological data provides a framework for research in the area of interest. To draw informed conclusions about cultural adaptations and site settlement patterns, a critical analysis of previous findings is pivotal to recognize cultural resource characteristics that are specific to the geographic area in question. An analysis of site size, toolkit diversity, and spatial distribution of sites compared to environmental attributes provide further support for future research along the foothills and the Front Range. This analysis allows for an increased understanding of who occupied this ecological transition zone of the hogbacks, what purpose it could have served in the past, and if the purposes varied depending on different environmental characteristics.

Archaeological sites nearby and along the foothills that have been well studied include Spring Canyon (5LR205), Spring Gulch (5LR252), Valley View (5LR1085), Fossil Creek (5LR13041), and Echo Cave (5LR349) (Brunswig 2016, 1990; Kainer 1976; LaBelle 2015; Pelton et al. 2016). Within the more extensive regional dataset, residential base camps in the foothills influential in recognizing prehistoric lifeways include sites such as: Magic Mountain (5JF223), LoDaisKa (5JF142), Van Bibber Creek (5JF10), Weinmeister (5LR12174) and Harvester (5LR12641), Willowbrook (5JF6), T-W-Diamond (5LR200), Roberts Buffalo Jump (5LR100), and Cherry Gulch (5JF63) (Anderson 2012; Hutchison 1974; Johnston 2016; Nelson 1981). All these sites have extensive artifact assemblages and illustrate the presence of permanent or semi-permanent habitation remains. All of them have undergone testing or excavation, providing in-depth chronological records of their occupations. These sites are further discussed in Chapter 5 to investigate the chronology patterns of the region.

Rather than focus on large residential campsites, this thesis utilizes all site information in one geographic area in the foothills. This provides a sample of the archaeological record that is observed in the Colorado Front Range and includes isolated finds and ephemeral campsites. These site types are commonly ignored in the archaeological record. Isolated artifacts and ephemeral campsites pertain to low-density, surface artifacts with limited above-ground features.

They are missing stratified chronological components. Some of these sites demonstrate short durations of use, which can be challenging to measure in the archaeological record where chronological periods range from hundreds to thousands of years. These site types account for much of the prehistoric past, especially for pre-ceramic populations that did not operate in permanent settlements (Morton 2015:9). These localities of single events are the substance of the material culture along the Front Range foothills and are incorporated into this analysis to recognize mobility and occupation patterns.

Methodology Overview

This project combines known data within the study area and includes both published and unpublished (OAHP/SHPO) sources. Dissemination and revisitation of previous work, or legacy work, is imperative in archaeology. Revisiting old artifact collections and written data provides a wealth of information from previous project work that otherwise would be lost to time. This is especially true in recognizing how archaeological frameworks have changed, and how new questions can be asked through using old information. As dependence on modern technology grows, it is crucial that historic survey and site reporting advances into now-regularly referenced databases and maintained systems to provide the most available data to current and future researchers and professionals. This data can then be accessible for a wider variety of projects and to more people.

Such use of previous work is common in Northern Colorado research studies. For example, Meeker (2017) explores two sites located north of this thesis' project area- Killdeer Canyon and T-W-Diamond-that were originally recorded in the 1970s. She employed prior artifact assemblages to recognize seasonal occupations spans. This has also been done for previously recorded sites from the 1970s in the Colorado high country along the Continental

Divide. Several researchers from Colorado State University (CSU) and the Center for Mountain and Plains Archaeology (CMPA) have revitalized field work and theoretical interpretations by applying new methodologies to this past work (Meyer 2019; Pelton 2013; Whittenburg 2017).

Most archaeological work is now completed through cultural resource management (CRM) firms or through the federal government (U.S. Forest Service, National Park Service, Bureau of Land Management, etc.). In the process of complying with guidance provided in federal laws such as the Antiquities Act, 36 CFR 800, the National Historic Preservation Act of 1966, as amended, the Archeological Resources Protection Act of 1979, and the American Indian Religious Freedom Act, archaeology as a science has been at the forefront of conducting project work within a public discourse and framework.

Public participation through consultation is fundamental to preserving cultural resources and identifying historic properties at risk of disturbance or destruction. Public engagement took place in this study in the form of community participation through the Sprenger Valley Housing Association. Individual meetings occurred between community members and me to identify properties and artifact collections that were previously recorded by the Sprenger Valley Field School in 1988.

Sites that were recorded by Calvin Jennings' Sprenger Valley Field School in 1988 have not been submitted to the State Historic Preservation Office (SHPO) and are not published in Compass, Colorado's online cultural resource database. Therefore, revisiting the sites and cataloguing the artifact collection enables a condition assessment of the sites and their artifacts. The author and community members reciprocated valuable information related to the historic utilization of the study area. This interaction improves upon interest and attentiveness towards the preservation of cultural resources that may be located on the public's privately-owned land

and in open spaces they visit. This betters our management, interpretation, and knowledge of archaeological records.

The methodology of this thesis revolves around gaining additional information from the artifact collections from sites previously documented within the project area. The goal of this project is to form the cornerstone for future research, and in understanding hunter-gatherer relationships within this ecological transition zone. Data from artifact collections and sites needed to be consolidated and summarized. This summarization process includes material culture frequencies and presence/absence, the assessment of temporal components recognized at each site, how intensively sites were used, and the determination of how large or small sites are in their artifact assemblages and what may have been the cause of this.

A Class I cultural resource inventory was completed within the project area. Stephanie Boktor, the Cultural Resource Information and GIS Specialist of the State Historic Preservation Office (SHPO) in Denver, Colorado was contacted in 2018 for a file search that included GIS data of all sites (prehistoric and historic) located within the Masonville, Fort Collins, Horsetooth Reservoir, and Loveland quads in Larimer county, Colorado. Literary resources and references for these sites were in SHPO's online database, COMPASS, or were presented within the file search provided by SHPO. Also included were shapefiles to input site locational information into a Geographic Information System (GIS) for spatial analysis and mapping. Additional site information and report searches were provided by Kallie Sanders, the Site Records Manager at the SHPO. Project reports and cultural resource inventories performed by the Center for Mountain and Plains Archaeology were digitally provided by the CMPA Director, Dr. Jason LaBelle, who was the principal investigator for these surveys when they were conducted between 2014 and 2017.

Artifact assemblages from historically recorded sites within the analysis area were physically analyzed. These assemblages included the Sprenger Valley Field School (1988) Artifact Collection which was loaned in part as a private collection and from the Archaeological Repository at CSU, as well as the Edison Lohr Artifact Collection (1947), which was loaned from the University of Colorado-Boulder Museum. Basic analysis of these assemblages was conducted on all artifacts which included weight (grams), raw material, and grade size. All projectile points received more detailed analysis which included basal width, max width, max length and max thickness, projectile point forms, and notching types exhibited. In comparison, previously recorded and published analysis data and artifact photographs were used for analysis on sites documented by Lauri Travis in her 1986 Colorado State University MA thesis and later in her *Plains Anthropologist* paper (1988) that detail her discoveries in the foothills.

The project area has gone through extensive development and is overall a well-utilized space. Due to this, cultural resource surveys were conducted in specific units of the project area in prior years. Twenty cultural resource projects were conducted within the project area. Five of these projects recorded prehistoric cultural resources, while three recorded only historic cultural resources. All the cultural resources and the history of the work conducted are presented in Chapter 3. Not all the sites previously recorded were utilized in this study's analysis. Site datasets used within the analysis were limited to those with clear, prehistoric components. Discussion on historic use of the foothills is limited to Chapter 2, as it is not a focus within this thesis.

The datasets used in further analysis were obtained from previous literature by Edison Lohr (1947), Lauri Travis (1986), Calvin Jennings (1988), Ashley Packard (2015), and Jason LaBelle (2014; 2017). Accessibility to datasets varied depending on the need for certain site information. Edison Lohr's research was made accessible through his physical artifact collections on loan to the Center of Mountain and Plains Archaeology in 2018-2019 from the University of Colorado-Boulder Museum. The collection included a copy of Lohr's report on the sites he and his team recorded, as well as the sites' provenance information. Lauri Travis (1986) provided relevant and detailed information on the sites she had recorded for her thesis on the foothills, along with high-resolution photos for portions of the artifact collections she examined. Travis' artifact collection is currently curated at Colorado State University. Calvin Jenning's research was accessible through both unpublished written site descriptions and field notes (1988), as well as through the physical artifact collection, which was on loan for this project in 2019 by Mr. Donald Aten as a private landowner, and by the Archaeological Repository at CSU.

Dr. Jason LaBelle's work was accessible as a primary resource with project reports from the Center for Mountain and Plains Archaeology. There were four sets of published data regarding cultural resources within the project area conducted by the CMPA. Three were cultural resource survey inventories that took place at the Devil's Backbone (2014), the Blue-Sky Trail (2017), and at the Namaqua Skyline Open Space (2017). The other project was organic residue analysis on the Wenborg steatite vessel, which was discovered in the northeastern section of the study area and analyzed by the CMPA in conjunction with the PaleoResearch Institute for dating purposes (Cummings et al. 2013).

Site spatial data was analyzed using ArcGIS 10.4 software. Locational data, site spatial patterning, environmental variables, and site component frequencies were all analyzed and drafted in ArcGIS using a variety of tools accessible within the program such as degree slope, distance, and selecting populations by location or attribute. Data analysis and the diversity index were conducted in Microsoft Office Excel. Artifact cataloguing and diversity index results were organized in MS-Office Excel spreadsheets with patterns presented and observed through charts and graphs.

Organization of Thesis

Chapter 2 describes the case study location and its physiography and that of the regions. In addition, the flora and fauna of the foothills is discussed along with how the natural environment has been shaped by the built human environment in the Colorado Front Range. Chapter 3 presents all the archaeological inventories that have been completed within the case study area through a chronological timeline. It includes an examination on how significant these studies are for determining prehistoric occupations of the foothills. These previous investigations include early 20th century work conducted by the Coffin brothers, E.B. Renaud, Edison Lohr, and Mary Elizabeth Yelm. Lauri Travis, a prior Colorado State University (CSU) MA graduate student, and her thesis work command a thorough review. The extensive fieldwork of the Sprenger Valley Field School, which was conducted in 1988 by a prior CSU professor, Dr. Calvin Jennings, is also summarized. In recent decades, there have been several cultural resource management firms that have conducted surveys within the project area, and field and lab work has continued to be completed in the foothills by the Center for Mountain and Plains Archaeology (CMPA).

Chapter 4 describes the artifact collections themselves and what was inventoried for this project. The Edison Lohr artifact collection, the Sprenger Valley artifact collection, the Travis artifact collection, and all other CRM or CMPA assemblages are detailed. Chapter 5 examines the project area's chronology within the regional chronological context of the Colorado Front Range and South Platte River Basin. Analysis on the artifact assemblages within the case study area is described in detail, and the patterns gleaned from this research on site-spatial distribution and on the number of components demonstrated at sites are discussed. Site-spatial and temporal distribution is important in recognizing how the foothills were occupied across space and time. This chapter will address how intensively the foothills were utilized and examine the distribution of sites across time from the Paleoindian to the Protohistoric.

Chapter 6 discusses why analyzing toolkit diversity and the richness and evenness of artifact assemblages provide insight into not only how the foothills functioned in different ways for prehistoric hunter-gatherer groups, but also how these differences translate in the archaeological record through factors. The Shannon-Wiener Index, usually used within natural resource studies, is adapted in this analysis to calculate the diversity of the artifact assemblages represented in the project area's archaeological record. At the end of the chapter, sites are placed within the context of the natural environment to examine if site size and artifact diversity correlate with eco-regional variables demonstrated within the case study area.

Finally, Chapter 7 offers final, theoretical conclusions on the results of this analysis and how the aims of this thesis were fulfilled. This study's results are then compared to previous studies and to the existing literature of the Colorado Front Range and the South Platte River Basin. A discussion on how this work may be expanded upon by future researchers is highlighted. It reflects on the significant role of public archaeology in archaeological research, as much of this analysis could not have been completed without the engagement and continued support of the local Sprenger Valley community.

CHAPTER 2: PROJECT LOCATION

What follows is a discussion of the project area's geographical setting as well as how the project area fits into the modern built environment. The purpose of this chapter is to orient the reader to the physical context this case study takes place in at both a local and regional scale, and the project area's cultural history background.

Figure 1. Photo facing northwest towards Red Rock Valley and taken by the author in June of 2018. The red sandstone cliffs of the Lyons formation to the right exemplify the sharp, characteristic uplifts of the hogbacks. Milner Mountain is to the left and Indian Creek flows north-south through the exhibited valley.

The project area is in the hogback and foothills transition zone, or borderlands, between two significant physiographic provinces: The Western Great Plains to the east and the Southern Rocky Mountains to the west. For this thesis, and for the following archaeological analysis that ensues, the South Platte River Basin is divided into three major ecological zones: the mountains, the hogback and foothills transition zone, and the plains. The foothills of the northern Front Range form the western margin of the Colorado Piedmont. The Colorado Piedmont then transitions east into the High Plains, forming the Great Plains Province (Gilmore et. al 1999: 11-12; USGS 1967:3-22).

Case Study Location and Study Area Boundaries

Attention was directed to one area of the foothills as a case study for the broader expanse of prehistoric utilization of the Colorado Front Range. The area is located between Loveland and Fort Collins in Larimer County. The foothills west of Loveland is representative of the Colorado Front Range due to its ‘double’ hogback extent that runs for approximately 7-miles north-to-south, which is visually impressive and is the geologic landmark for the area.

The southern end of this double hogback (and of the project area) acts as the gateway to Rocky Mountain National Park through the Big Thompson Canyon. The Big Thompson Canyon is the main artery for the Big Thompson River, a tributary to the South Platte River which flows from its headwaters in Rocky Mountain National Park east through the canyon and into the Great Plains. The river plays an integral role in supplying water to Front Range cities. This study area was chosen due to its geomorphologic importance and the significance of its cultural history in the region.

Major roads define the entire extent of the study area. US Highway 34 follows the Big Thompson River east to west and forms the southern boundary of the project area. North County Road 25 forms the southwestern boundary, which then travels north and intersects with West County Road 38E for the northwestern border. The historic town of Masonville off West County Road 38E is 0.55 miles west of the project area. West County Road 38E creates the northern boundary for the study area, following along the southern end of Horsetooth Reservoir in a generally east-west direction. South Taft Hill Road, also known as North County Road 19 or Wilson Avenue, finishes out the project area boundary by bordering the entire eastern side, north-to-south. The study area encompasses 19,050 acres and spans a maximum width of 4-miles east-to-west and a maximum length of up to 8.4-miles north-to-south (see Figure 2).

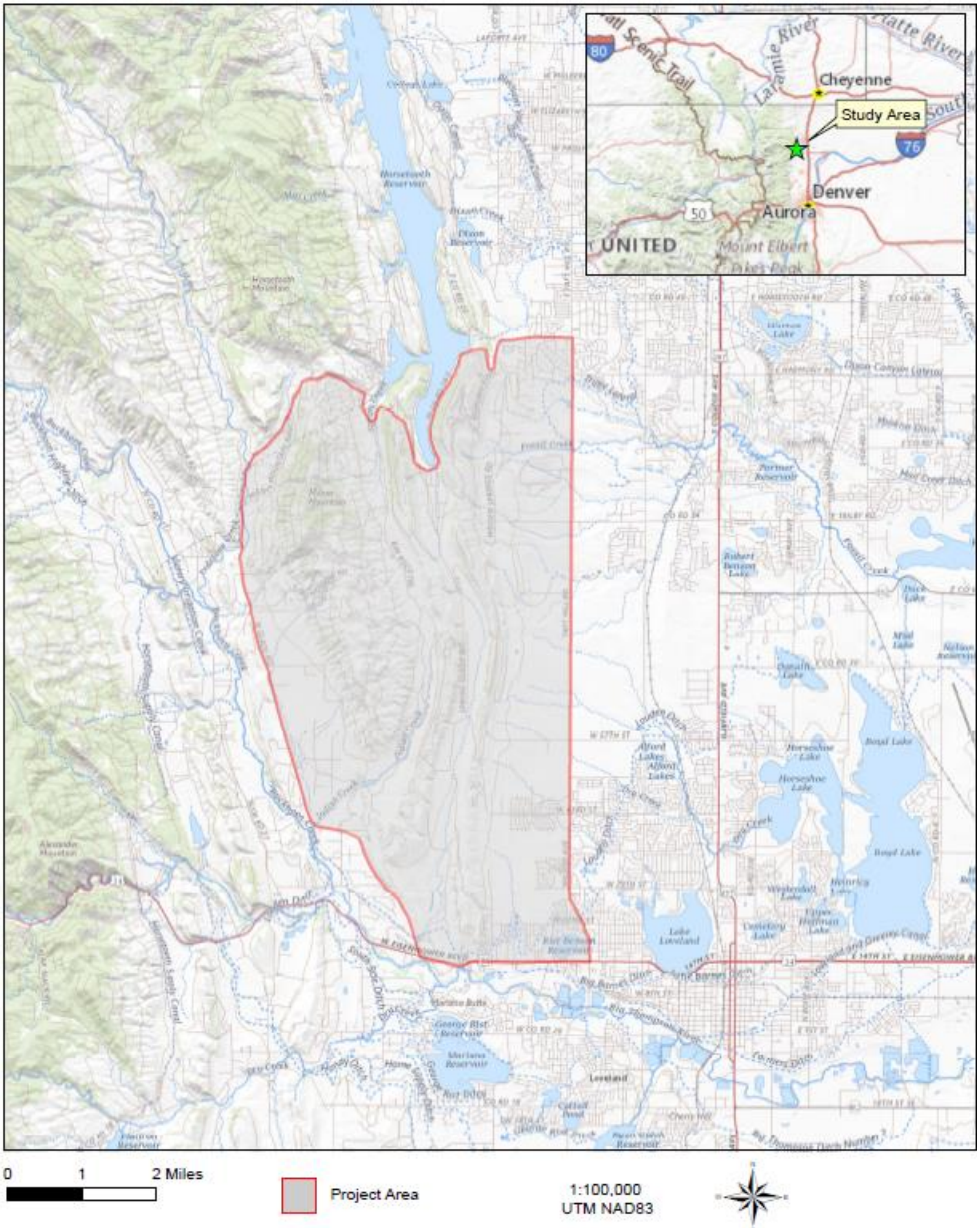


Figure 2. Project Area Location, Larimer County, Colorado.

The South Platte River Basin

The South Platte River Basin is one of eight primary watersheds in Colorado shaped by the Continental Divide. There is the North Platte located northwest of the project area, the Colorado River watershed that extends from the western side of the Rocky Mountains, the Yampa in the far northwestern part of Colorado, the Gunnison also along the western range and south of the Colorado, the Dolores at the far southwestern edge of Colorado, and the Rio Grande at the southern end of the Colorado Rockies. The Arkansas River Basin is located south of the South Platte River Basin and makes up the second half of the eastern portion of Colorado. The two are divided by the Palmer Divide, a highland that acts as a watershed barrier between them (Gilmore et. al 1999: 11-12).

The Platte River provides one of the most significant watersheds of both the eastern Rocky Mountains in Colorado and the central Great Plains, covering approximately 22,000 square miles of northeastern Colorado. This watershed provides water to large cities such as Denver, Greeley, Fort Collins, and seven of the ten largest agricultural producing counties in the state depend on it. From Greeley, the South Platte River turns east and flows about 200 miles into southwestern Nebraska where it confluences with the North Platte River. The North Platte extends down from eastern Wyoming and southeast into Nebraska before its confluence (see Figure 3).

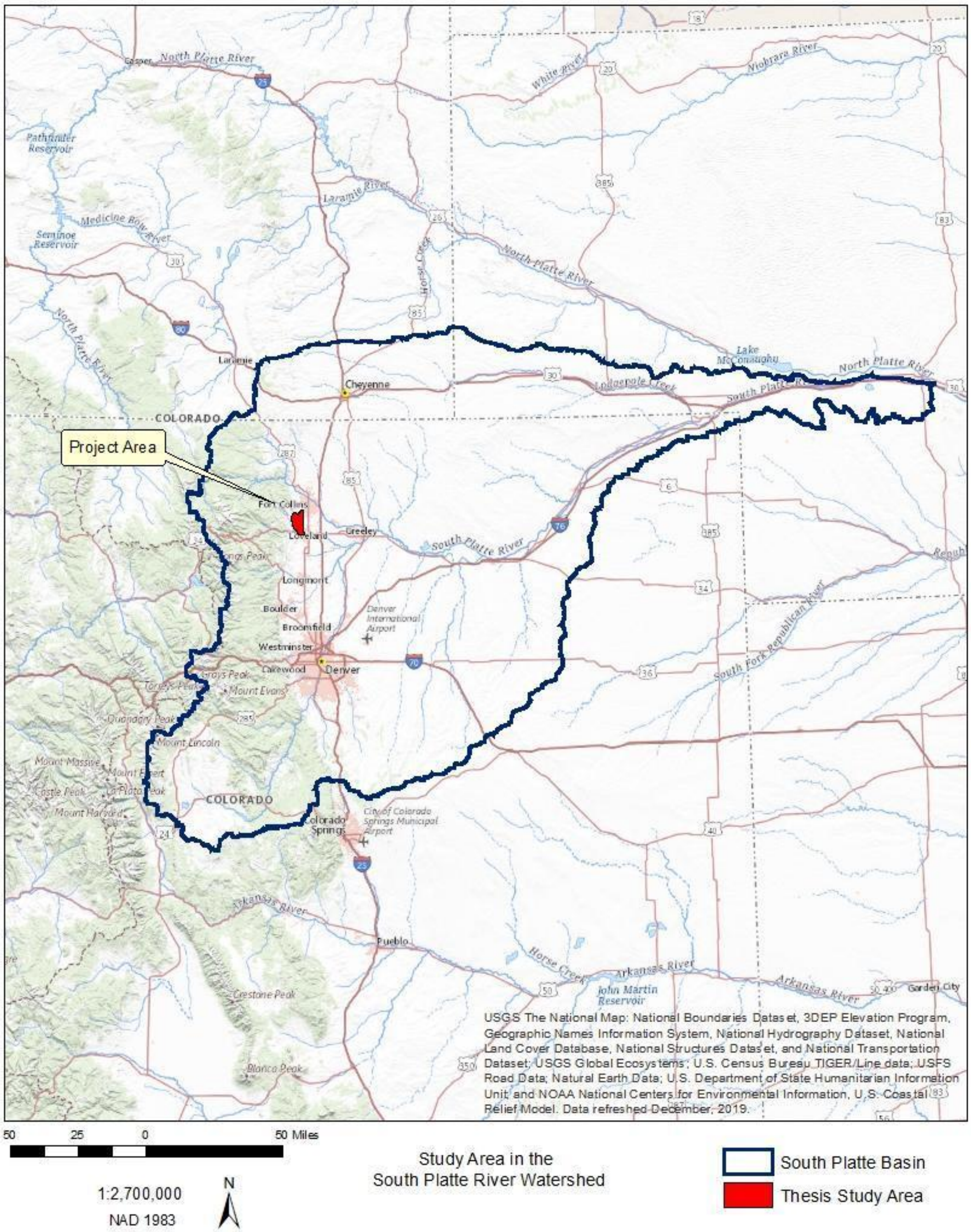


Figure 3. Project Area Location Within the South Platte River Basin.

The South Platte River watershed is extensive, covering approximately 15.5 million acres (From ArcGIS Feature Services). From the southwest, the South Platte travels through the South Fork South Platte River drainage which begins at the headwaters of the South Platte in Park county, Colorado. The South Platte River headwaters are in the Mosquito Range west of South Park in the Rocky Mountains. The headwaters are fed down the eastern slope of the Rocky Mountains and into the Colorado Piedmont through both the North and South Forks of the South Platte River. The South Platte drains to the northeast as the Big Thompson River which exits through the Big Thompson Canyon just west of Loveland. It continues traveling northwest by the Cache la Poudre River tributary which emerges from the mountains and foothills near Laporte and just northwest of Fort Collins (Mutel and Emerick 1984:9). A large network of creeks feed into the South Platte River in the surrounding plains to the north, east, and to the south.

Several of the South Platte River tributary drainages are located within the thesis project area. Buckhorn Creek is in the southwestern portion of the project area, with its headwaters just east of the northeast oriented South Fork Cache la Poudre River drainage route. Buckhorn Creek flows in an east and south-southeast direction to join the Big Thompson River to the south (Clausen 2012). Redstone Creek is to the northwest of the center of the project area and is a southeast, south-southeast, and southwest oriented Buckhorn Creek tributary west of Lory State Park that originates from Mount Ethel at the Rist Canyon-Red Stone Creek through valley which is oriented east-west (Clausen 2012).

Indian Creek is an ephemeral drainage located mostly in a north-south oriented valley bounded by the Lyons hogback strata to the east and Milner Mountain to the west. Indian creek is oriented to the northeast and to the northwest and flows from the Spring Creek Canyon east into the through valley and then south until it reaches Milner Glade where it meets with Buckhorn Creek. The Big Thompson River to the south forms the southwestern-most boundary of the project area where the river then diverges south and then east through Loveland to meet with the South Platte River.

The Northern Front Range

The Front Range is a mountain range of the southern Rocky Mountains located in the central portion of Colorado and the southern portion of Wyoming. The Front Range runs north-south and rises nearly 10,000 feet above the Great Plains to the east. This mountain range is the first one encountered when headed westbound from the Great Plains. Pikes Peak, Mount Evans, and Longs Peak are its most prominent peaks that can be seen from Interstate 25 that runs north-south through the Front Range Urban Corridor. The Front Range Urban Corridor is defined as the populated region of Colorado and Wyoming that is along the eastern flank of the Front Range mountains which extends from Cheyenne, Wyoming to Castle Rock, Colorado (McGuire 2020). The northern Front Range is the portion of the Front Range that extends north of Denver to the Colorado-Wyoming border.

The Northern Front Range foothills consist of a series of linear ridges of tilted sedimentary strata running roughly north south that run parallel to the southern Rocky Mountain range and along the eastern flank of the Colorado Front Range in northern Colorado. These linear ridges, or strike valleys (located along the strike of dipping strata), were produced by being sharply tilted during mountain uplift (Mutel and Emerick 1984:5). The hogbacks illustrate a geologic series from the Pennsylvanian Period to the Cretaceous Period (Coffin 1929:2-3). The through valleys between these ridges are water-eroded landforms and illustrate what were once south oriented flood flow channels. Horsetooth Reservoir to the north of the project area is in one such through-valley (Clausen 2012). In between the two hogback systems is a through valley which has been produced through water erosion of softer stone. It is here that water tends to gather, and which has also produced reliable places for springs on the valley bottoms. These springs are usually at the bases of what are recognized as water gaps, or areas of water drainage between the hogback ridges themselves, primarily with an east-west orientation (Pelton et al. 2017:2).

This geology forms the most substantial hogback system in the area which are known as the Dakota and Lyons hogbacks. The Dakota hogback is the easternmost linear ridgeline and is formed by Lower Cretaceous Sandstone beds. The secondary Lyons hogback is to the west of the Dakota hogback ridge and is made from the Lyons geological formation. The Lyons ridgeline is most recognized for its red sandstone geology.

The geology of the project area consists of both depositional and erosional processes typical to those present at a Front Range and Plains ecotone, with high quality sand and gravels having been mined historically and in modern contexts for concrete and asphalt aggregate, plaster sand, cement sand, concrete slab bedding, and decorative stone (Mutaw et. al 1991:8). The geologic formations of the area include Morrison Formation, Entrada Sandstone, Jelm Formation, Lykins Formation, the Dakota Group of the South Platte Formations and the Lytle Formation, and Benton Shale.

Milner Mountain has the highest elevation within the study area at 6,881 feet and its geology consists of metamorphic mica schist and gneiss rocks. Gray Mountain and Horsetooth Mountain are also made of batholithic granitic masses (Coffin 1929:5). Gerald Spence, an individual who spent his childhood in the Buckhorn Valley in the 1890s, writes in his book *The Hunter*, about Milner Mountain, "[…] Right on top was a bubbling spring of the coldest, sweetest water…which attracted animals" (Spence 1992:68). Due to the geology of the area including the presence of limestone, springs are common in the foothills and provide a permanent source of water for animals and for people and may have been a major attraction to transhumance populations in prehistory. The importance of these natural springs and groundwater is discussed further in Chapter 6.

The hogbacks/foothills transitional zone has an elevation that ranges from between 5,200 feet to 5,519 feet, so it does not experience extreme cold such as in the mountains or extreme heat like in the Plains (Travis 1986:6). Winds primarily originate from the west, and sometimes cause Chinooks, which channel even warmer air through the foothills and its valleys (Travis 1986:7). The climate is semi-arid, with well-defined seasons, and can be further characterized as a middle-latitude cool steppe (Gilmore et. al 1999:11).

The Rocky Mountains to the west have an enormous impact on the climate represented in the foothills. Overall, the Front Range is surrounded by a warmer and drier climate. The Front Range mountains block westerly prevailing winds and storms. It acts as a barrier to free air flow and shifts in movements in varying directions based on seasons and enables the creation of microclimates observed in vegetation patterns along its slopes (Gilmore et. al 1999:11). One such microclimate is exemplified in the foothills and hogback ecotone. The Front Range to the west and the Palmer Divide to the south block cold air masses and keep warm ones, providing relatively warmer temperatures in the foothills, especially evident during winter (Gilmore et. al 1999:12).

Flora and Fauna in the Foothills

The primary vegetation community present in the foothills and hogbacks is the Pine-Douglas-fir community bordered on the west by the Western Spruce-Fir forest and to the east by grama-buffalo grassland, or short grass prairie (Gilmore et. al 1999:25). The Pine-Douglas-fir ecotone can be divided even further into three major vegetation communities as identified by Travis (1986). These include grassland valleys, mountain mahogany, and ponderosa pine (Travis 1986:10). Grassland valleys include a mix of grasses and forbs co-dominated by rangeland. Mountain mahogany is a subtype of deciduous woodland represented in the study area and represents the most dominant vegetation type along with the grass/forb mix seen primarily within the valleys. This usually includes a very dense understory. There is also ponderosa pine intermixed with mesic mountain shrubs mostly located along the ridge crests. Riparian vegetation is limited within the project area along creeks and in the Hogback water gaps.

There is a high variety of native plants within the project area. Many of these plants are recognized as important to historic indigenous populations, and their macro botanical remains have been found in prehistoric contexts as well. Wild onions, sunflower seeds, chokecherries, and edible flowers were prehistoric dietary staples, along with prickly pear cactus pads. Goosefoot, pigweed, saltbush and seepweed leaves, seeds, and greens were all used for medicinal or dietary purposes. It is possible to make medicinal teas featuring these plants. The seeds have a high fat and protein content, can be eaten raw, and can be harvested through the winter. Sedges such as the four-wing saltbush can be used as baking powder while the stems can be eaten, and the tuberous ends can be ground down into flour (Cummings et al. 2013:9). Rootstalks of many plants are high in starch and sugars. Bulrush stems could be used to weave baskets and mats (Cummings et al. 2013:10-11) while a variety of grasses can be used to create footwear and clothing, basketry, and brushes and brooms (Cummings et al. 2013:11).

Table 1. List of known forbs in project area. Forbs list is not comprehensive. Data from Rimrock Open Space Management Plan (n.d.) and the PaleoResearch Institute (Cummings et al. 2013).

Forbs	**Common Name**	**Scientific Name**
	Violet	*Viola purpurea*
	Silver Sage	*Artemisia frigida*
	Yucca	*Yucca glauca*
	Sunflower spp.	*Helianathus spp*
	Prairie Sage	*Artemesia ludoviciana*
	Sand Lily	*Leucocrinum montanum*
	Wild Blue Flax	*Adenolinum lewisii*
	Wild Onion	*Allium textile*
	Western Wallflower	*Erysimum asperum*
	Woods Rose	*Rosa woodsia*
	Alyssum	*Alyssum parviflorum*
	Fringed Sage	*Artemesia frigida*
	Rocky Mountain Spurge	*Euphorbia robusta*,
	Wild Geranium	*Geranium caespitosum*
	Wormwood	*Artemesia filifolia*
	Bluebells	*Mertensia lanceolata*
	Western Wallflower	*Erysimum asperum*
	Evening Primrose	*Oenothera brachycarpa*
	Mullein	*Verbascum Thapsus*
	Poison Ivy	*Toxicodendron rydbergii*
	Prickly Poppy	*Argemone sp.*
	Povertyweed	*Monolepis*
	Seepweed	*Suaeda*
	Pussytoes	*Antennaria rosea*
	Goosefoot	*Chenopodium*
	Pigweed	*Amaranthus*
Succulents	Prickly Pear Cactus	*Opuntia maccorhiza*

Table 2. List of known sedges in project area. Sedges list is not comprehensive. Data from Rimrock Open Space Management Plan (n.d.) and the PaleoResearch Institute (Cummings et al. 2013).

Sedges	**Common Name**	**Scientific Name**
	Sun Sedge	*Carex stenophylla*
	Mountain Mahogany	*Cercocapus montanus*
	Bulrush	*Scirpus*
	Earth Almond	*Cyperus esculentus*
	Skunkbush	*Rhus trilobata*
	Rabbitbush	*Crysothamnus nauseosus*
	Wild Plum	*Prunus americana*
	Nut Grass	*Cyperus*
	Chokecherry	*Prunus virginiana*
	Snowberry	*Symphoricarpos oreophilus*
	Four-wing Saltbush	*Atriplex canescens*
	Greasewood	*Sarcobatus*
	Snakeweed	*Gutierrezia sarothrae*

Table 3. List of known trees in project area. Trees list is not comprehensive. Data from Rimrock Open Space Management Plan (n.d.) and the PaleoResearch Institute (Cummings et al. 2013).

Trees	**Common Name**	**Scientific Name**
	Ponderosa Pine	*Pinus ponderosa*
	Plains Cottonwood	*Populus sargentii*

Table 4. List of known grasses in project area. Grasses list is not comprehensive. Data from Rimrock Open Space Management Plan (n.d.) and the PaleoResearch Institute (Cummings et al. 2013).

Grasses	**Common Name**	**Scientific Name**
	crested wheatgrass	*Agropyron cristatum*
	Blue Grama	*Bouteloua gracilis*
	Buffalo Grass	*Buchloe dactyloides*
	Side-oats Grama	*Bouteloua curtipendula*
	Lovegrass	*Eragrostis*
	Dropseed	*Sporobolus*
	Rye Grass	*Elymus*
	Indian Ricegrass	*Oryzopsis hymenoides*
	Western Wheatgrass	*Agropyron smithii*
	Kentucky Bluegrass	*Poa pratensis*
	Canada Bluegrass	*Poa compressa*

Table 5. List of known non-native plants in project area. Non-native plants list is not comprehensive. Data from Rimrock Open Space Management Plan (n.d.) and the PaleoResearch Institute (Cummings et al. 2013).

Non-Native Plants	**Common Name**	**Scientific Name**
	Dandelion	*Taraxacum officinale*
	Ragweed	*Ambrosia trifida*
	Gumweed	*Grindelia squarrosa*
	Bindweed	*Fallopia convolvulus*
	Blue Mustard	*Chorisposa tenella*
	Cheatgrass	*Bromus tectorum*
	Smooth Brome	*Bromus inermis*
	Japanese Brome	*Bromus japonicus*

Animals within the project area include many ungulates such as elk, mule deer, and white-tailed deer, while carnivores include the coyote, fox, and mountain lion (see Table 6 below for comprehensive list). Rocky Mountain Bighorn sheep (*O. canadensis canadensis*) have winter and summer ranges that are primarily in higher elevation areas such as in Rocky Mountain National Park, the Rawah Wilderness, and along the Poudre Canyon north of the project area.

Their known summer and late spring range extends down into lower elevations into the Big Thompson Canyon, ending just west of the Devil's Backbone Open Space along North County Road 27 (Colorado Division of Wildlife 2011).

Table 6. Mammals, reptiles, amphibians, and birds in the project area. Referenced from the Rimrock Open Space Management Plan (5-1) and the Boulder County Audubon Society.

Common Name	Scientific Name
Mule deer	*Odocoileus hemionus*
Coyote	*Canis latrans*
Mountain lion	*Felis concolor*
Elk	*Cervus canadensis*
White-tailed deer	*Odocoileus virginianus*
bobcat	*Lynx rufus*
Least chipmunk	*Eutamias minimus*
Uinta chipmunk	*Eutamias umbrinus*
Rock squirrel	*Citellus variegatus*
Golden-mantled squirrel	*Citellus lateralis*
Hispid pocket mouse	*Peromyscus hispidus*
Deer mouse	*Peromyscus maniculatus*
Rock mouse	*Peromyscus difficilus*
Mexican woodrat	*Neotoma Mexicana*
Prairie vole	*Microtus ochrogaster*
Porcupine	*Erethizon dorsatum*
Red fox	*Vulpes fulva*
Gray fox	*Urocyon cinereoargenteus*
Raccoon	*Procyon lotor*
American badger	*Taxidea taxus*
Black-tailed prairie dog	*Cynomys ludovicianus*
Striped skunk	*Mephitis mephitis*
Mountain cottontail rabbit	*Sylvilagus nuttalli*
Prairie Rattlesnake	*Crotalus viridis*
Gopher Snake	*Pituophis catenifer*
Smooth Green Snake	*Opheodrys vernalis*
Tiger salamander	*Ambystroma tigrinum*
Eastern collared lizard	*Crotaphytus collaris*
American kestrel	*Falco sparverius*
Peregrine falcon	*Falco peregrinus*
Sharp-shinned hawk	*Accipiter striatus*
Red-tailed hawk	*Buteo jamaicensis*
Golden Eagle	*Aquila Chrysaetos*
Steller's Jay	*Cyanocitta stelleri*
Wild turkey	*Meleagris gallopavo*
Turkey vulture	*Cathartes aura*
Western tanager	*Piranga ludoviciana*
Pinyon jay	*Gymnorhinus cyanocephalus*
Black-billed magpie	*Pica hudsonia*

Prior to European settlement in Colorado, it is likely that most bighorn sheep populations existed as 'metapopulations,' where large numbers of bighorn sheep would congregate and would have greater movements between summer and winter ranges than what is observed today. Due to a variety of factors such as increased human impacts on the landscape, disease die-offs and over-hunting, bighorn sheep herds are now largely isolated with restricted range movements (George, J.L. et. al: 2009:13).

The Built Environment of the Foothills

The area has undergone significant human-environmental impacts due to its location in the wildland-urban interface of the Front Range urban corridor. The area includes major resources in its geology, water sources, and in its biotic communities. These factors have significantly contributed to its occupation by people throughout history and prehistory. What remains is a hybridization of both natural and cultural influences, which in effect determines the extent of cultural site preservation.

Historic Utilization, 1870-1960s

Historically, the study area underwent stone quarrying of its geologic uplifts because of its clay and mineral deposits. Between the 1870s and 1930s, minerals and clay from the foothills provided material for stoneware, brick, tile, terra cotta and sewer pipes (Deno 2008; Watrous 1911). Sandstone, gypsum, Lyons formation buff stone, alabaster, and lime quarries/kilns were extensive in the hogback region due to high demand from the mountain mining districts, where stone was used in ore smelting. Demand also came from Cheyenne, Denver, and from across Larimer county for building and infrastructure construction and was also in demand by local sugar beet factories such as the Great Western Sugar Company, which needed burnt limestone for converting raw beet juice into granulated sugar (Humstone 2007:7; Velasquez 1998:3-11).

The Stout Quarries were four major sandstone quarries operating near Stout (now known as Horsetooth Heights) that took place within the project area in the late-19th century that ceased operations by the 1930s (Deno 2008:4). Six additional Red Sandstone quarry operations took place alongside the project area in the Buckhorn Valley near Masonville. Many of these were operated by the Union Pacific Railway under its subsidiary, the Greeley, Salt Lake & Pacific Railroad (GSL&P), whose southernmost railroad tracks are now under Horsetooth Reservoir. Most of the sandstone, gypsum, and limestone quarries located within the Sprenger Valley and along Milner Mountain were small operations and were used by local masonry contractors (Deno 2008:14). Gypsum beds in the Lykins formation are over 50ft thick in the area and extend from the project area to down south (Coffin 1929:15). The Loveland Plaster Mill excavated alabaster in their quarry for use in cement and plaster (Coffin 1929:16). The need for these materials declined beginning in the 1920s when concrete and steel began to replace stone (Humstone 2007:7), however mining for minerals such as gypsum and clay was still occurring in the area until the end of World War II (Larimer County Natural Resources 2014:22).

Crop farming also represented a main source of livelihood along the Front Range (Aughenbaugh 2006). In 1881, Alfred Wild bought property in the Devil's Backbone Open Space area. He grew over two thousand fruit trees and produced a variety of fruits including apricots, peaches, pears, and plums. He was also recognized as the "Colorado's Pioneer Hop Grower" (Jessen 1984:55-58). During the early 1900s, sugar cherry orchards and sugar beets were the primary crops for Loveland's economy (Aughenbaugh 2006). Both the Great Western

Sugar Company and the Spring Glade Orchard, as well as canning operators, were important employers for the area (Aughenbaugh 2006).

The Spring Glade orchard, which was historically in Sprenger Valley in the 1920s, was reported to be the largest cherry orchard west of the Mississippi River, producing more than $1 million worth of product for three years in a row between 1928 and 1930 (Aughenbaugh 2006). The orchard was irrigated with cisterns and water wagons due to lack of permanent streams. Another cherry orchard was also in operation at the southern end of the Lyons Hogback (now a part of the Devil's Backbone Open Space) and was owned by Carl Fink between 1937 and 1947 (Larimer County Natural Resources 2014:23). He had planted 30 acres of cherry trees and owned a fox farm and grazed horses in the winter. The fruit crops in the Hogback valleys were not viable by 1960 due to continued drought and a shortage of canning supplies caused by World War II (Aughenbaugh 2006). The remains of historic agriculture and quarrying along the hogback valleys are visible today and are an ever-present reminder of the multiple purposes the foothills were utilized for.

Hydrology Infrastructure

Infrastructure within the study area includes the Charles Hansen Feeder Canal that gravity-feeds water for about thirteen miles to Horsetooth Reservoir. It also supplements the water supply of the Big Thompson River, and feeds water to the Cache la Poudre River valley farms through Buckhorn Creek and through a network of historic irrigation systems. The water is fed from the Flatiron Reservoir located west of Loveland and south of Highway 34. The Hansen Feeder Canal was a part of the Colorado-Big Thompson Project (1938) that was a federal water diversion project to collect West slope mountain water from the Colorado River headwaters and divert it to the Front Range and plains (Autobee 1993:2).

The Hansen Feeder Canal was built between 1948 and 1953 and is a major concrete-lined waterway. It crosses through the northwestern portion of the study area. Louden Ditch is in the southern portion of the study area and is a historic irrigation ditch built in 1877 to feed farms in the Loveland area, supplying water to the Great Western Sugar Company. It now continues to be a water line for Loveland parks instead of using city water (Whitmore 1990:4).

Major roads demarcate the boundaries of the study area. Horsetooth Reservoir is just north of the study area and has considerably affected both the natural and cultural landscapes of the northern Front Range. Horsetooth Reservoir was constructed in 1949, as a part of the Colorado-Big Thompson Project run by the Bureau of Reclamation (Maxwell 2020). As a part of the reservoir's construction, the community of Stout at its southern end has been largely inundated, leaving historic building foundations underwater (Grant et. al 1988:i).

The construction of Horsetooth Reservoir has played a role in cultural site identification and preservation, even though it is not directly within the project area. Horsetooth Reservoir is popular as a recreation destination, which has promoted outdoor activities and tourism within the general area. There is a high probability that cultural resources are found by the public in this way, and are either vandalized, collected, or unfortunately destroyed because of it.

Open Spaces and Natural Areas

Trail systems in the study area include Rimrock Trail, the Devil's Backbone Trail, Prairie Ridge Trail, Ridge to Ridge Trail, Indian Summer Trail, Blue Sky Trail, and the Namaqua Skyline Natural Area trail. The Devil's Backbone Open Space, managed by Larimer County, includes 17.25 miles of trail that connect Rimrock Open Space and Horsetooth Mountain Open Space located north of CR 38 E (Larimer County Natural Resources 2014:24). The Blue-Sky Trail is the primary trail through the Devil's Backbone Open space which extends from Highway

34 (Eisenhower Blvd) up north to CR 38E at the southwest end of Horsetooth Reservoir. Between CR 38 E and Highway 34, the Blue-Sky Trail continues through the valley between Milner Mountain and the Lyons hogback ridgeline while following alongside Indian Creek.

The Rimrock Open Space, managed by Larimer County, connects to the Coyote Ridge Natural Area and to the Prairie Ridge Natural Area to its north and east and to the Devil's Backbone Open Space to its west. This land was originally part of the Rimrock Ranch. 270-acres were purchased from the then-owners, Jack and Beth White in 2000 while another 180-acres were acquired through a conservation easement in 2001 (Larimer County Natural Resources n.d: 1-3). The Coyote Ridge Natural Area is managed by the City of Fort Collins Parks and Recreation Department and was acquired between 1994 and 1997, while the Prairie Ridge Natural Area is managed by the City of Loveland Open Lands and Trails and was acquired in 2001 (City of Loveland Open Lands and Trails 2018).

The Prairie Ridge Natural Area was originally used for dryland farming and was re-seeded with native species once its farming lease ended (City of Loveland Open Lands and Trails 2018). The Namaqua Skyline is a planned open space which will be managed by the City of Loveland Parks and Recreation Department (LaBelle et al. 2017:3). The Namaqua Skyline open space consists of 166-acres just east of the Devil's Backbone Open Space off Highway 34. The property includes the location of the Loveland's Winter Holiday Council's Namaqua Star, which is lit up annually for winter and is a staple in the community. The property for the open space was acquired in 2015 and 2016 (Johnson 2016).

These open spaces and natural areas create a contiguous unit of conserved public land that spans more than four miles wide. This space offers recreational opportunities for the public in the form of hiking, horseback riding, mountain biking, and wildlife viewing. This area is recognized as an important ecological transition zone between the plains and montane forests which is sometimes also called the montane shrubland. This area has increasingly become open space and natural preserves to protect the diverse biotic community and water resources here, and to also provide more outdoor recreational opportunities in southern Larimer county (Larimer County Natural Resources n.d:1-3).

Today, this area consists of primarily a rural, residential community and farmland surrounded by open spaces and natural areas managed by the county, the city of Loveland, and the city of Fort Collins. Historic infrastructure for the care of the cherry orchard is still observable today with cisterns, building foundations, and a light scatter of historic artifacts located in the valleys and along the bases of the hogbacks. Significant culturally geographic landmarks include the Devil's Backbone located in the southern portion of the study area, Milner Mountain to the west, and the Dakota and Lyons hogbacks which divide the montane forests from the plains. This area has long captured the attention of people through history, from European explorers to settlers, to farmers and the historic indigenous populations including the Ute, Arapaho, Pawnee, Shoshone, Lakota, and Cheyenne (Larimer County Natural Resources n.d:1-2).

CHAPTER 3: PREVIOUS INVESTIGATIONS AND RESEARCH HISTORY

In this chapter, previous investigations and the research history of the area will be discussed. The goal of this chapter is to reflect on the long lineage of work that has been completed in the project area and emphasize the significance of legacy work to present and future research. A Class I cultural resource survey is provided in the *Conclusions* section of this chapter.

Early Archaeological Work, 1900s-1970s

Archaeological exploration in northern Colorado began in the early 1900s, with many cultural sites being discovered by the Coffin brothers who are Roy C. Coffin and Judge Claude Coffin of Fort Collins, Colorado (Renaud 1935:17). As amateur archaeologists, they were the first to recover artifacts from the world-renowned Lindenmeier site north of Fort Collins beginning in 1924, wherein they campaigned in 1930 for professional researchers to document the findings. They contacted Dr. E. B. Renaud, who recognized the projectile points as Folsom. This was merely the beginning of a long and complex history of archaeological studies along the western margin of the High Plains in Colorado.

Dr. Etienne B. Renaud was a faculty member of the Anthropology Department at the University of Denver from 1920 to 1948. His extensive contributions to systematic site recording and the understanding of High Plains prehistory began in 1929 when he directed a survey in the physiographic region of the High Western Plains of eastern Colorado, southern Wyoming, southwest South Dakota, and northern New Mexico (Renaud 1936, 1946). He published his expedition findings and archaeological conclusions in a collection of 12 reports and over 120 articles and scientific papers spanning 1927 to 1944 that are archived in the University of Denver

Special Collections Repository. With logistical and financial support provided early on by the University of Colorado's Museum of Natural History and continued support from the University of Denver, he and his crew members strategically surveyed the land based on site density and accessibility. Most of their site recording, however, occurred because of leads by locals and local collectors (Downing 1981:237-238). By 1943, his team recorded hundreds of prehistoric sites across Colorado and in surrounding states.

His fourth report, *The Archaeological Survey of Colorado: Seasons 1933-1934* (Renaud 1935), details his work in South-Central, Northern, and Eastern Colorado. Of interest for this thesis, is his exploration of the Upper South Platte and the Upper Arkansas River valleys, where he recognizes the contributions of both Edison P. Lohr, a student at the University of Denver at the time, and Mary Elizabeth Yelm, who both provided additional site and collection information to his studies (Renaud 1935:16-17). Based on original site index cards at the University of Denver Museum of Anthropology, Renaud recorded one site (5LR428) that was within the project area that was later recorded again by Lohr (5LR30). Mary Yelm likely visited many of Lohr's sites as a part of the completion of her master's thesis, [*An*] *Archaeological Survey of Rocky Mountain National Park-Eastern Foothill Districts* (1935).

Edison P. Lohr began collecting artifacts by 1926 and continued his interest in prehistory through his undergraduate work at the University of Denver. He is most notable for being a crew member (LaBelle 2017) on the excavations at the Lindenmeier site, one of the largest Paleoindian sites with Folsom cultural remains in North America located in northern Colorado. He was also a crew member for the excavations of Mantle's Cave, a rock shelter that provided extensive, perishable remains of the Fremont culture, located in Dinosaur National Monument in northwestern Colorado (LaBelle 2017). By 1947, he had recorded a total of 51 sites along the eastern foothills in Northern Colorado (Lohr 1947:1).

Mary Yelm (1935), a graduate assistant at the University of Denver at the time, recorded eight additional sites within the foothills in relation to Renaud's work, however none of the sites she documented are within the defined area of interest for this project. In the late 1940s, Lohr donated his artifact collection and field notes to the University of Colorado's Museum of Natural History (LaBelle 2017:5). His sites were then assigned trinomial numbers by Dr. Joe Ben Wheat, who was the first curator of Anthropology for the University of Colorado's Natural History Museum in 1953, and who held the position until 1988 (Mobley-Tanaka n.d).

With increasing federal mandates for cultural resource preservation related to the National Historic Preservation Act of 1966 and the National Environmental Policy Act of 1969, Larimer County's industrial and urban development necessitated cultural resource inventories (Coberly 1996:29). Dr. Elizabeth Ann Morris and Calvin H. Jennings were hired into the Colorado State University's Anthropology Department in 1970 and in 1972, respectively. Jennings was the head of the Laboratory of Public Archaeology (LOPA), which financially supported field projects and research (Coberly 1996:29). Dr. Elizabeth Morris directed several archaeological field schools that led to the recording of notable sites such as the Kinney Spring site (Perlmutter 2015) near Livermore, Colorado between 1983 and 1985.

Lauri Travis' Master's Thesis, 1986

Liz Morris collaborated with Lauri Travis, a graduate student at CSU, in surveying the foothills near Loveland, Colorado in 1986 (Travis 1986:3). Travis and Liz Morris lived near the project area at the time of Travis' site recording ventures, and therefore possessed a detailed knowledge of the area's geography and the presence of archaeological resources within it.

Travis ultimately documented 27 sites and seven isolates along the Dakota and Lyons hogbacks in the fulfillment of her master's thesis, *An Archaeological Survey in the Plains-Foothills Ecotone, Northern Colorado* (1986). Travis' work in the foothills was later published in a volume of *Plains Anthropologist* (1988:171-186). The artifact collection from her study is currently curated with the Archaeological Repository at CSU (AR-CSU). All the sites Travis recorded are within the area along the Lyons and Dakota hogback ridgelines and along the terraced, east-facing slopes.

For her work, Travis surveyed 2.5 miles of the hogbacks to determine the number of archaeological sites in the area and how they were located on the landscape in relation to environmental variables (Travis 1986:1-3). One of her goals for her thesis was to add to the chronology of the Northeastern foothills at the time, and to determine why prehistoric peoples preferred the foothills to other geographic locations based on ecological attributes. The sites she recorded date from the Early Archaic period to the Protohistoric period and were dated using the associative-based method of artifact type (Travis 1986). Travis (1986) concludes that most sites date between the Early Archaic to Late Archaic periods (7,500-1,900 B.P.) (Brunswig 2016:49).

The Sprenger Valley Field School, 1988

In the continuation of the findings by Renaud, Lohr, Liz Morris and Travis, Calvin Jennings conducted the CSU field school north of Travis' project area and within the confines of the Lyons and Dakota hogbacks (Jennings 1988). Calvin Jennings' field school recorded a total of 18 prehistoric and historic sites, most of which were on the hogback ridge tops, in similar fashion to sites found by Travis (Jennings 1988). One multicomponent site (historic and prehistoric), one historic site, one historic isolated find, and only a few prehistoric sites and isolates were located within the valley between the two hogback formations, which is recognized as Sprenger Valley (Jennings 1988).

During the field school season in 1988, all the sites were formally mapped and were recorded using State Historic Preservation Office (SHPO) field inventory forms. Artifacts were collected from each site for analysis, along with select ^{14}C and macro-botanical samples for future radiocarbon dating and for botanical analysis. Two sites were tested and salvage-excavated based on the possible extent of subsurface cultural deposits and due to the extent of site disturbance (5LR1150 and 5LR1157) (Jennings 1988). After collection and initial analysis, most of the artifacts were given back to the Sprenger Valley landowner, Mr. Donald Aten. The remaining artifacts and the radiocarbon and botanical samples were curated with LOPA and are now in the Archaeological Repository at Colorado State University (CSU). The field school's findings were not published after the fieldwork was completed, and final site forms were not submitted to the Colorado SHPO. The site forms and field school documents are currently housed at the Archaeological Repository at CSU and were made available for this thesis.

Cultural Resource Management Firm Work, 1990s-2000s

In the 1990s and in the early 2000s, both the University of Northern Colorado and CRM firms continued archaeological work in the general area, including excavations of notable sites such as Echo Cave (Brunswig 1990) and the Valley View site (Brunswig 1999, 2016). Echo Cave is an Early Ceramic sheltered campsite near the Big Thompson River (Black 2008). The Valley View site is an important Early Ceramic pithouse site located along a hogback slope near the Big Thompson River. It contains a stone 'tipi' ring and a stone-walled pit structure (Black 2008, Brunswig 1999, LaBelle et. al 2016). Additionally, contract offices such as the Powers Elevation Co., Inc. based out of Aurora, Colorado and Retrospect of Fort Collins conducted cultural resource inventories in portions of the project area for the City of Fort Collins Planning Department as well as for the Bureau of Reclamation (Marmor 1995).

The Powers Elevation Co., Inc. surveyed the southern shoreline of Horsetooth Reservoir between 1989 and 1990, evaluating twenty-four historic sites, one multicomponent site, one paleontological site, and two historic isolated finds (Mutaw et al. 1991). Two of these historic sites are located within the northern section of the project area (5LR1415 and 5LR1418). From 1994 to 1995, Retrospect conducted their own archaeological and historical survey related to the historic Overland and Cherokee Trail routes which cross through the easternmost section of the project area and parallel the hogback ridges traveling generally north-south. One prehistoric ground stone isolate (5LR1861) was recorded within the northeastern project area bounds by Retrospect during their reconnaissance survey of the Overland and Cherokee Trails (Marmor 1995).

There were twelve additional surveys that took place within the project area during the 1990s and early-2000s. James Enterprises, Inc. recorded 5LR11069 (historic dugouts) when surveying land for the proposed Blue-Sky Trail (2005:5). Centennial Archaeology, Inc. recorded one prehistoric isolate (5LR11875) outside of the study area during their survey for the proposed Dixon Creek to Horseshoe transmission line that crossed through the project area (Painter 2008:22). No prehistoric cultural resources were located within the study area during all twelve of these remaining inventories (Austin 1994; Bretchel 2005; BRW, Inc. 1990; Burton 2006; Gilmore 2007; Harrison 1990; Jepson 1995, 2005; Mutaw 1991, 2001; Painter 2008; Patterson 1996). During their survey for road improvements, BRW, Inc. could not relocate 5LR48 and 5LR50 which are projected to be within the project area and were originally recorded by Lohr (1947) (BRW, Inc. 1990:2).

Archaeological work that took place in the last decade within the project area include one cultural resource inventory by Cultural Resource Analysts, Inc. in 2014, who conducted a survey prior to construction and improvements of two pump stations, a water tank and water lines on private land. Centennial Archaeology, Inc. documented three historic resources related to development and transportation (5LR13318.2, 5LR13378.5, and 5LR13381.4) and revisited a historic bridge (5LR9522) during their survey in 2015 (no report on file). The latest cultural resources surveys have been conducted by the Center for Mountain and Plains Archaeology (LaBelle 2014, 2017; LaBelle et al. 2017).

Center for Mountain and Plains Archaeology, 2000s-2010s

The Center for Mountain and Plains Archaeology has long conducted research in the foothills. In 2007 and 2008 for example, the CMPA renewed research at the significant site of Spring Canyon, a multicomponent prehistoric campsite located 0.1 miles north of the project area and just east of Horsetooth Reservoir. It is one of the largest and most diverse sites in the northern Colorado foothills and spans the Paleoindian to the Late Prehistoric periods (LaBelle 2008, Pelton et. al 2016).

The CMPA is dedicated in researching the history and prehistory of the human-environmental interaction by working with a multitude of partners such as the U.S. Forest Service, U.S. National Park Service, Bureau of Land Management, City of Fort Collins Natural Areas Program, Larimer County Department of Natural Resources, Fort Collins Museum of Discovery, and private landowners. Much of this work includes fieldwork such as excavation and pedestrian survey, as well as lab research on artifact collections. At the same time, CSU undergraduate and graduate students gain valuable experience and insight into the archaeological process of research design, analysis, and presentation of results.

Within the study area, the CMPA conducted pedestrian surveys of the Namaqua Skyline (2017), along the Blue-Sky Trail (2017), and within the Devil's Backbone Open Space area (2014). The Namaqua Skyline was surveyed for a proposed trail management plan by the City of Loveland Parks and Recreation Department (LaBelle et al. 2017), while the Devil's Backbone was surveyed prior to new trail construction by the Larimer County Parks and Open Space division (LaBelle 2014:1). Site 5LR30, a prehistoric camp originally recorded by E. P. Lohr in the 1940s was revisited during the Devil's Backbone survey but was not positively relocated (LaBelle 2014:3). A dart fragment was found in proximity to the site location of 5LR30. This midsection was made of a purple chert with dendritic inclusions and illustrates a portion of a dart or spear point older than 2,000 years in age based on its form and design (LaBelle 2014:3).

During the CMPA's Namaqua Skyline Open Space survey in 2017, three prehistoric finds originally recorded by Lauri Travis were also revisited, but no new artifacts or features were relocated (5LR.972, 5LR.175 and 5LR.955). The Namaqua Skyline field survey included the recording of five, likely historic sites and one rock shelter with a prehistoric association, three likely prehistoric rock shelter sites, as well as one site with an undetermined age (LaBelle et al. 2017:20). The isolate of unknown age includes a stone core and a glass fragment (Temp Site No. NS-2017-9). Based on its close association with the trail and modern debris, it is highly probable that the isolate is modern or historic in age rather than prehistoric. One of the rock shelters included one lithic flake (Temp Site No. NS-2017-5) while the other two have unknown cultural components (Temp Site No. NS-2017-6 and NS-2017-7) (LaBelle et al. 2017:20). The potential for subsurface cultural deposits for all these sites is high due to the frequency of known rock shelters in the area with prehistoric components (LaBelle 2014; Travis 1988) and the increased likelihood of preservation of cultural materials in a sheltered context where remains are much more protected from the elements and are not as easily observable or accessible by the public.

In 2017, two newly discovered projectile point fragment isolates were found and collected (5LR.14330 and 5LR.14331) on two separate occasions by Bob Loomis and Joel Schwab, both employees of Larimer County Parks and Open Lands, who turned in the projectile point fragments to the CMPA-CSU after they discovered them on the Blue-Sky Trail (Meyer 2017). One of the isolates is a tan fine-grained quartzite midsection that resembles a Late Archaic dart point due to its morphology (5LR.14330), while the other is a Late Archaic dart points alike to the Pelican Lake type (5LR.14331). Both the 5LR.14330 and 5LR.14331 locations were revisited by the CMPA to determine if any other cultural materials were present. No other artifacts were observed at these locations during an informal survey. Both projectile point isolates were discovered on or adjacent to the Blue-Sky Trail, which is an extremely popular recreational trail. The projectile point fragments were formally recorded on SHPO inventory isolate forms and submitted to the state preservation office.

Additional research was completed in the project area by Ashley Packard between 2013 and 2015 with support provided by the CMPA and Dr. Jason LaBelle (Packard 2015). Packard was an undergraduate student at Colorado State University at the time. Her Honors Anthropology paper, *Steatite Vessels in Northern Colorado and the Concept of Prehistoric Borders* (2015), examined the spatial distribution of steatite vessels and steatite sources to examine prehistoric cultural relationships between indigenous groups in the Wyoming Basin and Southern Rocky Mountains. Steatite is a soft, metamorphic rock that was used by indigenous populations to carve into bowls, figurines, beads, tubular pipes, and atlatl weights (Packard 2015: 2-3) and is attributed to the Protohistoric period (650-85 B.P.) (Brunswig 2016:49) through association-based dating techniques, manufacturing marks by metal tools on the artifacts, and now by residue analysis of the Wenborg Vessel (Packard 2015: 27). The epicenter of steatite vessels is northwest Wyoming and in the adjacent parts of Idaho and Montana (Benedict 1985:23).

The Wenborg Vessel was found southeast of Horsetooth Reservoir on the Dakota hogback ridgeline and had been located cached underneath a large boulder. It was discovered by Tim Wenborg in 2012 while he was hiking on private property (Packard 2015: 10). Craig Wenborg, who was Tim Wenborg's father, contacted Dr. Jason LaBelle regarding the discovery. The Wenborg vessel was then analyzed in 2012 by Dr. Jason LaBelle, students from the CMPA, Dr. Richard Adams, who is a well-known steatite expert, and by Linda Scott Cummings and R.A. Varney from the PaleoResearch Institute (PRI). ^{14}C samples and pollen/phytolith/Fourier-Transform Infrared Spectroscopy (FTIR) samples from interior and exterior washes of the vessel were taken and the results were discussed in a final report written by the PRI team (Packard 2015: 10-11).

The results indicate that the vessel was most likely a cooking vessel illustrated by an accumulation of carbon on the exterior of the artifact, and that grass seed utilization was taking place based on grass seed presence within the interior of the vessel (Packard 2015: 13-14). Produced AMS radiocarbon dates of the vessel demonstrate its use during the Late Formative/protohistoric period or Historic period (Packard 2015: 14; Cummings et al. 2013: 12). After identifying spatial and temporal distribution patterns of all the available steatite data, Packard concludes that the spatial pattern observed reflects territorial boundaries of the Protohistoric Eastern Shoshone or that of Comanche ethnogenesis (Packard 2015: 33).

Chapter Conclusions

Based on the findings of cultural resource inventories that have taken place, as well as in conversations with the study area community during fieldwork conducted for this thesis, there are additional cultural resources that have not yet been professionally recorded. The area represents a mixed-use interface, with recreation, industry, and exurban development playing key roles in both potential site preservation and data disturbance. It is crucial that archaeological reconnaissance continues within this area as nearby urban centers continue to grow in population and public desire for access to outdoor recreational space increases (Travis 1986:128). As with much of what has already been recorded throughout the years, contact with local communities and private landowners is crucial in identifying additional sites.

The work of E. B. Renaud, E. P. Lohr, Mary E. Yelm, and Elizabeth Morris represent the first academic reflections of what the archaeological record looks like within the project area. Their legacy continues to provide data that will advance our knowledge on prehistoric lifeways and utilization of this landscape. Lauri Travis' thesis research produced an exceptional framework for further examination. Completed in the 1980s, her academic findings of archaeological sites in the foothills and her conclusions on their relationship to environmental conditions (Travis 1986) continue to be used for analysis today. Her analysis indicates the remarkable proximity of sites to one another which is reflected within the broader pattern of site distribution across the project area, with hotspots of prehistoric sites and cultural activity. These concentrations are intensively linked to the first Dakota Hogback, which as described by Travis (1986) in her thesis, represents the very definition of an "ecotone."

Dr. Calvin Jennings' work with the Colorado State University Archaeological Field School enabled the recording of multiple sites previously unknown by researchers. With these recordings was the collection of artifacts and macrobotanical samples that provided an opportunity for research during the present analysis. In addition, site provenance information is submitted to the State Historic Preservation Office for database and archival entry.

More current work, such as that of the CMPA, has played a steady role in the identification of cultural resources in and around the project area throughout the years. They have aided in illustrating the archaeological layout of sites along the foothills and how sites may have transformed through the years. Research conducted provides exceptional information on the landscape's temporal use beginning in the Archaic and continuing into the Historic period.

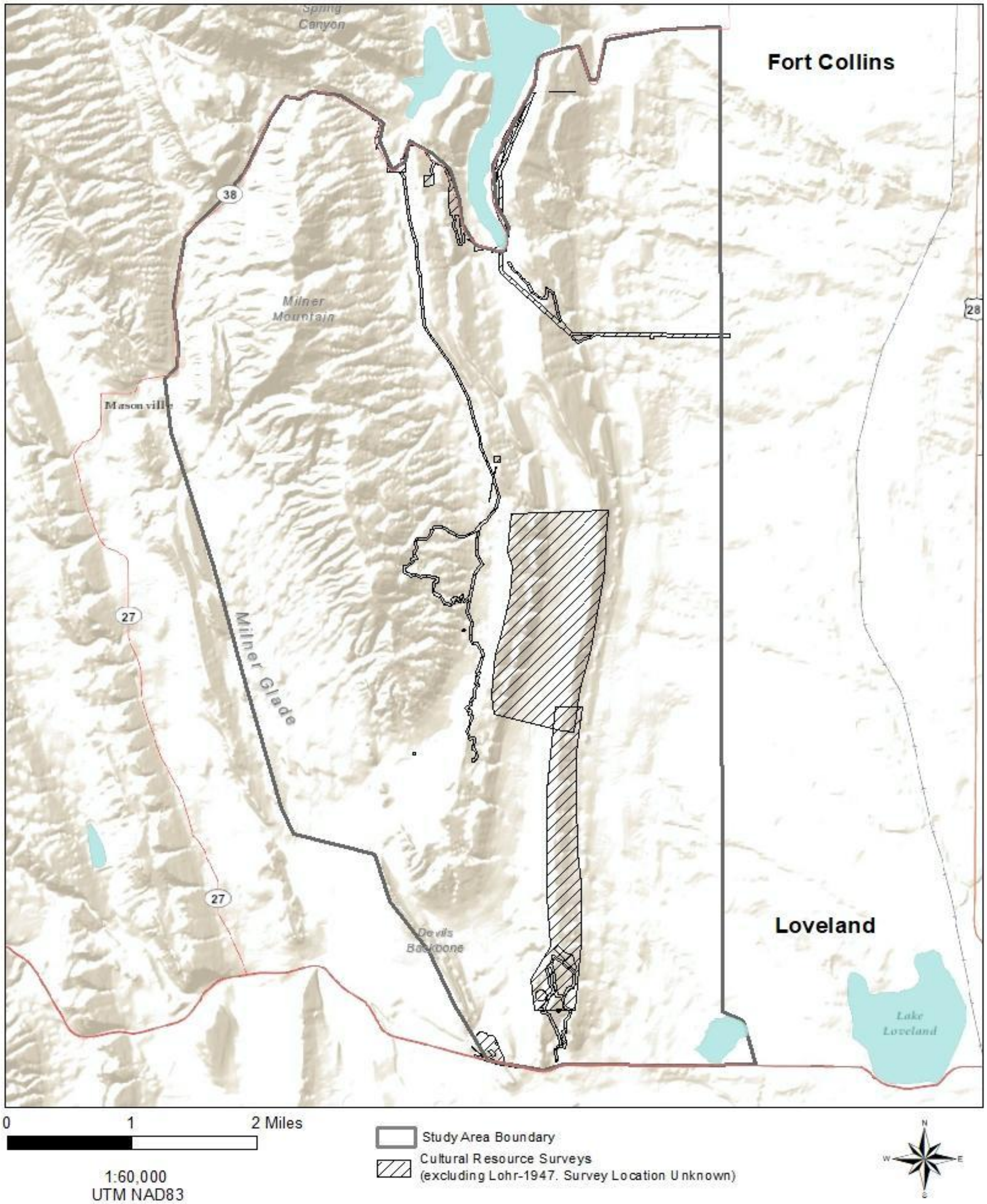


Figure 4. Previous Cultural Resource Surveys in the Project Area.

Table 7. Class 1 Literature Review of All Previously Recorded Prehistoric Sites and Isolates within the Project Area.

Smithsonian No. and Name	Original Site Type: Period(s)	Field Eligibility	NRHP Eligibility	Recorder(s)
5LR.29	Lithic Scatter: Prehistoric	Unspecified	None	Lohr UCM 1947
5LR.30/ 5LR.428	Lithic Scatter: Prehistoric	Needs Data>Not Eligible (2014)	None	Renaud 1935 ------------------ Lohr UCM 1947 ------------------ CSU CMPA 2014- Not Relocated
5LR.31	Open Camp: Prehistoric	Needs Data	None	Lohr UCM 1947
5LR.40	Open Architectural: Prehistoric	Unspecified	None	Lohr UCM 1947
5LR.42	Open Camp: Prehistoric	Unspecified	None	Lohr UCM 1947
5LR.48	Open Camp: Prehistoric	Unspecified	None	Lohr UCM 1947
5LR.49	Open Camp: Prehistoric	Unspecified	None	Lohr UCM 1947
5LR.50	Open Architectural: Prehistoric	Unspecified	None	Lohr UCM 1947
5LR.52	Open Architectural: Prehistoric	Unspecified	None	Lohr UCM 1947
5LR.155	Open Camp: Late Prehistoric	Not Eligible	None	Travis CSU 1978
5LR.156	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1978
5LR.157	Sheltered Camp: Prehistoric	Not Eligible	None	Travis CSU 1978
5LR.175	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1979 --------------- CSU CMPA 2017- Not Relocated
5LR.176	Quarry: Prehistoric	Not Eligible	None	Travis CSU 1979
5LR.641	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.642	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.939	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.940	Lithic Scatter: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.941	Lithic Scatter: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.942	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.943	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.944	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983

5LR.945	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.946	Lithic Scatter: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.947	Lithic Scatter: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.948	Lithic Scatter: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.949	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.950	Open Camp: Prehistoric	Needs Data	None	Travis CSU 1983
5LR.951	Sheltered Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.952	Sheltered Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.953	Lithic Scatter: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.954	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.955	Quarry: Prehistoric	Not Eligible	None	Travis CSU 1983 CSU CMPA 2017- Not Relocated
5LR.956	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.957	Open Camp: Prehistoric	Not Eligible	None	Travis CSU 1983
5LR.958	Sheltered Camp: Prehistoric	Needs Data	None	Travis CSU 1986
5LR.972	Isolate: Late Archaic Projectile Point (2000 BC-AD1)	Not Eligible	None	Travis CSU 1983 -------------- CSU CMPA 2017- Not Relocated
5LR.973	Isolate: Prehistoric Core	Not Eligible	None	Travis CSU 1983
5LR.975	Isolate: Prehistoric Ground stone	Not Eligible	None	Travis CSU 1983
5LR.976	Isolate: Prehistoric Flake	Not Eligible	None	Travis CSU 1983
5LR.977	Isolate: Prehistoric Ground stone	Not Eligible	None	Travis CSU 1983
5LR.978	Isolate: Prehistoric Ground stone	Not Eligible	None	Travis CSU 1983
5LR.981	Isolate: Archaic Projectile Point	Not Eligible	None	Travis CSU 1983
5LR.1148	Sheltered Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1150	Open Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1151	Lithic Procurement: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988

5LR.1152	Open Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1153	Sheltered Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1155	Open Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1156	Open Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1157	Sheltered Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1158	Open Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1159	Open Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1160	Open Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1161	Sheltered Camp: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1162	Lithic Scatter: Prehistoric	Unspecified	Not in Compass	CSU LOPA 1988
5LR.1168	Isolate: Ground stone	Not Eligible	None	CSU LOPA 1988
5LR.1169	Isolate: Ground stone	Not Eligible	None	CSU LOPA 1988
5LR.1861	Isolate: Ground stone	Not Eligible	None	Marmor 1994
5LR.14330	Isolate: Late Archaic Projectile Point	Not Eligible	Not in Compass	CSU CMPA 2017
5LR.14331	Isolate: Late Archaic Projectile Point	Not Eligible	Not in Compass	CSU CMPA 2017
Temp: NS-2017-5	Prehistoric	Needs Data	Not in Compass	CSU CMPA 2017
Temp: NS-2017-6	Rock Shelter	Needs Data	Not in Compass	CSU CMPA 2017
Temp: NS-2017-7	Rock Shelter	Needs Data	Not in Compass	CSU CMPA 2017
Temp: NS-2017-10	Lithic Raw Material Source	Needs Data	Not in Compass	CSU CMPA 2017
----	“Wenborg Vessel” Steatite Vessel	Unspecified	None	2012

Table 8. Class 1 Literature Review of all Previously Recorded Multicomponent Sites and Isolates within the Project Area.

Smithsonian No. and Name	Site Type: Period(s)	Field Eligibility	NRHP Eligibility	Recorder and Reference(s)
5LR.1149	Multicomponent: Prehistoric Open Camp and Historic Isolate	Unspecified	Not in Compass	CSU LOPA 1988

Smithsonian No. and Name	Site Type: Period(s)	Field Eligibility	NRHP Eligibility	Recorder and Reference(s)
Temp: NS-2017-9	Isolate: Unknown Age, Stone Core with Glass	Not Eligible	Not in Compass	CSU CMPA 2017
5LR.1154	Agriculture/Irrigation: Historic and metate fragment	Unspecified	Not in Compass	CSU LOPA 1988

Table 9. Class I Literature Review of Known Project Reports that recorded prehistoric sites within the Study Area.

Report ID	Date	Report Title	Author/Association
CMPA Archaeology Report 2017-6	2017	Namaqua Skyline: Cultural Resource Survey in Southern Larimer County, Colorado	LaBelle, Jason, Michelle Dinkel and Kelton Meyer/CMPA, Colorado State University, Fort Collins, Colorado
CMPA Archaeology Report 2014-03	2014	Block Survey Of A Southern Parcel Of The Devil's Backbone Open Space, Larimer County, Colorado	LaBelle, Jason/ CMPA, Colorado State University, Fort Collins, Colorado
LR.LG.R17	1995	An Historical And Archaeological Survey Of The Overland/Cherokee Trails Through The Fort Collins Urban Growth Area, Larimer County, Colorado	Marmor, Jason/Retrospect Cultural Resource Firm for the City of Fort Collins Planning Department, Fort Collins, Colorado
N/A	1986	An Archaeological Survey in the Plains-Foothills Ecotone, Northern Colorado. MA Thesis.	Travis, Lauri/Colorado State University, Fort Collins, Colorado
N/A	1947	Indian Camp Sites from Northern Colorado (Larimer County). Unpublished report on file.	Lohr, Edison P./University of Colorado Museum of Natural History, University of Colorado, Boulder, Colorado
N/A	2015	Steatite Vessels in Northern Colorado and the Concept of Prehistoric Borders	Packard, Ashley/Colorado State University, Fort Collins, Colorado
PRI Technical Report 12-151	2013	Pollen, Phytolith, Starch, and Organic Residue (FTIR) Analyses and AMS Radiocarbon Dating of a Steatite Bowl from Horsetooth Reservoir, Colorado	Cummings, Linda Scott, Chad Yost, Melissa K. Logan, R.A. Varney, and Kathryn Puseman/PaleoResearch Institute, Golden, Colorado

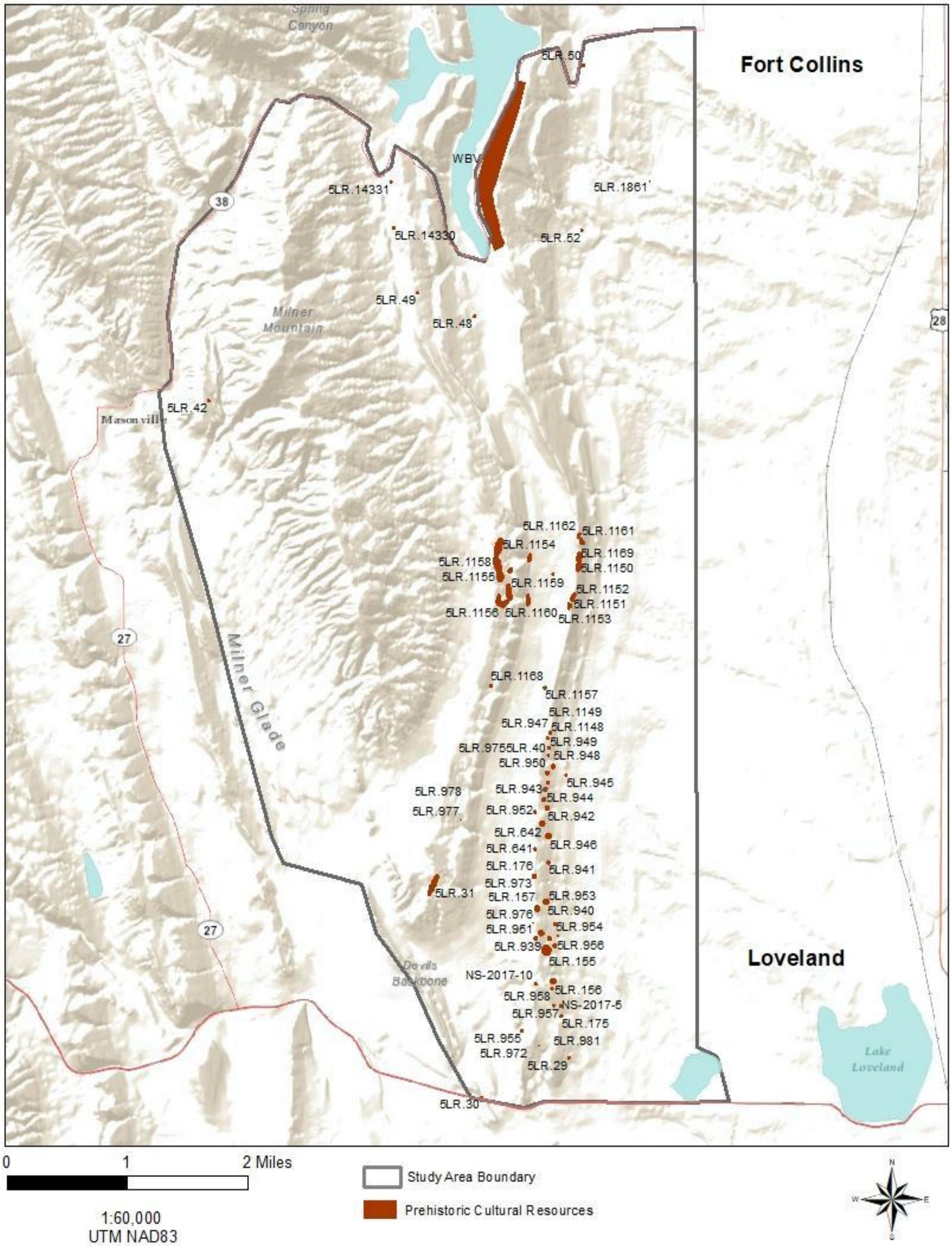


Figure 5. All sites with prehistoric components in the project area.

CHAPTER 4: DESCRIPTION OF STUDY AREA ARTIFACT COLLECTIONS

Archaeological work within the project area was summarized in Chapter 3. In Chapter 4, site inventories are examined in detail. Several data sources were considered within the author's analysis of site distribution and cultural use of the surrounding landscape. Two artifact collections required additional, newly formulated work to enable any type of site analysis, and further support and improve upon existing datasets. These collections were the Lohr assemblage (1947) and the Sprenger Valley assemblage (1988) and are reviewed in the first part of this chapter. The Travis (1986) artifact collection and all other assemblages are summarized towards the end of this chapter.

The Edison Lohr archaeological collection provides a multitude of avenues for further study in prehistoric lifeways. For this investigation, the Lohr assemblage offered a means to recognize toolkit diversity and site distribution within time and in space. After being provided by the University of Colorado to the CMPA, the collection was catalogued and numerically organized by SHPO site numbers by several CMPA student employees. The sites were identified and subsequently inventoried by the author. Artifact IDs were compared between those written on the artifacts themselves and those written in Lohr's 1947 report. Finalized inventories were submitted to the University of Colorado, along with the catalogued assemblage.

During its housed presence at Colorado State University, Lohr's artifact collection was suitable for a variety of purposes, including provisioning undergraduate classes with practical examination of artifact types and a further recognition of collaborative, curation protocols.

Another dataset processed in this thesis was that of the 1988 Colorado State University archaeological field school in the Sprenger Valley (Jennings 1988). The principal investigator of the Sprenger Valley field survey was Calvin Jennings, a previous CSU archaeological professor and researcher. For this investigation, he prepared a team of students to conduct fieldwork in the Sprenger Valley for their archaeological field school (Jennings 1988). This study had three goals that formed the purpose of the resulting cultural resource inventory. These goals were 1) to gain further insight into prehistoric lifeways in the northern Colorado Front Range, 2) to provide a means of conservation of archaeological data, and 3) to enable field experience for undergraduate and graduate students (Jennings 1988).

Upon my own artifact analysis, most of the nomenclature from prior research was utilized (Jennings 1988; Lohr 1947; Travis 1986). Some of the retouched and utilized flakes were newly identified for both the Lohr and Sprenger Valley artifact assemblages. Additional re-classification of other tool types and lithic types occurred for both assemblages. For example, Lohr had additional artifact classifications of “retouched chips” or “utilized chips” (1947).

The sites used in this thesis were previously recorded, with given site types by the initial investigators. Some of these site types were re-defined for this study based on the standard Colorado site types used compared to the original site types considered forty years ago. These basic site types are used in accordance with the site types currently used in the State Historic Preservation Office’s NRHP compliance guidelines. General site categories that are used in this inventory include Open Camp, Sheltered Camp, Open Architecture, Sheltered Architecture, Open Lithic, Quarry, and Isolated Find. These site types are based on the artifacts and features present at sites, the environmental settings they are situated in, and the frequency of artifact types compared to one another demonstrated at each locality.

The Edison Lohr Surface Artifact Collection

The E. P. Lohr assemblage was loaned by the University of Colorado in 2019 to the Center for Mountain and Plains Archaeology laboratory for analysis and examination by the author and by an undergraduate Archaeology class taught by Dr. LaBelle. Once received, the collection was re-organized and inventoried by Smithsonian site and artifact IDs and compared to the catalogue written by Lohr in 1947 in his report, *Indian Campsites from Northern Colorado (Larimer County).*

In his report, Lohr describes the purpose behind his archaeological investigations in the area. The 51 sites included in his report were collected over 22 years and mostly took place in the 1930s. Lohr himself recognizes the significance of what we have lost in terms of data potential due to artifact collecting of these sites by the public (this is by the late 1940s, some 70+ years before this thesis), and how continuing to remain ignorant of these privately-held assemblages by not interacting with the community is undoubtedly limiting research along the foothills of the Northern Front Range (1947: 1). Therefore, he actively worked with artifact collectors due to their overwhelming knowledge about the areas in which they located cultural resources.

His site inventories in his report are framed upon the interviews and conversations he has had with artifact collectors on what cultural material and remains they have observed in the field (Lohr 1947). He then located these sites and recorded them based upon his observation of cultural material that remained. For example, there are a few site narratives he provides which mention the presence of stone rings based on his discussions with local collectors, or where there are a variety of artifact types collected prior to his investigations that he did not find at the site during his fieldwork (Lohr 1947).

In total, there are nine cultural resources Lohr (1947) located within the project area. Locations discussed by Lohr in his 1947 report were compared with those provided as ArcGIS shapefiles by SHPO. SHPO site locations are possibly mislocated up to 0.2-miles from the sites' recorded locations. Eight cultural resources are sites (5LR29, 5LR30, 5LR31, 5LR40, 5LR48, 5LR49, 5LR50, and 5LR52) while one is classified as an isolated find (5LR42). The isolated find (5LR42), a prehistoric knife, was inventoried as missing from the collection when all artifacts were catalogued at the CMPA laboratory when received by the University of Colorado-Boulder. A basic description of the knife was provided in Lohr's 1947 report.

Figure 6. Sample of formal lithic tools from site 5LR30. The Edison Lohr Collection, University of Colorado-Boulder. Photo taken by the author (2019). Photo No. 610- Left to Right: FS1, FS2, FS3 (drill), FS8 (Plains side-notched projectile point).

The total number of artifacts analyzed from the CU Lohr collection is 448. The total number of artifacts Lohr reported in 1947 is 461. Thirteen of these artifacts appear to be missing from the collection prior to when the loan was received by the CMPA. Missing artifacts primarily consist of ground stone and lithics including flakes and tools. Artifact classes such as knives, cores, and bifaces were kept based on the original classifications given in Lohr's 1947 report. For the toolkit diversity index, these classifications were summarized into 13 artifact types to be able to compare the assemblage to others. Material type for each artifact was provided within Lohr's report, however raw materials sources are not. Critical measurements such as weight (gm) and greatest thickness (mm) were measured for every artifact. Size grade (G1-G3) was measured for all flakes. For tools, max width (mm) and max length (mm) were also taken. Projectile points had additional measurements such as greatest length (mm), shoulder width (mm), neck width (mm), and basal width (mm).

Morphology is described, and the portion of the projectile point present if not complete is identified. Many of the projectile points are incomplete and missing important analytical characteristics such as bases, shoulders, stems, or notches, as well as midsections. This was also recognized by Lohr as a potential issue for the projectile point collection represented at the sites he visited and recorded (1947:5). The primary, diagnostic feature of a projectile point is the base (Ricken and Todd 2020b:131). If the base was not present, there was a high likelihood the projectile point could not be properly typed in the collection. Rather, these were generally identified as an "unspecified" Archaic or Late Prehistoric projectile point during analysis based upon the tool's overall size and likelihood of use in an atlatl or bow weaponry system.

In total, 64 out of 165 projectile points were typed by the author that were from the Lohr collection. This represents approximately 39% of the total projectile points used in this analysis. The rest of the projectile points were too fragmentary to discern a projectile point style. Lohr (1947) identified many of the projectile points that he recorded as "Yuma" points and described the Yuma points as "stemmed arrowheads." The classification of Yuma is a previously used term for points that represents Late Paleoindian-Cody Complex projectile point styles (Brunswig 2016:83) now recognized as Eden/Scottsbluff and Kersey that were found in the central and high plains such as those found in eastern Colorado. The name is derived from Yuma County, Colorado where they were first discovered (Bradley and Stanford 1987; Justice 1987).

The points originally characterized as Yuma had diagonal flaking patterns and the bases are ground which would have helped with hafting of the point to a shaft (Lohr 1947:6). As typologies have changed, these projectile points were identified as either Kersey, Allen, Eden/Scottsbluff, or Plainview points based on the different characteristics they illustrated. Lohr himself agreed that such re-classifications of artifacts should be expected by other researchers through time (1947:2).

Other lithic tools such as scraper types were further distinguished by Lohr and defined as either side scrapers, notched scrapers, or as end/thumb scrapers. For standardizing artifact types in this thesis, the author placed all scrapers into one category (scrapers). Other artifact types provided by Lohr include *flaked blanks* and *amorphous discoids*. Lohr defines these as large chunks of lithic material that were used to obtain flakes from (1947:9). Based on this definition, as well as a physical examination conducted on the artifacts themselves, these were classified as lithic cores for the purposes of this study.

The Sprenger Valley Artifact Collection

The Sprenger Valley artifact collection required field visits to the Sprenger Valley community west of Loveland and an additional informal survey was completed at the most significant sites that were recorded during the 1988 field school.

Archaeological research in the valley occurred for five weeks in the summer of 1988 under the direction of Calvin Jennings, a Colorado State University professor and researcher.

Several undergraduate and graduate students from CSU participated in the fieldwork. Mary Painter, who was a crew chief and a graduate student on the project at the time, later became an archaeologist and was key in providing corroboration in the implementation of this thesis project, as she now resides in the Sprenger Valley foothills. The resulting field school fieldwork led to a considerable amount of data including artifacts and radiocarbon samples, hand-drawn study area and site maps, fieldnotes, feature descriptions, as well as site and isolate forms.

The survey area for the field school totaled approximately 820-acres along the bottom of the Sprenger Valley and along the adjoining hogback ridgelines and terraces. Key areas were chosen for the survey based on the likelihood of containing sites. Sprenger Valley is located between the Dakota and Lyons Hogback ridgelines that run north-south through the project area. Spring Glade Road runs down the length of the valley after crossing over the Dakota hogback from the southeast. The land where the survey took place was originally the Sprenger Valley Estates and Aten Valley Ranch, which was owned by Mr. Donald Aten since the 1970s. Aten granted access to his property to Calvin Jennings and his students for their field school in 1988. Mr. Aten later sold his land in separate parcels for a proposed housing development, which became recognized as the Sprenger Valley community.

Calvin Jennings' field school methodology consisted of pedestrian survey with test excavation and salvaging occurring at sites where there was possible high disturbance of cultural deposits, such as near a road, or where there was high potential to find subsurface archaeological materials, such as along the terraces of the hogbacks or under rock overhangs. Sample survey blocks were completed where there was potential for site discovery based on these environmental settings.

Site testing and excavation occurred at sites with high potential for subsurface deposits, with both soil samples and ^{14}C samples collected from cultural features such as fire pits to enable future chronometric and subsistence studies. Such macro and micro-botanical samples were taken at sites 5LR1150 and 5LR1157. Most of the collection (99%) was kept with Mr. Aten and his family.

In total, the field school recorded fourteen sites that were determined to be prehistoric in age. Seven of these sites were open camps, three sheltered camps, one was determined to be a lithic procurement site, two were inferred to be used for food processing, and one site included both a sheltered and unsheltered locality. Two sites are multicomponent (5LR1149 and 5LR1154). 5LR1149 is a prehistoric open camp that includes one violet-colored glass shard. 5LR1154 functioned as a water storage tank for cherry orchards previously grown in the valley, but also includes one metate fragment. Three isolates (5LR1168, 5LR1169, and 5LR1170) were documented as well. Two of the isolates are ground stone (5LR1168 and 5LR1169) while one is a historic violet-colored glass fragment (5LR1170).

5LR1157 underwent limited testing by the field crew to determine the extent of subsurface cultural deposits. The field crew set up three test 2x2m test pits adjacent to one another downslope and southwest of the rock shelter where it was determined that cultural material was eroding out. This was also based on dark sediment and artifacts located in the road cut. Excavations demonstrated a thin humic layer above colluvial sediment. The colluvial sediment layer had a thickness between 40-50 cm. Debitage flakes were recovered from this layer. Beginning at 50-60 cmbgs (centimeters below ground surface), there was a relatively intact sandy loam layer with small gravels. This layer provided a cord-marked pottery sherd, and this level also contained a firepit where a charcoal sample was taken from. Comparatively, 5LR.1150 was test salvaged due to the extent of damage that occurred to it because of road grading and construction.

A road running north-south cuts through most of the site and through 5LR1151 and 5LR1152. This road was a previous fire-access route for the fire department. Soil at the site consists of a sandy loam with gravel intrusions and approximately 30 cm of deposition. Blackened sediment exemplifies areas of possible midden deposits or large ash mounds where artifacts are also concentrated. Three stone rings are concentrated in the southern portion of the site. One of them has an associated antechamber. The artifact scatter includes ceramics, chipped stone flakes and tools (projectile points and scrapers), a variety of ground stone, and fire-cracked rock. Less than 1% of the site was collected as part of a grab sample. Two of the stone rings were sketched during the field school (Jennings 1988). Most of the fire pit features were defined by blackened, ashy soil, oxidized fire-cracked rock, a concentration of artifacts, as well as irregular stone patterns.

The site consists of three stone-ring features, eleven fire pits, as well as an artifact scatter. It represents a large campsite possibly used during the winter. There is evidence for camp activities, food processing, and lithic reduction. The site also has an excellent view shed of the Plains and valley bottoms to the east, north, and south. The location is on top of the eastern slope of the first Dakota hogback on a 12% slope grade. The western boundary is defined by a sandstone rock outcrop while the eastern boundary is defined by a steep slope to the valley below.

Upon the 2018 re-visitation, two possible hearth features were relocated within the deflated roadbed. One of the features is located towards the northern portion of the site while another was relocated near the present fence line to the south. A light scatter of lithics and ground stone were observed in the vicinity of the features, particularly near the northernmost fire pit. Artifacts may be continuing to erode from the roadbed due to its significant disturbance through the site. The southern portion of the site where the stone rings are present was unable to be re-visited because of limited access. Two “disturbed areas” are exhibited on the original site sketch map in the northern portion of the site; neither of these were uniquely definable from the natural geography demonstrated.

Site forms were written following the conclusion of the field school; however, the data was not formally sent to the State Historic Preservation Office (SHPO), which maintains archaeological records for the state. One of the ancillary goals of this thesis is to complete the formal site form process for these recorded sites and to submit them to the State Historic Preservation Office for their inclusion in the state heritage database. In addition, large site location maps that were hand-drawn in 1988 by the field school students were scanned by the author and then redrawn in Adobe Illustrator to ensure their digital accessibility in 2019. The original field site forms will be sent along with the updated GIS shapefiles of site locations to SHPO in the spring of 2021.

The analysis of the Sprenger Valley CSU Field School artifact collection was made possible through local community interest and participation. It became clear in the early stages of this thesis that public outreach in the area was necessary to provide the author any additional information on the type of archaeological work done in the area. Contact with community members outside of Mary Painter and Mr. Aten first occurred through the author’s conversations with Bonnie McDermid, the Sprenger Valley Housing Association President, beginning in 2018. The Sprenger Valley community showed great interest in learning about the past use of the land they had called home. Visits to interested landowners were made by the author in 2018 and in

2019 to revisit sites originally recorded by the Sprenger Valley field school, and to confirm the presence of cultural resources that had not been previously recorded but were recognized by the landowners and their families.

For this project, most of the artifact collection of the Sprenger Valley field school was loaned by Mr. Donald Aten, while the projectile points and ceramics were analyzed by the author at Mr. Aten's house. Photographs were taken of them with a digital camera. The entire collection was still in their original plastic field bags within small cardboard boxes. All the artifacts were re-bagged into archival-safe polyethylene storage bags.

Figure 7. A variety of projectile points and one knife (far right) within the private Sprenger Valley artifact collection from the 1988 CSU Archaeological Field School. Artifacts are from Multiple Sites. Artifacts date between the early Archaic and Late Prehistoric.

The provenience information for each field specimen was either written on the bag with a permanent marker or was included on a new paper tag inside of each specimen bag. The associated cardboard boxes that needed repair were fixed. After this initial inventory and consultation with Mr. Aten, the rest of the collection that included chipped stone debris, manos and metate fragments, as well as biface and tool fragments, were taken into my short-term possession for further analysis. All artifacts were returned to Mr. Aten in the fall of 2020.

Figure 9. 5LR1150 Ceramic Sample from Sprenger Valley artifact collection (private collection). All ceramic sherds pictured are cord-marked on one side. Photo showing both interior and exterior pieces. Four pieces on left are refits. Photo by author (2018).

Figure 8. Sample of Fossil Creek site cord marked pottery. Courtesy of the Center for Mountain and Plains Archaeology.

The inventorying and recording of such an extensive collection necessitated additional help in inventory and recording basic measurements. In 2019, aid was requested from undergraduate students. Jessie McCaig, an undergraduate from the Anthropology department at

CSU, volunteered to assist with this undertaking. McCaig inventoried the entire collection and submitted the final inventory in an Excel document to the author. The inventory included basic artifact metrics and analysis of all ground stone, and lithic flakes and tools. This analysis and inventory were completed at the CMPA laboratory on the CSU campus. The metrics from her work are applied within the author's primary analysis on assemblage toolkit diversity.

The analysis of these collections and the information provided by the community on cultural resource site locations and previously unrecorded artifacts aid in our further understanding on temporal land use and in prehistoric adaptations as cultural markers of this landscape. Bonnie McDermid, the Sprenger Valley HOA President, and her husband John McDermid, also decided to curate the artifacts they had found in the valley to the CMPA, donating them to future research.

The Travis Artifact Collection

The Travis artifact collection was employed through the utilization of data provided in Travis' 1986 M.A. thesis, *An Archaeological Survey in the Plains-Foothills Ecotone, Northern Colorado,* also summarized in her 1988 paper by the same name in the *Plains Anthropologist.* During her fieldwork, Travis recorded 1,881 artifacts from twenty-six prehistoric sites, excluding about 1,100 lithic flakes and informal tools she estimated being present at 5LR946. 27.3% of the recorded artifacts are characterized as ground stone while 56.8% of the assemblage consists of lithic debitage (flakes and shatter). She recorded 81 formal lithic tools, 25.9% of these being projectile points (Travis 1986). Edge ground cobbles and grinding slabs are the most represented within the ground stone artifact category, accounting for more than half of the ground stone collection.

Travis did not conduct any site subsurface testing or excavation during her fieldwork. Her artifact assemblage consists of a 100% surface site items. Her ground stone and debitage analysis represent the most in-depth studies on artifact types that have occurred within the project area. She describes the artifacts and their distribution between sites.

Additional Assemblages

There are nine sites and isolates in that study area that represent prehistoric occupations recorded by the CMPA and by Retrospect. Six of these (5LR1861, 5LR14330, 5LR14331, NS-2017-5, NS-2017-9, and the Wenborg Vessel isolate) have known prehistoric artifacts in their assemblages that can be generally identified by artifact type (projectile points, ground stone and stoneware). The three other sites (NS-2017-6, NS-2017-7, and NS-2017-10) are probable prehistoric site locations with no definitive prehistoric artifacts. Below is Table 10 showing all prehistoric sites and isolates within the project area that *do not* correspond to the three primary artifact collections of Lohr (1947), Travis (1986), and Sprenger Valley (1988).

Table 10. All sites/isolates outside of primary collections in the project area.

Smithsonian No. and Name	Original Site Type: Period(s)	Assemblage	Field Eligibility	NRHP Eligibility	Recorder(s)
5LR.1861	Isolate: Ground stone	Sandstone slab metate	Not Eligible	None	Marmor 1994
----	"Wenborg Vessel" Steatite Vessel	Soapstone/steatite vessel, cached	Unspecified	None	CSU CMPA 2012
5LR.14330	Prehistoric Isolate	Late Archaic Projectile Point	Not Eligible	Not in Compass	CSU CMPA 2017
5LR.14331	Prehistoric Isolate	Late Archaic Projectile Point	Not Eligible	Not in Compass	CSU CMPA 2017
Temp: NS-2017-5	Prehistoric Isolate	Chipped stone flake	Needs Data	Not in Compass	CSU CMPA 2017
Temp: NS-2017-6	Rock Shelter	Unknown	Needs Data	Not in Compass	CSU CMPA 2017
Temp: NS-2017-7	Rock Shelter	Unknown	Needs Data	Not in Compass	CSU CMPA 2017
NS-2017-9	Rock Shelter	1 lithic core, historic glass	Needs Data	Not in Compass	CSU CMPA 2017

Smithsonian No. and Name	Original Site Type: Period(s)	Assemblage	Field Eligibility	NRHP Eligibility	Recorder(s)
Temp: NS-2017-10	Lithic Raw Material Source	Unknown	Needs Data	Not in Compass	CSU CMPA 2017

5LR1861 Isolated Find

An archaeological survey was conducted within the project area in 1994 and 1995 by Retrospect. The project was conceived by Carol Tunner, previously of the City of Fort Collins Planning Department. Funding for the reconnaissance literature survey and pedestrian inventory for the project was obtained through the Colorado Historical Society. The objectives of the project were to locate Cherokee/Overland Trail corridors and associated archaeological properties within the Fort Collins Urban Growth Area, a 70-square mile planning area encompassing the city of Fort Collins in Larimer county, Colorado. Approximately 32 miles of historic trail routes were surveyed (Marmor 1995: i-1). Upon this survey, one prehistoric isolated find was located.

5LR1861 is a sandstone slab metate that was recorded at the base of a broad range and is made of a ‘whitish’ sandstone, which may be from the local Dakota Sandstone deposits. According to Marmor in his 1995 report, the artifact is unmistakable as a metate slab, and probably indicates short term use at a temporary camp. The area in vicinity to the artifact was surveyed, however no other archaeological components were observed. Additional testing was recommended by the original recorders for the immediate vicinity of the artifact to determine if there are additional archaeological remains (Marmor 1995:152-156).

The Wenborg Vessel

In 2015, Ashley Packard, an undergraduate at CSU, conducted analysis of steatite vessels from the foothills. She aimed to examine their utility and function in Colorado and Wyoming, and to discern trading and travel patterns of peoples during the Late Formative/Protohistoric period to historic period along the southern Rocky Mountains and in the Wyoming Basin. The Wenborg Vessel was similarly studied. It is complete and stands at 23.5 cm tall. It has a circular rim and a flat base and was likely made using a metal tool based on the equally spaced striations and crosshatching across the surface of the bowl (see Figure 10). Both the exterior and the interior of the vessel is gray with a dull luster and a rough texture (Packard 2015: 11). The artifact is in the Wenborg family's private collection.

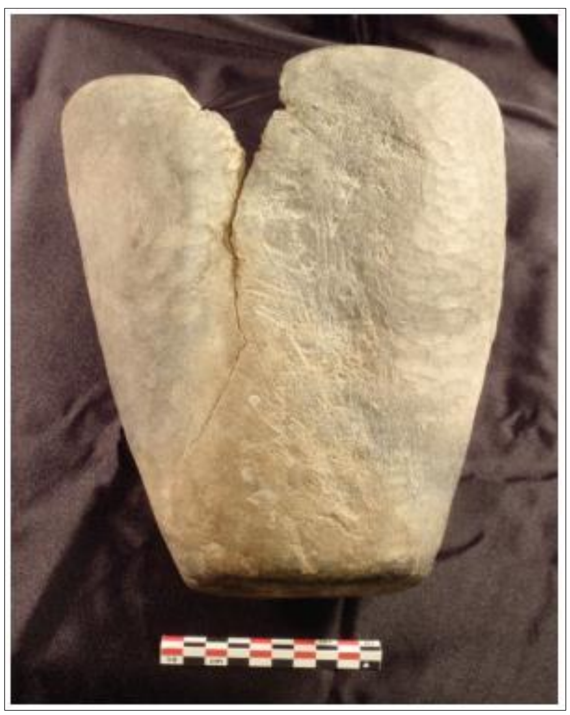


Figure 10. The Wenborg vessel. Photo courtesy of the Center for Mountain and Plains Archaeology.

The Wenborg vessel was a cached artifact, located underneath a boulder along the Dakota Hogback just southeast of Horsetooth Reservoir (Packard 2015: 10). The area where the artifact was located has not been professionally surveyed, and it is uncertain if there are additional prehistoric artifacts within the vicinity of its discovered, cached location. Steatite artifacts and sources are common in Wyoming (Packard 2015:2). Such artifacts have also been documented in Utah, Montana, and Idaho, and only eight sites containing these artifacts have been reported in Colorado (Packard 2015:2). No known, exposed steatite sources are recognized in Colorado, with large quantities found in the Northern Rocky Mountains near Yellowstone National Park and in the Southern Rocky Mountains in Wyoming's Laramie Mountains (Packard 2015: 4). This information makes the artifact incredibly significant, as it likely represents territory boundaries or ethnogenesis of the Eastern Shoshone or Comanche during the Late Formative to Historic periods (Packard 2015: 33). This artifact's general location is considered and its AMS radiocarbon dates are a welcome addition to recognizing the project area's chronology patterns (see Chapter 5).

Namaqua Skyline Sites

Three of the ten sites recorded during the CMPA'S Namaqua Skyline survey in 2017 are natural rock shelters that have a have a high likelihood of having prehistoric cultural remains or have a positive cultural association (Sites NS-2017-5, NS-2017-6, and NS-2017-7) (LaBelle et al. 2017: 13). One of these rock shelters had a prehistoric chipped stone flake inside it (NS-2017-5). Two rock shelters (Sites NS-2017-6 and NS-2017-7) do not have any evident prehistoric or historic cultural remains. However, LaBelle et al. (2017) recommend formal recording, photographing, measuring, and possible shovel testing of the rock shelters to determine the potential for cultural deposits (LaBelle 2014: 4; LaBelle et al. 2017: 13-14).

Another site (NS-2017-9) consisted of a chipped stone core and several pieces of glass located in a small rock face alcove along the Dakota Hogback escarpment. These may have been ‘cached’ together in modern or historic times (LaBelle et al. 2017: 15-16). Whether the stone core is truly prehistoric or was manufactured later is unclear, however, its source material is possibly an exposed fused/baked shale outcrop approximately 100 meters away. This exposed outcrop was recorded as site NS-2017-10 and is eroding downslope (LaBelle et al. 2017:17). Due to the scant nature of the prehistoric record at these sites (a few non-diagnostic artifacts and only the natural features of the rock shelters themselves), they are recognized as isolated occurrences and are employed in my analysis of prehistoric site spatial patterning. NS-2017-5 and NS-2017-9 have demonstrated prehistoric components and are therefore recognized in my toolkit diversity indices.

CHAPTER 5: CHRONOLOGY

Time-sensitive markers are used to identify the chronological pattern reflected at sites. They can be relative or absolute and can include artifact types and thermal features with radiocarbon samples. Identifying these markers helps to determine if any sites are multi-component in nature, illustrating if they were also re-occupied overtime (multicomponent).

What follows is a discussion of the methods that are used by archaeologists to determine chronology at sites. The existing regional chronology of the Colorado Front Range foothills is reviewed. The study area's chronological sequence is then compared to that of the region's, with a discussion on where this pattern of temporal occupation emerges and an inference on why.

Chronology Methods

Methods for temporal reconstruction include examining the archaeological record identified within the project area and establishing a chronology based upon the collected artifact assemblages and reported site information. Absolute dating through radiocarbon sample analysis, and relative dating techniques such as seriation of artifact types such as ceramics and projectile points are crucial ways to recognize temporal periods at sites. The presence of ground stone and architectural features such as stone 'tipi' rings can also be used to determine a local chronology and temporal occupational spans at sites. There are several additional methods to analyze chronology sequences in archaeological investigations that will not be discussed in length here. This includes the use of stratigraphy and the law of superposition in relative dating, obsidian hydration dating (OHD), dendrochronology, and thermoluminescence dating (TL). All are valid ways to measure event ages of the past. The dating method chosen for a study usually revolves around the site/assemblage background and collection/excavation techniques, the “event” that is to be dated, and the collection provenience of the sample to be dated.

Temporal “index” markers such as projectile point typologies are important in recognizing at what approximate chronological stage a site of activity has occurred (Stiger 2001:29). Projectile points are key in differentiating temporal periods and cultural traditions at sites and are paramount in deconstructing cumulative palimpsests, or accumulations, of activity. Analyzing projectile point morphology is a standard way to explore time and culture at a site, especially if studying sites that are open lithic or artifact scatters and that may not offer subsurface cultural deposits or architectural and thermal features. Projectile point typologies represent only one way to determine chronology. They can also be used to determine behavioral traits and in understanding site use and the intensity of an occupation.

Typology, or artifact “type,” is characterized through several traits that correspond to an artifact class inferring a cultural and/or temporal phase. The projectile points’ forms or morphology include basic shape classifications such as lanceolate, triangular lanceolate, corner-notched, side-notched, basal-notched, or shouldered (Andrefsky 1998; Taylor 2006). Date ranges, or periods or phases, are based on those given for referenced local and regional types that have been associated with radiocarbon dates or through other means of dating at “type sites.” Provisional dates are beneficial in building a chronological sequence for the study area. Further analysis on the raw material of projectile points can also exemplify the level of mobility of either people traveling into the foothills or the movement of the artifacts themselves through trade and exchange processes.

Projectile point measurements taken could correspond to the effects of attrition, use/breakage, reuse/re-sharpening, and natural weathering. This relates to my questions on toolkit diversity through the understanding of which tools were reused and how intensively a toolkit was utilized and for what possible activities. Basal morphology, or the form of the base of the projectile point, is the most important part of a projectile point in classifying its typology. It is the least affected by cultural and non-cultural post-processes such as attrition, weathering, and damage (Taylor 2006).

Radiocarbon dating is another way of recognizing site chronology and is recognized as the most significant dating technique in an archaeologist's arsenal. Radiocarbon dating was a method developed in 1946 by Willard Libby (Higham and Petchey 2000:255). This absolute dating technique essentially revolves around the idea of measuring the level of carbon-14 (C-14) in an organism sample and comparing that to the known carbon-14 levels throughout time to estimate a date range of when that organism was absorbing C-14. Plants and animals absorb carbon throughout their lifetimes as it is released into the biosphere through photosynthesis and its contact with ocean surface water (Higham and Petchey 2000:256). The concentration of carbon-14 levels within an organism remains in equilibrium to how much carbon-14 is in the atmosphere. When the organism dies, the remaining carbon-14 begins to decay and emits a beta particle. The half-life of carbon-14 is when half of it has decayed, and it is this measure that is used to calculate carbon-14 levels through time. The half-life of carbon-14 is 5730+/-40 years. By applying a calibration curve to the resulting date range, calendar years can be identified (Higham and Petchey 2000:256).

A material sample is sent to a radiocarbon laboratory that determines the amount of C-14 left in the sample. This can be calculated using direct ion detection accelerator mass spectrometry (AMS) to measure C-14 concentration ratios or can be recognized radiometrically (Higham and Petchey 2000:258). AMS radiocarbon techniques are usually used for small samples that weigh only milligrams (Higham and Petchey 2000:263). Some common materials that can be radiocarbon dated are bone, leather, soil and lake sediments, charcoal, wood, twigs and seeds, fabrics, parchment, corals, and antler and horn (Higham and Petchey 2000:258). The resulting, conventional radiocarbon dates are denoted as BP (Before Present), with the year 1950 and beyond as ‘present.’ 1950 is the year of Libby’s first radiocarbon publication. With radiocarbon dating, however, there is also the assumption that carbon-14 levels have remained consistent through time as well (Higham and Petchey 2000:258), and therefore the date is presented with a standard error measurement as well.

Radiocarbon samples are used to date ‘target events,’ or a particular event in time (Higham and Petchey 2000:264). Whether or not the actual time of the event is being dated is dependent upon the complexity of the steps that the archaeological investigation conducted to retrieve the sample, and what pre-event, post-event cultural and non-cultural formation processes led to the sample that was recovered (Higham and Petchey 2000:264).

The presence of other artifacts represents yet another way for archaeologists to recognize site temporal components and culture historical reconstructions based on seriation techniques. Ceramics, ground stone, and architectural features have the potential to provide base temporal periods. Ceramics were first recognized in the Early Ceramic (Plains Woodland) period between AD 150-1100 (Bozell and Winfrey 1994; Butler 1988; Duddleson 2008; Gilmore 1999). Ceramics are a key attribute of the “pre-village” ceramic tradition in the western Plains (Bozell and Winfrey 1994:127). Ceramic traits such as temper, size, shape, and surface treatment can be used to identify different cultural phases (Bozell and Winfrey 1994:130). Distinct ceramic styles can help to place sites in the Middle or Late Woodland periods, for example (Bozell and Winfrey 1994:125-127).

Alternatively, a difference in the frequency of ground stone within an assemblage may illustrate the difference between an Archaic component and an Early Ceramic or Late Prehistoric component. As sedentism increased through time, so did “site furniture” such as ground stone (Stiger 2001:162) as there was an increase in plant processing (Perlmutter 2015:126).

Shifts in how frequent ground stone is used through time likely corresponds with changes in environmental conditions. For example, Benedict (1978, 1979) argues that drought on the Plains during the Late Archaic causes local populations to seek ‘refugia,’ areas where subsistence becomes concentrated and where ground stone tools become more frequent and diverse due to a wider variety of activities taking place at campsites (Pelton 2013:65). The high number of hearths (>5) observed at each of four sites in the project area are evidence of such semi-sedentism.

In her thesis, Travis (1986) uses ground stone as morphological, temporal markers of site use by evaluating the number of ground sides, the amount of use-wear observed, and the general morphology of each mano including its length and shape (Travis 1986:113). Ground stone has also been used as temporal indicators at other foothills sites such as Magic Mountain, a residential campsite located west of Denver (Irwin-Williams and Irwin 1966). Such a temporal analysis of ground stone remains uncommon and instead represents a way to discern only a broad generalization of time. More commonly, the increasing frequency of ground stone through time is utilized rather than identifying morphological differences. An increase in ground stone at sites is pronounced beginning in the early Archaic (Troyer 2014:113).

Unlike projectile points, ground stone does not outwardly reflect *stylistic* variations that may be observed through time and through space. Rather, increased diversity in the type of ground stone recovered from sites and in the frequency of them may depict larger, technological shifts and changes in subsistence strategies. For example, with the invention of the bow and arrow comes the utilization of ground stone abraders to shape projectile arrow shafts (Pelton et al. 2016:13).

In addition, there was an increase in non-portable architecture that required more time and energy investments to construct (Perlmutter 2015:109). If more specific site locations were being persistently used overtime, there would be more formidable habitation structures evident, such as those demonstrated at the mountain site of Yarmony in Eagle county (Metcalf and Black 1991), or subterranean structures and depressions in Wyoming and in New Mexico (Larson 1997:363). In addition to more sedentary dwellings, we would also expect to see an increase in storage structures and caching of resources (Larson 1997:363). The presence of stone rings and the possibility of wickiup use exemplify more short-term durations of use, more than likely for small bands and task groups to oversee good hunting areas and herd movements, conduct communication with other groups, and locate new economic resources such as lithic and ground stone raw material sources (Meeker 2017:4). The only item found cached thus far in the project area is the Protohistoric Wenborg Vessel, which would indicate recurring visitation to the area but does not demonstrate intensive, long-term occupation.

Although stone rings can provide a broad associative chronology for prehistoric occupations in the foothills, projectile points in comparison still provide the best relative chronological sequence. Radiocarbon dates, in comparison, provide an absolute dating method that can more accurately illustrate the utilization and occupation of a landscape through time. What follows is a review of the regional chronology demonstrated in the Colorado Front Range and the methods used to differentiate between periods and cultural transitions that occurred in the region through time.

Regional Chronology

The following regional chronology used within this thesis is based upon sites that have been recorded along the Front Range in north-central Colorado. The regional chronology is broken down into 9 temporal periods: The Early, Middle and Late Paleoindian periods, the Early, Middle and Late Archaic periods, the Early Ceramic and Middle Ceramic periods of the Late Prehistoric, and Protohistoric.

Significant sites of north-central Colorado and the Front Range include: The Valley View site (Brunswig 2016), Fossil Creek (LaBelle 2015), and the Spring Canyon (Pelton et al. 2016) and Spring Gulch (Kainer 1976) sites. Other sites that have been dated in the foothills include those located west of Denver such as LoDaiska rock shelter (Irwin-Williams and Irwin 1961), Magic Mountain (Irwin-Williams and Irwin 1966), Van Bibber Creek (Nelson 1969), and the George W. Lindsey Ranch site (Nelson 1971).

The Paleoindian Era

The Paleoindian stage (12,000-8,000 BP) is demarcated by the end of the late Pleistocene period of the Younger Dryas climatic change and the cyclical warming of the early Holocene (Hofman 1996:22). At around 10,000 BP, the environment was cooler and wetter, and included megafauna in Colorado such as camels, sloths, and mammoths. Colorado subalpine conditions consisted of an annual precipitation rate of at least 40 inches and had a mean temperature at or below 53º F in the summer (Markgraf 1981:233). A pre-Clovis culture is recognized within the regional chronology of the area at sites such as Lamb Spring in Douglas county, and Selby and Dutton in Yuma county (Eighmy 1984; Gilmore 1999:53).

The Early Paleoindian period is characterized by Clovis occupations (11,300-10,900 BP), the Goshen cultural period (10,450-10,153 BP), and the Folsom cultural period (10,950-10,250

BP) (Brunswig 2016:49). The Younger Dryas cold event occurred between 12,900-11,600 BP (Pelton et al. 2017:240). The Paleoindian complexes, and later the bison-hunting Folsom, are generally recognized as being large-game hunters who also had high mobility due to their subsistence strategy.

The Agate Basin and middle-to-late Paleoindian period (10,690-7,700 BP) (Brunswig 2016:49; Pelton et al. 2017:243) is recognized as a dry period in most of the Great Plains. There is a rise in tree lines to levels shown today due to this increase in warming temperatures. The cultural phases of this period are characterized as the foothills and mountain middle-to-late Paleoindian traditions observed in the Rocky Mountain basins and range. There were Plains groups which visited the foothills seasonally while there was also a mountain-centric cultural complex which occupied the Rockies (Frison 1991; Gilmore 1999; Pitbaldo 1999). This cultural complex is recognized as the Paleoindian Foothill/Mountain tradition (Lee 2012:172).

Middle Paleoindian components are exemplified well in Colorado archaeology with temporal and cultural complexes consisting of Hell Gap (10,500-9,500 BP) (Holliday 2000:227; Pelton et al. 2017:243) and Agate Basin (10,430-9,350 BP) (Brunswig 2016:49). Sites of these temporal complexes are well demonstrated on the Kersey Terrace in northern Colorado (Perlmutter 2015:18). In comparison, the Late Paleoindian is defined by the Cody Complex (10,690-10,170 BP) in the form of Eden/Scottsbluff projectile points, Cody knives, and Alberta points (Pelton et al. 2017:244), and by the Allen/Frederick Complex (9,400-7,800 BP) (Holliday 2000:227). These Late Paleoindian projectile points tend to have very narrow bases (Lee 2012:172). The Plano period, or middle-late Paleoindian period, may overall be indicative of some of the increased reliance on smaller fauna and plant resources that we observe later in the

Archaic era, demonstrating progression towards semi-sedentism and a broad-based economy (Gilmore 1999:69-80).

The Archaic Era

The Archaic Period (7,500-1,900 BP) (Brunswig 2016:49) is mostly characterized by the environmental onset and ending of the Altithermal (7,000-4,000 BP), which consisted of long-term arid ecological conditions, although there was likely more moisture at lower elevations compared to conditions today (Markgraf 1981:234). With a decline in annual precipitation, much of the faunal and floral types represented were altered dramatically through resource dispersion as the montane woodland forest migrated upwards and the sagebrush range was extended (Markgraf 1981:234). The extent of change in human behavior in Colorado, as a reaction to these pervasive shifts in ecological conditions, has been argued considerably between researchers throughout the decades (Cassells 1997; Gilmore 1999). Differences in human behavior should be recognized as fluid in relation to the local and likely regional environments in which behavior is molded.

An overall, general framework for the Archaic period is increased broad-spectrum foraging of flora and fauna, as evidenced in the archaeological record through seed/nut processing with ground stone, and by the wide variety of animal remains discovered at sites. It is hypothesized that people increased movement towards the margins of the Plains and droughts intensified in the Great Plains. The people diversified their subsistence strategies and diet by focusing mostly on local, seasonally available foods rather than relying on their nomadic hunting traditions (Benedict and Olson 1978).

During the Early Archaic, the foothills would offer more consistent weather patterns and associated animal/plant diversity in the wintertime than in the mountains, which also supports the hypothesis that the camps in the foothills represent seasonal, winter occupations. When conditions would become too extreme up in the mountains, movement to lower elevations would be expected where the environment would be less harsh and more stable food procurement would be possible.

The Early Archaic is represented by the Mount Albion Complex (5,730 +/- 145 BP (Benedict 1975), originally defined by Benedict (1975; 1979) at the Hungry Whistler site (5BL67). Other significant sites that have the Mount Albion Complex type include the Wilbur Thomas Shelter (5WL45), Helmer Ranch site, Ptarmigan site (5BL170), and the Cherry Gulch site (5JF63), all of which are located on the eastern slope of the Rocky Mountains near Denver (Des Planques 2001:22-23). Mount Albion is recognized more broadly as being a part of the Early Archaic Mountain Tradition projectile point morphology and is also accompanied by other typologies such as the Magic Mountain Complex Type 3 and the Cherry Gulch Types 1 and 2 (Black 1991, see Figure 5).

Cherry Gulch types are not serrated like the Magic Mountain Type 3 points. Therefore, these could be differing cultural populations that share an adaptive projectile point form. Differences in morphology could also be related to the degree of retouch or use, individual group technological adaptations, or are due to the environmental weathering of the artifacts themselves (Des Planques 2001:25). Des Planques (2001) argues that due to some of these point types being recovered at some of the same sites, that either these cultural groups existed at the same time and were interacting with one another or were at least utilizing the same site locations (Des Planques 2001:25).

Projectile point types such as Mount Albion and Magic Mountain are often made with the same local lithic raw materials instead of being made of exotic raw materials, a trait that possibly has its origin from the Foothill/Mountain Paleo Tradition (Pitblado 1999). Most of these points are found within the intermontane area of the Rocky Mountains, however as observed in this study, there is dispersion into the eastern foothills of the mountains as well.

Broad-spectrum hunting and gathering continued through to the Middle and Late Plains Archaic periods, and during the Middle-to-Late Plains Archaic periods, the extreme arid, climatic conditions began to decline and became more stable. The Middle Plains Archaic period (7450 B.P.-1450 B.P) (Stiger 2001:27) is characterized by adaptations to more modern climatic conditions and a broader-based subsistence strategy that had long-term stability (Stiger 2001:27). Pronghorn-trapping sites such as Laidlaw in southern Alberta were also used during this period, along with increased use of ground stone and stone-filled fire pits, further indicating a trend toward broad-spectrum hunting and gathering (Gilmore 1999:80-83; Stiger 2001:27).

The Middle Archaic is represented by the McKean Complex (5,738-3,165 C14 cal yr. B.P.) (Brunswig 2015:81), Duncan/Hanna, and Mallory projectile point types. The Magic Mountain site includes projectile points from the McKean Complex. The McKean complex was originally defined in the Black Hills in northeastern Wyoming where Mulloy dated projectile points forms to the Plains Archaic. The McKean complex includes a variety of forms: the McKean Lanceolate, Duncan, Hanna, as well as Mallory point types (Hofman 1996: 87). It is argued that Duncan-Hanna projectile points were used as atlatl dart tips while McKean and Mallory point types were used on spears or lances (Davis and Keyser 1999:53).

Northeastern Colorado archaeological sites where McKean points have been recorded include the LoDaiska site (5JF142), Kinney Spring (5LR144), Spring Gulch (5LR252), Phoebe Rockshelter (5LR161), and Lunch Cave (5LR288). The McKean Complex has been found as far north as Alberta and as far south as southern Colorado (Des Planques 2001:50-51). One of the most significant sites to represent this period in northeastern Colorado is the Magic Mountain site 15 km west of Denver, located in the hogback ridges south of the study area.

The Late Archaic further demonstrates the shift to a broad-based subsistence strategy, with an increased number of sites being in the foothills. The Late Archaic is also exemplified by Yonkee and Pelican Lake projectile point types. Projectile points illustrated for this period utilize local raw materials and are likely an atlatl technology (Lee 2012:174). Late Archaic points are observed at Magic Mountain, Willowbrook, as well as Dipper Gap (Metcalf 1973; Mutaw et. al 1991).

Late Prehistoric Era

The Late Prehistoric period (AD 150-AD 1540) is classified into two separate phases: The Early Ceramic period (1,900-900 BP) and the Middle and Late Ceramic period (900-650 BP) (Brunswig 2016:49). The Late Prehistoric period illustrates great technological change and an increase in the regional populations and in relative sedentism compared to the Archaic era (Perlmutter 2015:20-21).

The Early Ceramic period includes the Plains Woodland cultural phase (AD 150 -1100) (Bozell and Winfrey 1994; Butler 1988; Duddleson 2008; Gilmore 1999) which is evidenced through increased sedentism by the presence of pit structures and storage pits (Duddleson 2008:194), an even broader hunting and gathering subsistence strategy, and the introduction of new technologies such as the bow and arrow and experimentation with horticultural practices (Bozell and Winfrey 1994:125). Cord-marked pottery makes its appearance and is used primarily for cooking and not for storage, cleaning, or transport (Duddleson 2008:191). The introduction of pottery, the bow, and arrow came later in Colorado. Compared to other areas and is likely due to land use intensification as a wider breadth of foraging was utilized during this period and more productive and efficient ways of hunting, storage and food preparation was required (Perlmutter 2015:129-130).

The Early Ceramic Plains Woodland variants known as South Platte Phase and the Arkansas Phase (1850-800 BP) were first proposed by Butler (1988) for northeastern Colorado Woodland sites and are characterized by hunter-gatherer groups that experimented with maize horticulture in the western Plains subarea including the Colorado Piedmont and the High Plains. The phase corresponds to flexed internment burials, the use of cord-marked pottery, diagonally-corner-notched points, and expanding base drills (Butler 1988:459). The South Platte Phase also corresponds to similar sites and assemblages represented in western Nebraska and eastern Wyoming (Bozell and Winfrey 1994:129). Woodland variants such as the Hog Back Phase (950-1350 BP) proposed by Nelson (1971) (to account for Front Range foothills sites such as the George W. Lindsay and Magic Mountain sites), were previously identified as being a part of the same Woodland period as well, however these phases have been rejected due to insufficient data and not enough distinguishable characteristics between phase types (Butler 1988:450).

Interregional contact began to increase during the Woodland Period substantiated by the occasional presence of items such as obsidian and Southwest designed ceramics in site assemblages (Wyckoff and Brooks 1983). There seems to be little similarity, however, between the eastern and western North American Plains Woodland groups (Butler 1988:450-452). There was higher population density in the Eastern Plains compared to the Western Plains. This difference in sustained population density illustrates regional variation in social organization and structure (Duddleson 2008:181).

The Valley View site (Brunswig 2016) is located south of the study area on the hogback west of Loveland and provides an opportunity for comparison of radiocarbon dates. Two shallow pit houses were excavated at Valley View, and a well-defined roasting pit resulted in a Plains Woodland ^{14}C age of 1282 BP (Brunswig 2016). The multicomponent camp site of Fossil Creek (LaBelle 2015), located in the Fossil Creek Natural Area in the City of Fort Collins, is approximately 6 miles east of the foothills and has added a new date also associated with the early Ceramic with a date of AD769-864 (LaBelle 2015:27). Radiocarbon dated sites include Killdeer canyon (5LR289), which dates to the Late Ceramic period (A.D. 1540-1860) (Meeker 2017), and the T-W Diamond (5LR200) which dates to the Middle Ceramic period (A.D. 1140-1540) (Meeker 2017).

The Protohistoric Era

The Protohistoric is usually defined as continuing from European contact to the Historic Period (Newton 2016). The Protohistoric period is characterized by Late Ceramic assemblages, primarily illustrated by tri-notched projectile point types, as well as by Contact Era assemblages which include metal projectile points and steatite pots. The Protohistoric period is documented at such significant sites such as the Lykins Valley site (5LR263) (Newton 2016). The Lykins Valley site is a nineteenth century Plains Indian occupation in the foothills-ecotone along the eastern edge of the Southern Rocky Mountains. Newton's analysis of the Lykins Valley site illustrates that during the post-contact period, the Plains Indians responded to European contact through change and by demonstrating resilience, by continuing their traditional practices and by using traditional technologies, even with the introduction of livestock such as the horse and by European trade goods (2016:51). It is also evidenced that this Plains Indian group had connections to the south (illustrated by Jemez Mountain obsidian from New Mexico) and to the north in Wyoming (2001:58).

Ethnohistorical relationships between the indigenous tribes at the time of European contact becomes apparent within ethnohistoric records. Tribes such as the Ute, Shoshone, Apache, Cheyenne, Plains, Kiowa, and Arapaho are all represented to some degree in Colorado as new tribal territories are sought out, alliances formed, and new technological innovations are used (Newton 2016). The Protohistoric era continues until permanent European settlement in the region, corresponding to the 1858 Colorado Gold Rush (Perlmutter 2015:21).

Project Area Chronology

The purpose of this is to discern how the study area fits into the larger, regional chronology of the Front Range and the South Platte River Basin, and to recognize any temporal patterns in site density within the project area. Both relative and absolute dating methods were used for this analysis on the chronology recognized in the project area. Relative dating techniques included looking at projectile point typologies, ceramic attributes, and noting the frequency of architectural features, thermal features, and ground stone recorded at each site. One twig sample went through AMS radiocarbon dating.

Projectile points in the Lohr and Sprenger Valley collections were analyzed by the author during their loan from both the University of Colorado (Lohr collection) and by Mr. Aten, from the Sprenger Valley (Sprenger Valley collection). Illustrations and artifact descriptions of the projectile points and formal tools recovered from Calvin Jennings' 1988 Sprenger Valley field school were also accessible for this study. Lauri Travis took photos of the projectile points from the sites she recorded for her thesis, as well as completed her own analysis on the collection. A projectile point typology is constructed by the author for the study area based on comparable local and regional datasets demonstrated at other Front Range and Rocky Mountain sites. An analysis of projectile point morphology is often the only way to date an archaeological site, particularly surface sites that do not have existing stratigraphy or that have not been excavated (Reckin and Todd 2020b:144).

Only complete or mostly complete projectile points with bases or partial bases were used to construct a typology-based chronological sequence for the study area. Bases, or haft elements of projectile points, are the most diagnostic attribute and are the most likely part of the item to remain (Ricken and Todd 2020b:131). All projectile points that were in this collection were analyzed for general measurements such as greatest length (mm), maximum width (mm), greatest thickness (mm), shoulder width (mm) when possible, basal width (mm) when possible, and weight (gm). These measurements are much more consistently preserved between assemblages, and do not require any complicated analysis like angle measurements of attributes such as notching (Ricken and Todd 2020b:131). Their overall morphology and the projectile point portion present were also noted, along with their typologies. The projectile points that are typed in this study are ones which are complete or ones that have a diagnostic base. Many of these projectile points are small, illustrating continual retouch for reuse. The number of worked and utilized flakes also illustrate extensive use of lithic tools within the assemblages and at sites.

These act as general temporal indicators for sites where absolute dates from radiocarbon dating methods may be missing. Only 2 out of the 66 sites with prehistoric components in the project area have radiocarbon dates (5LR1157 and the Wenborg Steatite Vessel) while 23 sites have diagnostic projectile points or ceramics that can be typed to a period. In this way, artifact assemblages and relative dating methods are crucial to identifying prehistoric occupations spanning the Paleoindian period to the Protohistoric period.

Chronology Results

Based on documentation by Lohr (1947) during his recording of site 5LR.30, a Middle Paleoindian Folsom projectile point fragment was recovered by an artifact collector. The location of this Folsom fragment is currently unknown. Folsom points would be demonstrated by being large and fluted (Pelton et al. 2016:8). Three other sites illustrate Late Paleoindian-Cody Complex components in the form of Eden, Kersey and/or Scottsbluff projectile points (5LR.49, 5LR.50, and 5LR.1156) that date to between 10,600-10,000 BP (Pelton et al. 2017:243). There is a total of 5 Paleoindian points in this examination. Paleoindian points are recognized as being large, un-fluted spear points (Perlmutter 2015:17).

Figure 11. 5LR49 McKean and Paleoindian projectile points. (From left to right: FS.114 (Base), 111 (Base), 117 (Midsection-Paleoindian), 112 (McKean). Photo by author.

There are 18 sites and/or isolates that date to the Archaic era. Most projectile points within the study area exemplify Archaic period projectile point darts. These Archaic types include the Mount Albion, McKean, and Duncan-Hanna complex forms (see Figure 11). McKean and Hanna point types have abrupt shoulders, a concave base, and a long neck (Pelton et al. 2016:12). These same Archaic types are also recorded at other archaeological sites along the foothills outside of the project area, including at Magic Mountain (5JF223) and at the Hungry Whistler site (5BL67) located west of Denver, Colorado.

Dart points were more typically used during the Archaic era than in earlier or later prehistoric eras (Meyer et al. 2017). The Early Archaic is demonstrated in as many as fifteen sites and/or isolates. Many of the projectile points within the study area represent being a part of the Mount Albion Complex (n=19). The Middle Archaic period is also illustrated within the study area at eight separate sites. Duncan-Hanna projectile points total to 16 in the project area. Pinto Basin projectile points total to 2. In the project area, the Late Archaic is evidenced as Pelican Lake/Elko or Yonkee, projectile points (see Figures 13 and 14). Pelican Lake or Besant types are recognized as Late Archaic in age (Taylor 2006, Todd et al. 2001) as they are relatively large and are corner-notched (Lee 2012:174). There are 5 Pelican Lake projectile points and 2 Elko projectile points in the record.

Figure 12. 5LR31 Mount Albion Knife (FS. 46). Early Archaic. Photo by author. The Edison Lohr Collection.

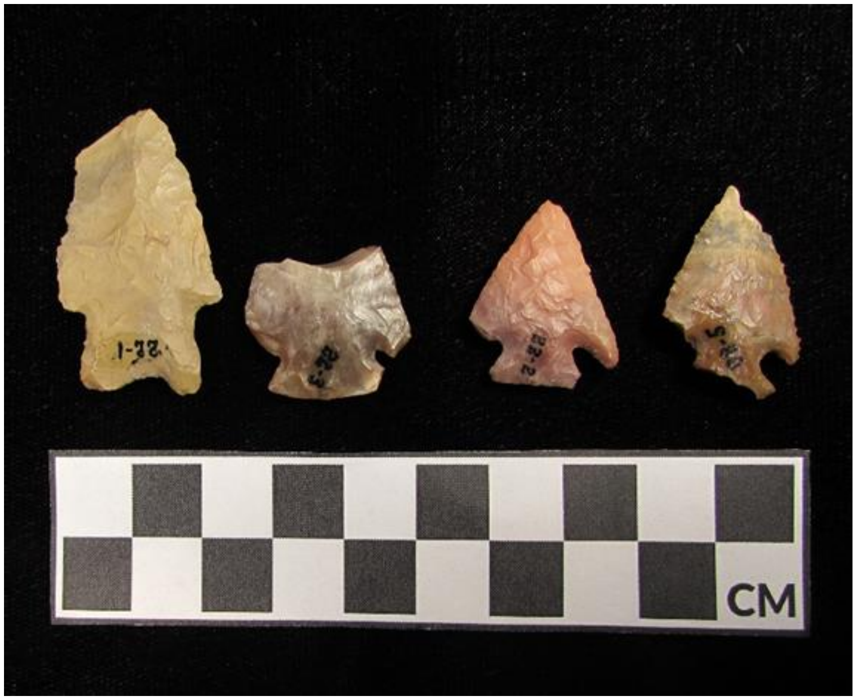


Figure 13. 5LR49 Late Archaic projectile points (From left to right: FS. 1, 3, 2, 5). Photo by author. The Edison Lohr Collection.

Figure 14. 5LR49 Late Archaic Projectile points and knife. From left to right: FS. 22,29,23,25 (knife). Photo by author. The Edison Lohr Collection.

The Late Prehistoric period in the project area is defined by the presence of Early Ceramic/Plains Woodland pottery and projectile point forms. Stone rings are demonstrated at sites that date between the Late Prehistoric (including the Early Ceramic) and the Protohistoric (Long 2011; Meeker 2017). The prehistoric reasoning for their production and use is still debated (Gilmore 1999:326-327), most stone ring sites likely exhibit the remains of tipis as the stones were used as essentially tent pegs or foundations to prevent wind destruction to the tipi itself. Hides used to create the shelter would be transported from site to site (Meeker 2017:4). Stone ring sites are located along the Front Range (Long 2011; Meeker 2017), providing a cross-comparison of sites within the project area to others within the local region in terms of utility and temporal occupations. Since stone rings can only be definitively dated if tested for radiocarbon samples, or need to be in association with other dated materials, these sites are not defined as belonging to one period for this study unless diagnostic materials are present.

The Late Prehistoric is illustrated in as many as 9 different sites within the project area. 7 of these sites have defined Early Ceramic components, while the other Late Prehistoric components are likely representations of the Middle Ceramic or Late Ceramic. Projectile point typologies for the Late Prehistoric include the Hogback (Early Ceramic) corner-notched (n=23) point with straight to slightly convex bases (Taylor 2006) (see Figure 15). These points have been found at sites such as Fossil Creek, and the Harvester/Weinmeister sites (Anderson 2012; LaBelle 2015).

Figure 15. Late Prehistoric era, early Ceramic period foothills corner-notched projectile point (FS 44) from 5LR1150. Photo taken by author. Projectile point in private Sprenger Valley artifact collection.

The Middle Ceramic period represents the transition from corner-notched points to side-notched points. Middle to Late Ceramic projectile points exhibited within the project area include the Prairie side notched (n=1), the Plains side notched (n=10), as well as the Rosegate desert stemmed (n=1), and Shoshone (n=1), all with variations exhibited within the project area. Similar projectile point types have been found at the Roberts Buffalo Jump (Johnston 2016). They are also like those demonstrated at Killdeer Canyon and T-W-Diamond (Meeker 2017). Late Prehistoric and Plains Woodland projectile point types are illustrated by triangular unnotched and notched points (Eighmy 1984) while some tri-notched projectile points have also occurred during the Late Prehistoric component (Meeker 2017:23).

In addition, there are a total of 43 ceramic sherds recorded within the project area that are likely Early Ceramic in age. Nineteen ceramics recovered at 5LR155 were produced with the paddle and anvil technique and have a sand grain temper (Travis 1986:104-105). The exterior surface is cord marked but some are partially obliterated and smoothed over. Three sherds have small diamond-shaped cord marking patterns. All ceramics range in color from gray to a dark brown. The interior surface is smooth and carbon residue may be present (Travis 1986:105). 5LR1150 includes 14 ceramic sherds that illustrate mica temper. All the ceramic sherds exemplified burning and all of them are cord marked. One sherd is a rim piece with a simple form, and there are two pottery pieces that refit.

At 5LR1157, 9 ceramic sherds were found during the test unit excavations that occurred at the site in 1988. Seven of them were cord marked while two had no evidence of corrugation on their exterior surfaces. Four pieces refit with one another. One piece has cord markings that are partially obliterated or smoothed over. All these pottery fragments are burned. The pottery at 5LR1150 and 5LR1157 range from dark red to a tan in color (see Figure 8). There is one ceramic sherd missing from the 5LR1157 collection (CO:D:12:10.15). The pottery in the project area likely represents early Ceramic types because they are relatively flat, the rim does not show a design, and there are no indications of handles which are otherwise observed from Middle Ceramic Upper Republican pottery (LaBelle 2015:64).

These ceramics were compared to similar types represented at other Front Range sites. For example, the Fossil Creek site to the east had 103 total ceramic sherds recovered after excavation, testing, surface survey, and after reviewing a private collection (LaBelle 2015:62) (see Figure 9). At the Spring Canyon site just to the north of the study area, 11 Early Ceramic pottery sherds were recorded from Lohr (1947) and Morris (1971) (Pelton et al. 2016:14). Killdeer Canyon included almost 500 Early Ceramic pottery sherds recorded from excavation and surface survey (Meeker 2017:8) while T-W-Diamond had 139 sherds (Meeker 2017:14). Early Ceramic pottery is generally conoidal in shape, and the exteriors are either cord-marked or partially obliterated. A cord-wrapped paddle can create such a patter on the exterior of the vessel (LaBelle 2015:63) and can be purely designed or can be done for a utilitarian purpose such as for heat conservation while cooking or to provide grooves for easier handling (Duddleson 2008).

The early Ceramic period link for this pottery is also substantiated with the AMS radiocarbon date sampled from 5LR1157. A radiocarbon sample from 5LR1157 was sent for testing to Beta Analytic by the author to determine an age from the cultural deposits represented. The site itself was first discovered due to eroding subsurface deposits from the main Spring Glade Road which leads through the Sprenger Valley approximately north to south. Upon closer inspection, cultural deposits of both darkened organic sediments associated with surface artifacts were observed underneath a north-facing overhang of a large boulder. The boulder is located approximately 20-meters upslope from the eroding cultural deposits in the roadbed.

During the field school, three 2x2 meter test pits were placed on the slope to investigate if there were any subsurface intact cultural deposits. A cultural subsurface deposit was reached 40 centimeters below the surface and extended 60 cm in depth. During excavation, lithic debitage as well as a cord-marked ceramic sherd were recorded. In the same stratigraphic layer as the ceramic sherd, a rock filled fire pit was evidenced, at which point the intact carbon sample AN4 (CO: D12:10. ASS2) was collected. The sample was collected from this in situ thermal feature and had remained undated until this study. The sample was sorted through to identify a large and durable organic remnant which could be further disintegrated during laboratory tests. The charred ponderosa pine twig (*Pinus ponderosa*) remnant was chosen from the overall sample originally collected and was sent to Beta Analytic in 2019.

The sample consisted of numerous charcoal flecks and small wood charcoal fragments. It was reviewed under a magnifying glass to locate a wood fragment to identify the plant species and have a complete circumference to determine the age of the sample. It was decided that one charcoal piece would be sent to Kathryn Puseman of the Paleoscapes Archaeobotanical Services Team (PAST), LLC in Bailey, Colorado, who was subsequently contacted through email the same year for a service request to identify the radiocarbon sample's botanical species. After identification, the sample was split in half by Ms. Puseman and sent to the Beta Analytic Testing Laboratory in Miami, Florida for radiocarbon dating.

The charcoal sample was analyzed through accelerator mass spectrometry (AMS) radiocarbon dating, which provides higher precision than radiometric dating. Radiocarbon laboratory pretreatment for charcoal and wood includes removing any surface contamination from the sample. It is then crushed and washed in alkali to remove any non-sample carbonates from the sample before being dated (Higham and Petchey 2000:266). The results indicate that the sample dates to 1310 +/- 30 BP with a 68% probability of 1294-1223 cal BP and 27% probability of 1213-1181 cal BP. This illustrates that the sample has a 95.4% probability of coming from between 656 AD and 769 cal AD, which would place it squarely within the Plains Woodland complex chronological sequence.

Primary vegetation surrounding the site is mountain mahogany and ponderosa pine. Mountain mahogany is dense surrounding the site and ponderosa pine is located on top of the hogback ridge in clusters. Prehistorically, ponderosa pine provided shelter, food, fuel, and wood for various other uses, further aiding in the recognition of its significance in the daily lives of prehistoric peoples.

Accurate dating of the sample is stringent upon issues related to the ponderosa pine sample's growth rate and when it was eventually used or reused. These sampling errors are recognized as *inbuilt* errors (Higham and Petchey 2000:265). Inbuilt errors are the difference in age between the sample organism's death and when it was used in the archaeological event being dated. This could lead to the date determination to be too old (Higham and Petchey 2000:265). What is being dated through AMS is when the sample's tree rings stopped growing, which happens when the tree is laid down and stops absorbing carbon from the biosphere (Higham and Petchey 2000:265). Due to this issue, the radiocarbon determinations are ranked based on confidence level in the sample and its original provenance from robust determination to tentative determination (Higham and Petchey 2000:265). However, since the sample is a ponderosa pine twig, the old wood problem is likely non-existent.

There are eight sites that demonstrate probable, protohistoric components, with only one demonstrating a definite protohistoric component (the cached Wenborg Vessel). Protohistoric sites in the project area are exhibited through the presence of stone rings, which are illustrative of a use of the landscape and through the presence of Late Prehistoric-Protohistoric projectile points such as the Desert side-notched type (n=5) which is demonstrated at three sites, with two of these same sites also having stone rings present (5LR.1150 and 5LR.1155). Most of the stone rings recorded do not have an associated hearth in their interior centers. There are up to 30 stone rings located near 5LR40 which were reported by Lohr (1947) that also may demonstrate hearth potential. The exact location of these stone rings, however, are unknown, and could not be discerned through aerial imagery. However, there is one site that was recorded by Travis (1986) on top of the first Dakota hogback which could represent a hunting shelter (5LR946). Travis (1986) argues that this type of prehistoric feature is likely associated with a Protohistoric component because of its high preservation, although it does not have a clear association. There have been no recovered glass beads at these sites in the project area, which would be clear evidence of the protohistoric period as trade with Plains Indian groups were widespread (Newton

2016; Von Wedell 2011). In addition, the Wenborg vessel is the only steatite artifact from Colorado that has been radiocarbon dated (Packard 2015: 33). Its calibrated radiocarbon dates of AD 1660-1700, AD 1720-1820, and AD 1910-1950 illustrate its use during the Protohistoric period or Historic period (Cummings et al. 2013).

Overall Patterns

The chronological taxonomy of the study area consists of Archaic era and Late Prehistoric period sites. The Early/Late Archaic periods, as well as the Early Ceramic phase of the Late Prehistoric period, are the most prolific eras illustrated on the landscape, accounting for nineteen out of the twenty-seven total sites (70%) that are datable within the project area.

Twenty-seven sites (41.5% of the total number of sites) in the project area contain diagnostic artifacts and/or features that aid in identification of their temporal occupation(s). The results from the radiocarbon sample documented at the 5LR1157 site occupation occurred at 1310 +/- 30 B.P., during the Late Prehistoric period. Interestingly, this radiocarbon date also corroborates the ^{14}C date taken at Valley View located only 2.5 miles southwest. This date corresponds well to the relative chronologies of projectile point typologies also represented in Sprenger Valley and is further corroborated by the recovery of cord-marked pottery at the same profile as where the radiocarbon date was taken from at 5LR.1157. Due to this local environment's importance for past and living peoples, receiving a radiocarbon date for a site central to the study area not only provides better temporal control of prehistoric occupation of the foothills, but also presents a welcomed and valuable addition to the regional prehistoric chronology of the Front Range.

In this analysis, there are four Paleoindian projectile points, 36 Archaic projectile points, 22 Late Prehistoric, and one Protohistoric projectile point. Fifteen of the sites in the study area, which have locational data as well as artifact data, cannot be dated because of a lack of diagnostics. Twenty-three other sites likely fall under a broad, chronological sequence between the Early Archaic and Protohistoric due to the presence of ground stone. This time frame is based on the local, regional data available on mano chronology studies (Gilmore 1999; Irwin-Williams and Irwin 1966; Travis 1986). No other diagnostics are exhibited at these site locations where a ground stone chronology is used to identify a broad chronological sequence.

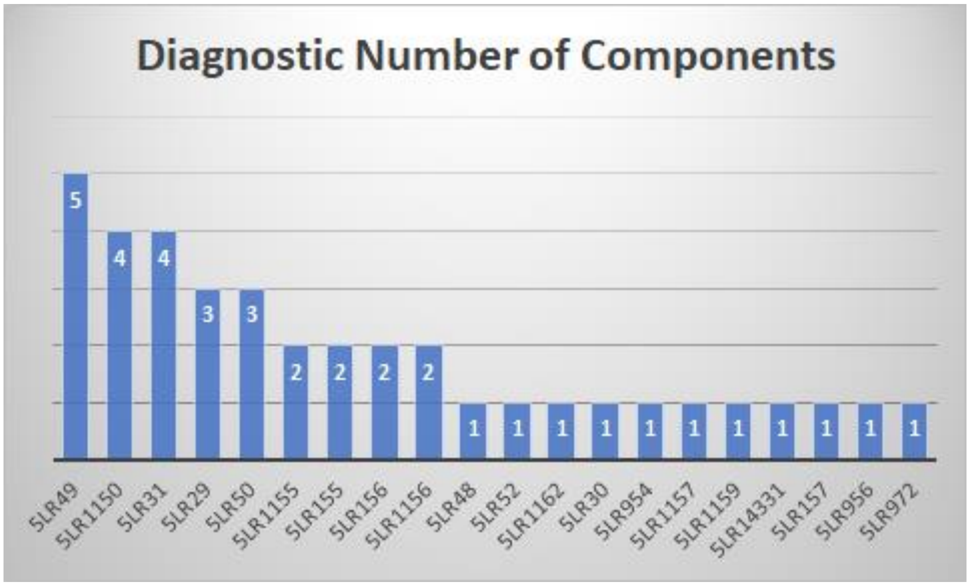
Based on the analysis conducted for this thesis, environmental conditions played a significant role in where hunter-gatherer bands decided to conduct activities. Site locations that offer overlooks, nearby water sources, and protection from weather were the most prolific within the study area. This site spatial distribution in relation to environmental variables is further examined in Chapter 6. This same pattern is observed through time as well, with evidence to support this hypothesis by the spatial arrangement and clustering of sites within these areas beginning in the Paleoindian period and clustering dissipating during the Protohistoric period. In addition, it is these same general localities and temporal occupations that exemplify persistent use through time.

Chapter Conclusions

The most intensively used periods represented within the project area are the Early Archaic, Middle Archaic, Late Archaic, and Early Ceramic. These components are well known in northeastern Colorado for their increased frequency in the archaeological record compared to other periods (Perlmutter 2015; Troyer 2014). This may be partly due to greater ground surface exposure, as well as greater surface visibility in artifact density and feature types. For example, stone rings are highly visible, and may account for some of the spike in Early Ceramic period sites documented throughout Colorado. Many of these sites are also located along the hogback ridgelines that have minimal soil deposition and high rates of exposure due to colluvial and aeolian geological processes, further enabling higher visibility and increased preservation from human activity such as urban development compared to the valleys below. Artifact density is also highly dependent upon the amount of sedentism displayed in an area. Early Archaic pit structures are illustrated in the Colorado high country at sites such as Yarmony (Metcalf and Black 1991), lending support for finding such periods in the archaeological records due to formidable features. Therefore, more mobile Native American groups from the Paleoindian period with minimal site features would be less likely to be found in the record.

There are fourteen sites out of twenty-three sites (60.8%) with a diagnostic number of chronological components that appear to be single component. Four sites within the study area appear to have 2 temporal components (18.2%), while one site has 3 components (4.5%). There are three other sites with 4 chronological components (13.6%) and one site (5LR49) that has 5 components (see Table 11). High intensity of use is inferred at sites with 3 or more components, accounting for 21.7% of the datable record.

Table 11. Frequency of Datable Temporal Components per Site.



81.8% of the sites demonstrate few temporal components (defined in this thesis as less than 3). Sites with a high number of components (>/= 3 components) are disparate compared to most of the project area sites in terms of both their frequency within the study area and the geographic locations they occupy. However, they follow a similar pattern of existence primarily along both hogbacks, with a few sites across from one another on separate hogback ridge tops or directly adjacent to one another. These sites would illustrate continued use over time or could demonstrate larger band sizes. Large activity sites with a high number of components represent both diverse and single activities taking place. Inferred functions of these sites are campsites and lithic manufacturing stations. This is not unlike other sites in the foothills.

Table 12. Sites with Datable Temporal Components and Represented Periods. Green cells illustrate presence.

Site	Component Totals	Paleoindian	Early Archaic	Middle Archaic	Late Archaic	Early Ceramic	Middle-Late Ceramic
5LR49	5	■	■	■	■	■	
5LR1150	4		■	■	■	■	
5LR31	4		■	■	■		■
5LR29	3		■	■		■	
5LR50	3	■	■			■	
5LR1155	2			■	■		
5LR155	2		■			■	
5LR156	2		■	■			
5LR1156	2	■		■			
5LR48	1		■				
5LR52	1					■	
5LR1162	1		■				
5LR30	1	■					
5LR954	1				■		
5LR1157	1					■	
5LR1159	1			■			
5LR14331	1				■		
5LR157	1		■				
5LR956	1		■				
5LR972	1				■		
5LR981	1				■		
5LR40	1					■	
Wenborg Vessel	1						■
Total	41	4	11	8	8	7	2

For example, T-W-Diamond likely represents only 1 or 2 chronological components (Meeker 2017:108). This same pattern is reflected within the project area, where most sites have 1 or 2 defined temporal components (see Table 11). Larger base camp sites such as Spring Canyon that illustrate a high number of components, spanning the Folsom period to the Late Prehistoric (Pelton et al. 2016:1), exemplify intensive reoccupation and are extremely uncommon. Other large base camp sites in the region include LoDaiska, Magic Mountain, and Spring Gulch. These large sites have also been tested or excavated, and this may be the reason why they have more recorded components.

Why the periods between Early Archaic and Early Ceramic are much more present in the foothills than Paleoindian or Late Ceramic/Protohistoric periods is debated. We would expect to see later periods represented much more compared to earlier eras, however this is not the case (see Table 12). Instead, the Early Archaic is represented slightly more than later periods. There are a few hypotheses on why this pattern may be occurring. It may be due to the length of time classified in each temporal period. For example, the Middle Archaic lasts much longer in time compared to the Protohistoric. There seems to have been increased population density in the foothills and mountains as the Plains underwent a warming period during the onset of the Altithermal, pushing people to the mountains where there were cooler temperatures, more permanent water sources, and a rich diversity of plants and animals (Benedict 1981; Binford 1978, 1979). This would explain the increase in artifacts and features observed not only within the project area, but also at other sites in the foothills during this period.

CHAPTER 6: SITE SIZE DIVERSITY OF THE STUDY AREA

Site size and use over time is evaluated through calculation of a diversity index related to evenness and richness of the site assemblages recorded. Use of the Shannon-Wiener index within an anthropological context can improve our overall ability to recognize the extent of artifact diversity represented at archaeological sites. A study of site placement upon the landscape lends further support for the results of this analysis.

A critical variable in such a study is the scale of analysis, including both the geographic focus and extent of the study itself (Whittaker et al. 2001). There are three scales of analysis that are examined within this study. Analysis is conducted with the provided assemblage datasets at the *artifact scale* (with individual analysis), *site scale,* and at the *landscape scale*. These scales of analysis contribute to our recognition of site spatial patterning across the landscape, as well as identify potential activities taking place at such sites and why. The foothills ecotone is distinct in its setting and environmental conditions, particularly against the backdrop of the Rocky Mountains and alongside the Great Plains.

The preface for this study is the previous archaeological work that has taken place. Research in the area has primarily focused on the significance of the ecological environment in site use and function (Travis 1986). Topographical and ecological factors such as slope, elevation, aspect, viewshed, and distance to critical resources such as water are some of the many variables considered by other researchers. Thus, these variables will be analyzed to exemplify their key roles in site placement and patterning in further detail. Methods to examine these environmental attributes have changed extensively through time, and the use of Geographic

Information Systems (GIS) improves upon and enhances previous hypotheses on how the environment impacted human settlement and migration.

The existence of site artifact assemblages and site location information enables a reasonable study of site location, site assemblage size, and assemblage diversity to determine why there are observed prehistoric activities at these certain localities compared to others, and to what extent these situational contexts were used by Native American groups. Site size and distributional placement of such sites in the landscape are analyzed to recognize patterns in potential group sizes and in determining single, ephemeral site uses or possible cumulative palimpsests of activity to infer social structure of groups. Cumulative palimpsests are the accumulation of activities that occurred at an archaeological site that are reflected by artifacts and features from multiple activity episodes that are mixed or may be difficult to separate out into individual events (Bailey 2007:204).

Questions to aid in understanding these patterns of hunter-gatherer use include: What types of tools are found discarded at these sites? What is the richness in diversity of these tools? Which sites might represent cumulative palimpsest occupations, and which ones instead represent ephemeral and isolated utilization of the local environment?

An objective of this thesis is to determine if there are spatial patterns to sites that demonstrate how the landscape was used within the project area. For this analysis, environmental conditions and subsistence strategies are examined to potentially answer the following question: Were the foothills used *persistently* over time, even when not *intensively* used through time? A toolkit diversity index and site spatial patterning provides reasonable support to hypothesize the answers to these questions.

Summary of Analysis Methods

There are 66 sites and isolated finds with prehistoric components within the study area. The sites were individually evaluated for their assemblage compositions and the frequency of artifacts and features they contain. All the sites were then compared with one another in their spatial distribution across the landscape.

All the artifact assemblages were used in this analysis; however, chipped stone tool categories are the only artifacts applied in the Shannon Diversity Index portion of this analysis because they are often used in archaeological studies as the best representation of site activities (Shott 2010:889). Lithic tools are the “gear” of the Native American bands that occupied or moved through the area (Binford 1979), and tool presence (or absence), and its richness and evenness rates in an assemblage can be used to infer not only what activities may have taken place at a site, but by using a diversity index, occupation intensity can be inferred as well.

The resulting site sizes of the diversity index are not meant to demonstrate any hypothetical function of how a site was used through time, and instead are used to indicate the general time depth nature of the sites themselves as well as how intensively they were used. The site size results can then be compared with the number of recorded features identified at the sites and the rest of the sites’ assemblages (debitage, ground stone, ceramic frequencies, etc.) to test this method’s reliability in determining occupational spans and presented activities. There may also be an underlying functional basis to the site size definitions used within this analysis but examining site function past the level of “focused activity” or “unfocused activity” is not one of the objectives of this study.

Since the assemblages used are samples of the total site assemblage composition (which is unknown unless there is intensive excavation and data recovery), their overall H index values are used instead of assemblage population totals, as purely utilizing counts of artifacts and not redefining them into proportional units will ignore the variability demonstrated in each assemblage (Hiscock 2002:251).

Site sizes were placed into a hypothetical model that reflects the range of variation observed in the evenness and richness rates of each assemblage. The model has the following site size categories: Small, focused activity sites (small site size, low assemblage diversity), small, unfocused activity sites (small site size, moderate assemblage diversity), large, focused activity sites (large site size, low assemblage diversity), and large, unfocused activity sites (large site size, high assemblage diversity). This analysis and how these resulting site size types were recognized will be discussed later in this chapter.

Calculating diversity and classifying sites within an index is common within archaeology as a discipline. For example, Kenneth L. Kvamme (1988) conducted a type of diversity index in his analysis on lithic scatter site assemblages that were recorded in the central Rocky Mountains in 1979. These fifty site assemblages were recorded from open-air lithic sites found in parklands in the mountains. Some of the sites were large and rich in chipped stone tool types while others were small and consisted of a few pieces of debitage and no lithic tools (Kvamme 1988). In his paper, Kvamme (1988) developed a clustering technique to identify patterns in tool abundance and diversity by using debitage amounts, site size, lithic core amounts, flake sizes, and flake cortex amounts to construct a “snowflake” diagram that assigns a site type to the totality of these variables (represented as plotted “snowflakes” on a diagram) for each site.

He came up with five major site types, or lithic scatter assemblage classes, which were: extended/multiple occupation sites, limited occupation sites, chipping sites, tool kit sites, and quarry sites (1988:388-390). In his work of summarizing assemblage similarities and differences to discern site types from the assemblages, he rescaled each of the above variables he examined to be between 0 and 1 to measure all of them in similar units (1988:388). He recognizes that the resulting, assigned site types are subjective, and therefore tests the technique's accuracy by comparing the given site types to the frequencies of cortex on flakes within each assemblage. Kvamme (1988) argues that based on conducted probability distribution tests, there is a clear correlation between lithic reduction stages and the types of activities occurring at sites. For example, a site defined as a quarry should demonstrate larger flakes with more cortex and should demonstrate more cores (1988:390-391). This result is demonstrated in his work. The results of this comparison reaffirm his assertion that the clustering capabilities of the snowflake method are overall successful in determining site types, even though it is not a rigorous multivariate analysis (1988:392).

The Shannon Index is an information statistic index that can reflect how many different types exist within a dataset while considering species richness and their evenness. By then comparing the resulting site sizes with additional information known about the sites (assemblage totals, frequencies and recorded features), the subjectiveness of site size types can be tested. Reckin and Todd (2020a) utilized the Shannon-Wiener Index for recognizing toolkit diversity differences between two mountain Native American populations who lived in the Absaroka and Beartooth Mountains of the Greater Yellowstone Ecosystem (2020a:1). Like this study, they were interested in recognizing the cumulative mean duration of occupations within these landscapes and were not as interested in site function. Their hypothesis is that higher evenness and heterogeneity in tool types would exemplify increased occupation duration because people would be more likely to do a variety of activities over a longer period (2020a:8). They also used lithic raw material types to recognize if tools were being manufactured with local or nonlocal materials, which could illustrate the amount of mobility taking place between the mountains and other regions. To analyze occupation duration and mobility patterns, they classified tool types into three categories to use in the diversity index: bifaces, scrapers, and drills/awls (2020a:5). Since they are limiting tool types to fit into only three categories, the effects of sample size in using the Shannon Index are diminished (2020a:9). They then compared their results of the Shannon Index to those of the Simpson Index, an additional diversity index that measures the presence of dominant categories in a population (2020a:9). Their results indicate that the longest occupations in the mountains took place during the Early Archaic, which they argue is because of the onset of the Altithermal, or Early Holocene Warming period (2020a:13). Between the Late Archaic and Late Prehistoric, the diversity indices and raw material proportions are all similar, which they relate to a transition to a more mobile, seasonal pattern (2020a:13). By utilizing diversity indices that are normally used at a site-by-site scale to instead recognize patterns in the landscape itself, adaptive decisions of local foragers were recognized in the archaeological record.

Toolkit Diversity

Diversity is the number of different classes present in a population (Grayson and Cole 1998; Kintigh 1984). This variable is measured in proportion to the total sample size per assemblage of specific classes. In the case of this study, the classes are lithic tool types and diversity of the assemblage refers to the distribution of the lithic tool classes within a given assemblage (Grayson and Cole 1998:927). The totality of tools represented in each site assemblage is recognized as the “toolkit” in this analysis. In this study, it is inferred that by calculating toolkit diversity, a site’s intensity of occupation, or “size,” can be determined. In addition, the evenness (or abundance) of tools within the assemblage has the potential of identifying site activity. In this current case, the evenness is discerned to how focused the toolkits reflected at each site seems to be.

A lot of archaeological studies have utilized diversity or abundance indices to recognize assemblage composition variability while also questioning the operability of diversity indices in archaeological studies (Grayson and Cole 1998; Hiscock 2002; Kintigh 1984; Kvamme 1988; Lepofsky et al. 2005; Shott 2010). Lithic assemblages are made up of sometimes multifunctional tool types that are made even more unclear with fragmentation, artifact accumulation, extended use-lives and highly curated toolkits that can lead to over-representation of some artifact samples and not others. As Grayson & Cole (1998) and Hiscock (2002) note, this additional complexity in archaeological assemblages is not always critically considered in diversity analyses which may lead to incorrect interpretations. This is particularly true when such diversity indices are adopted to suggest variable cultural complexities through time and to identify differences in cultural groups rather than just differences in activity types, which has substantial and far-reaching implications that do need additional lines of evidence (Andrefsky 1998:190; Grayson and Cole 1998:928). For example, LaBelle (2005) recognizes that the generalization of Paleoindian groups as specialized bison hunters is largely based upon low richness and skewed evenness in the faunal assemblages at Paleoindian sites, leading to the assumption that Paleoindians had high mobility and focused on bison as their subsistence strategy (2005:14). As LaBelle (2005) illustrates, however, the evidence used for such a generalization is based on inadequate sampling of sites and their assemblages (middens and kill sites studied vs. occupation sites) (2005:17).

To determine toolkit diversity, sample *richness* “S” and sample *evenness* “E” are calculated. Sample *richness* refers to the number of artifact classes represented per assemblage while sample *evenness* refers to the total number of artifacts in each artifact class per assemblage, also recognized as the distribution structure (Cruz-Uribe 1988:180). Therefore, S is calculated from counts (the number of artifact classes represented) while E is calculated from proportion differences between artifact types (Shott 2010:890).

The Shannon Index, or the 'H' index, is used to recognize patterns in distributional diversity within a given population. Therefore, this index has a far-reaching application. The primary components affecting the statistical significance of the Shannon Index are the sample size (Cruz-Uribe 1988:181), artifact taphonomy, and artifact life history including manufacture, reduction, and discard. Additionally, artifacts can have a complicated use-life, making it difficult to assume a static artifact function (Andrefsky 1998:189; Reckin and Todd 2020a:5; Shott 2010:897). Artifact clustering or scattering may also reflect cultural or environmental formation or taphonomic processes, with these formation processes being a key part of artifact life histories. Vertical and horizontal dispersal, trampling, and weathering all lead to artifact and assemblage fragmentation and need to be considered during interpretation (Hiscock 2002:251).

The Analysis: Theoretical Framework and Methods

All the sites are classified into four categories of site size (or site use intensity and occupation duration) based on the corresponding evenness and richness rates exhibited within each site's assemblage. Like debates surrounding lithic artifact morphology and its relationship to function (Andrefsky 1998:190-210), a study of site function differs from a study of site morphology and its assemblage structure. Site size types are used to recognize any patterns in intensity of site use, with similar assemblages attributed to either focused or unfocused activities and the duration of the occupation, either long-term or short-term. This represents an important first step in recognizing how the foothills were prehistorically used and occupied.

In Grayson's & Cole's (1998) test of assemblage diversity indices using standard regression procedures, he recognized that the relationship between the measure of richness "S" and assemblage size is highly significant (r=0.96) (1998:934), with diversity possibly even being dependent upon it.

Site "size" is determined through the percentage rate of richness and evenness of chipped stone tools by first using the Shannon-Wiener Index. Chipped stone tools provide a reasonable source of analysis of assemblage diversity and site size due to several key characteristics. First, chipped stone has generally high sample sizes in the archaeological record. Chipped stone tools are used for a variety of purposes including meat and vegetable processing, hide preparation for shelter and clothing as offering ways of slicing, scraping, puncturing, or engraving (Andrefsky 1998:33). Chipped stone, unlike other artifact types such as bone, wood, or ceramic, have higher and more consistent rates of preservation, especially in open-air contexts.

To utilize the Shannon Index for artifact assemblages, a classification system for lithic tool types that could be utilized across all analyzed assemblages had to be developed (Grayson and Cole 1998:929). The new classification scheme consists of seven chipped stone artifact types that follow the framework of the chipped stone nominal classification recommended in William Andrefsky Jr.'s lithic guide, *Lithics: Macroscopic Approaches to Analysis* (1998, 2010). The artifact classifications chosen for the assemblage diversity index are as follows in Table 13:

Chipped Stone Toolkit Classes

Table 13. Tool Classes used for the Shannon Index for Toolkit Diversity.

Lithic Cores	Scrapers	Knives	Bifaces	Projectile Points	Drills	Perforators/ Gravers

All the chipped stone tools used within this analysis likely illustrate intentional modification (removal of lithic material to shape) to produce an anticipated form, or morphology. Flake tools (utilized/use wear flakes, retouched flakes, river cobbles) are not included within this classification scheme as they are commonly recognized as "expedient" or "situational" gear and are informal tools of immediate circumstances and are therefore not curated as a part of a portable toolkit (Binford 1977; 1979; Stiger 2001:162).

Cores are lithic stones that have had flakes removed from their surfaces. They are viewed as representing a raw material source for usable flakes or having utilitarian function for cutting and chopping (Andrefsky 1998:20). Cores may be curated as a part of a toolkit if there is anticipation that raw material sources may be scarce in some areas and manufacturing of additional tools may be required in the future (Binford 1979:259). Cores are then exhausted after all possible flakes are removed from them (Andrefsky 1998:12).

Scrapers come in a variety of forms, however endscrapers and sidescrapers are the most common. Scrapers/fleshers are shaped unifaces that are usually equated with the function of removing hair or flesh from hides (Andrefsky 1998:73). They can be used as expedient or informal technology (Andrefsky 1998:79). Alternatively, scrapers may illustrate a hafted element, evidencing possible curation and maintenance (Stiger 2001:69).

Bifaces are chipped stone objects that have two worked sides with previous flake removal that form a single edge commonly used as knives (Stiger 2001:69). They can be either hafted (notches or shoulders) or unhafted and their functions can reflect those of projectile points, multifunctional knives, drills or preforms of projectile points. Use, wear, and retouch may be used to identify the inferred function(s) of a biface (Andrefsky 1998:75-77).

Atlatl spears, arrow points used with a bow and arrow, or spear points used as lance tips are seen in projectile point classification (Andrefsky 1998:73). Projectile points are the most common artifact to be used to delineate cultural traditions or temporal phases (Stiger 2001:29). They are also the most likely to be collected by artifact collectors in addition to ceramics (Lohr 1947; Renaud 1935; Travis 1986).

Gravers are used to incise objects (Andrefsky 1998). They consist of unifacial retouch and have a sharp spur that enables engraving of softer material such as bone, wood, other stone, or antler (Andrefsky 1998:73). A stone drill is worked on both sides and can be used to puncture soft materials like leather, bone, soft stone, or wood (Reckin and Todd 2020:5).

The data also factored into what artifact classes were chosen for this analysis. There was variation between the datasets in terms of collection methodology. For example, during the Sprenger Valley field school, only <1% of artifacts were collected from some sites when as much as 25% of artifacts were collected from others (Jennings 1988). Such a stark contrast in collection rates between sites reflect different rates of artifact visibility, artifact fragmentation (smaller pieces not collected as much, etc.), and different sampling techniques. Either way, sampling and collector bias impacts sample size for all artifact collections, which are observed.

Some artifact types were not used within this diversity index analysis and were used instead to corroborate the index results. Ceramics, although they represent a fragmented type of tool used for transporting, cooking, and storing food, are exceedingly uncommon in the project area and in the foothills. There are only three sites with ceramics present within the project area. For this reason, they are recognized as outliers. Even though they are not included within this part of the analysis, ceramic frequencies are used later in this study to identify if they support the results of the diversity indices and resulting site classifications.

Quartz nodules recorded by Travis (1986) are also excluded within the lithic tool types used in the diversity index. They are included within total assemblage sizes because Travis (1986) recorded them, and she posits they were brought in from somewhere else as manuports and used at camps or task sites for lithic manufacturing. There are no other associated attributes or descriptions for these objects.

Other artifact types such as classified ground stone and debitage are used to substantiate analysis results through their exhibited assemblage frequencies. Ground stone, or artifacts produced from grinding or pecking (Andrefsky 1998:75), are not classified within the grouping system used for lithic technology. Debitage is also excluded from this analysis, since it represents the unused chipped stone pieces that are discarded after a lithic tool reduction phase. This includes flakes (striking platform present), flake shatter (no striking platform observed), and angular debris (blocky chunks of stone) (Andrefsky 1998:81). Only formal lithic tools represent enough, definable traits to exemplify consistent presence and permanence within the collections themselves (see Figure 6 for examples).

The number of temporal components for each site are compared with the site size classification scheme present in this chapter to again test the scheme's site assumptions on duration of occupation. Multiple components may exemplify reoccupation of the same space by the same Native American group or by others and has the potential to also illustrate band congregation. By analyzing the relationship between site placement, site components, site size, and artifact diversity, persistence of place in the foothills is evaluated.

In her thesis, Meeker (2017) examines occupation spans at Killdeer Canyon and T-W Diamond. Meeker works to determine if these sites were re-occupied through time or if they represent single components of use. She posits that the stone ring features at these sites themselves were not reoccupied through time based on no overlapping stone rings present, and no reusing and displacement of stone ring features (Meeker 2017:4). Instead of dozens of stone rings representing an aggregation of Native American bands, she argues it is more likely that these heavily used sites represent persistence in place reoccupation.

The T-W Diamond site illustrates a short-term, single component campsite. Killdeer Canyon is also evaluated to represent a single component, with task specialization occurring based on unequal dispersion of faunal remains between stone ring features (Meeker 2017). Both sites contained mostly non-local tools with little evidence of ground stone or hide and clothing processing (drills, scrapers, needles, etc.). The higher frequency of tools at T-W Diamond compared to Killdeer Canyon may represent a large aggregation of people rather than multiple reoccupations.

The Shannon 'H' Index Analysis

After all the artifacts were appropriately classified into formal tool types, richness and evenness percentage rates were calculated for each site by using the following equation of the Shannon-Wiener Index (Magnussen and Boyle 1995: 72) along with the following variables (see Table 14):

$$H' = -\sum_{i=1}^{s} (p_i)(\log_2 p_i)$$

or

$$E_H = H / H_{max} = H / \ln S$$

Table 14. Shannon Index Variables.

H	Shannon's diversity index
S	total number of species in the community (richness)
p_i	proportion of *S* made up of the *i*th species
E_H	equitability (evenness)

In this equation, the result, also known as Shannon's equitability (E_H), can be calculated by dividing H by H_{max} (here $H_{max} = \ln S$). It consists of first calculating a summation value for each artifact type represented at each site. This summation value is then used in calculating the 'H' value, which provides a portion of the result needed to determine evenness. 'H max,' or the number of artifact classes represented at each site, is used to calculate the richness of the sites' artifact assemblages. Both the *H* and the *H max* values are used to calculate the evenness percentage rates. Equitability assumes a value between 0 and 1 with 1 being complete evenness. These percentage results can then be compared between sites.

Shannon-Wiener Index Results

The resulting site categories are small unfocused activity sites, large unfocused activity sites, small focus activity sites, and large focus activity sites.

Table 15. Table illustrating relationship between assemblage diversity measurements of richness and assemblage site intensity of use.

Richness (%) Rate	*High**	Intensively occupied. (cumulative palimpsest). High assemblage diversity.
	*Low**	Short duration of occupation. Singular event. Low assemblage diversity.

*Low (<50%); High (>50%)

Table 16. Table illustrating relationship between assemblage diversity measurements of evenness and the focus of activity occurring.

Evenness (%) Rate	*Skewed High*	Activity is less focused. (More activities/site; more diverse)
	Skewed Low	Activity is focused. (Less activities/site; less diverse)

To calculate richness as high or low, a threshold of 50% is used. Evenness, or abundance within each tool class, is either skewed high or low (see Table 16). For example, if a site, known as Site A, has a calculated richness rate of 43% (3 out of 7 tool classes are present within the assemblage), then the toolkit assemblage diversity is low and therefore reflects a short duration of occupation (see Table 15). If Site A's evenness rate is low as well (one tool type is represented much more than another), then Site A reflects a focused use on one activity. Site A's low richness and evenness and a high frequency of lithic cores may illustrate an opportunistic exploitation of a lithic quarry.

The evenness and richness results were then compared to the 'H' index calculation to test if the hypothesized site size classifications corresponded with the H index values. When arranged from lowest H index values to the highest, all of them demonstrate a pattern in their H values. An H '0' value illustrates only 1 or 2 tools within the assemblage, reflecting low richness and a skewed high evenness (see Table 17).

Table 17. Sites and their associated H Values in the Shannon Index.

Site No.	*H Index*
5LR42	0
5LR642	0
5LR940	0
5LR944	0
5LR958	0
5LR951	0
5LR953	0
5LR972	0
5LR981	0
5LR1152	0
5LR1158	0
5LR1160	0
5LR.14330	0
5LR.14331	0
NS-2017-9	0

site.

5LR40	0.450561209
5LR1156	0.500402424
5LR1151	0.636514168
5LR954	0.636514168
5LR1157	0.636514168
5LR49	0.67303587
5LR1159	0.693147181
5LR1161	0.693147181
5LR1162	0.693147181
5LR939	0.693147181
5LR947	0.693147181
5LR52	0.693147181
5LR641	1.039720771
5LR157	1.098612289
5LR956	1.098612289
5LR942	1.098612289
5LR31	1.143418279
5LR50	1.214889654
5LR1155	1.255183392
5LR156	1.265856752
5LR48	1.265856752
5LR1150	1.318032628
5LR30	1.320888343
5LR155	1.365478318
5LR941	1.386294361
5LR29	1.477489731

Mean H Index Calculation: 0.963129651

Small unfocused sites (n=12) have H values that range between 0.45-0.69. Four of these sites have thermal features (5LR40, 5LR1151, 5LR1157, and 5LR1161) while sites 5LR40, 5LR52, and 5LR954 have architectural features. One site (5LR49) is near the middle of the H index range at 0.67. Although its richness is extremely high at 100%, demonstrating all 7 tool types, its evenness is skewed exceptionally low at 35%. This is due to the stark abundance of projectile points within its assemblage compared to all other tool types (n=111 out of 132 tools). In addition, the site also has six thermal features, further illustrating intensive occupation at the site.

The last site size classification includes large unfocused activity sites (n=14). Their H index values range between 1.09 to 1.47. These sites have the highest assemblage diversity within the project area. Based on this information, cumulative palimpsests of a diverse array of activities are demonstrated. On closer inspection, two of these sites (5LR30 and 5LR941) have less than 15 total artifacts and have no ground stone, thermal features, or architectural features. For example, 5LR30 has 3 knives, 1 drill, 1 projectile point, and 2 bifaces (4 out of 7 tool classes) having a debitage total of 5. 5LR941 has a toolkit consisting of 1 core, 1 scraper, 1 biface, and 1 drill (4 out of 7 tool classes) having a total of 4. These toolkits are diverse, yet their assemblage sizes, lack of features and the absence of artifacts reflect sedentism sites as isolated occurrences. It is the totality of these sites' assemblages and features that provide additional context for theoretical interpretation. For sites with such a low assemblage size, it seems that the diversity index alone would not be the most suitable measure of occupational intensity.

The index results also indicate that the tool types utilized for measuring diversity may also misplace some sites within the theorized site classification scheme. For example, 5LR642, a site with a large percentage of its assemblage represented by ground stone (59.7% of its assemblage), had been placed within the small, focused activity site category. The site's assemblage size (n=92) in association with the amount of ground stone present (n=55) reflects much more intensive use than what would be otherwise assumed for sites placed within a small site size category. 5LR642 has the second highest total ground stone amount in the project area following 5LR155 (n=334). In addition, 5LR642 also has one architectural feature (a stone ring).

These three sites (5LR642, 5LR30, and 5LR941) are outliers. The site size hypothesis on the relationship between the datasets corresponds favorably overall to the assemblage diversity index. For example, all the sites classified as small unfocused (diverse) activity sites were short term, unfocused occupations. The large, unfocused activity site size category captured almost all sites with the highest assemblage sizes in the project area (excluding 5LR642) as illustrated at Killdeer Canyon north of the project area (Meeker 2017). In addition, the sites with the most thermal features are represented in this category as well, further evidencing cumulative palimpsests and the effectiveness of the index.

There are only eleven sites in total with thermal features (17% of record). Seven are with ephemeral structures (11% of record), with one site illustrating a total of 30 stone rings (5LR40). Forty sites demonstrate the use of ground stone (61% of record) and the same amount includes lithic debitage (62.5% of record). Only three sites have Plains Woodland ceramic remains (5% of record) while one site consists of a cached steatite vessel. There are eight sites that dominate the record in terms of their frequencies of architectural and thermal features, as well as in their frequencies of varying artifact types (See Table 18). These sites represent only 12% of the entire prehistoric site total in the project area.

Table 18. Sites with Highest Frequencies of Features and/or Artifacts.

Artifact/ Feature	5LR40	5LR155	5LR156	5LR642	5LR946	5LR1150	5LR1151	5LR1155
Hearths	Present	5-10	5-10	0	0	11	1	1
Structures	30	0	0	1	0	3	0	2
GS	0	334	10	55	0	13	0	45
Debitage	8	856	56	31	<1000	232	203	56
Ceramics	0	19	0	0	0	20	0	0
Formal Tools	6	28	8	1	Informal only	42	3	36
Highest Frequency								

Only seven sites in the project area have associated architectural features. Three of these sites are represented in the large, focused activity site category (5LR50, 5LR1150, and 5LR1155) while three are in the small, unfocused activity site classification (5LR40, 5LR52, and 5LR954). Most of the features are stone rings except for the feature at 5LR954, recognized by Lauri Travis (1986) as a shelter feature constructed of stacked sandstone bedrock slabs intertwined with a dead Ponderosa pine tree. Edison Lohr (1947) suggests 5LR.40 is associated with up to 30 stone rings as well as several hearths, although the exact count of either is unknown. If indeed 5LR40 consists of over 30 stone rings, it likely reflects a large band moving through the area rather than reoccupation, as demonstrated at the T-W Diamond site located north of the project area (Meeker 2017).

There seems to be no correlation between sites that have architectural features and their assemblage sizes. These features are also only demonstrated at unfocused activity sites. Architectural features such as stone rings are indicative of short-term, likely seasonal occupations (Meeker 2017:3). According to Meeker (2017), stone ring sites have notoriously low assemblage sizes, making them difficult to recognize occupation span. As illustrated in this paper, utilization of a diversity index on existing sites with stone ring features may prove useful in recognizing occupation span and site use duration.

Result Challenges

There are challenges with using the Shannon Index on cumulative palimpsests and single episodes of activity. Both are remnants of settlement and site patterns, and their identification may have to do more with natural formation processes and surveyor's bias than actual episodes of visitation and use at specific locations (Bailey 2007:205). Cumulative palimpsests are especially tricky since they offer low resolution in individual occupation spans.

Six of these sixteen sites (37.5%) only have one lithic tool within their total assemblages (no debitage, ground stone, ceramic, etc.). It is more likely that these 6 isolates are reflective of quick discard or loss consisting of four projectile points (5LR972, 5LR981, 5LR14330, 5LR14331), one knife (5LR42), and one lithic core (NS-2017-9) rather than sites of activity that lasted more than a few hours.

In addition, twenty-two sites (or isolates) could not be placed within the site size classifications because they do not have any lithic tools. For most of these sites, this exclusion is understandable as they illustrate one artifact type and only a few artifacts. However, four of these sites (5LR175, 5LR948, 5LR957, and 5LR1149) have both ground stone and debitage. Although their total assemblage sizes are less than 15 artifacts, it would be expected that they would represent more than just quick discard or loss since more than one artifact type is present. One of these twenty-two sites (5LR1154) also has a hearth, and even though it only has one recorded piece of ground stone, its feature would signal a longer duration of use.

Another site (5LR946) has hundreds of river cobbles with battered ends and thousands of primary and secondary flakes. Since the tools represented at this site are classified as informal, this site was not included within the diversity index either. In addition, actual counts of artifacts in the site assemblage are unknown. Based on Travis' (1986) description of the site, it likely illustrates a large, focused activity site. Therefore, the site is included with 5LR49 into that site size category but would otherwise not be assessed.

Section Conclusions

There is a spectrum of sites demonstrated within the project area. Other than the few exceptions that challenge the accuracy of the Shannon-Wiener index in identifying assemblage diversity and therefore site size, most of the sites in the project area illustrate low or moderate toolkit assemblage diversity (n=25, not including those sites that only have one lithic tool and no other artifacts (n=6)). Most sites do not contain thermal or architectural features, and the frequency of debitage within the project area far outweighs that of ground stone, further illustrating ephemeral use.

Although most of the site sizes reflect smaller and shorter occupations, however, the amount of ground stone present (n=~800) is higher than what would be initially anticipated. This is likely due to the foothills offering a tremendous amount of Lyons formation sandstone, an advantageous raw material for producing grinding slabs and manos because of its harder and more durable characteristics (Brunswig 2015:91). This resource is in such high demand it has been found at sites throughout Rocky Mountain National Park (Brunswig 2015:81). Based on the high ground stone frequencies represented and its dispersion across all site sizes within the project area, it looks like intensive sandstone exploitation was occurring. Since the ground stone frequency also includes tools such as edge ground cobbles, a ground axe head, and large metamorphic rocks as defined by Travis (1986), it is likely that ground stone frequency is an indication of high plant processing as well.

Most sites are illustrative of isolated occurrences that are not represented within the Shannon-Wiener index. The second and third most populated site type is that of small, focused activity sites and small, unfocused activity sites. The index differentiated ten sites from the rest as illustrating high toolkit diversity. While this is true for all ten, only eight of these sites are validated to belong in the cumulative palimpsest site size category based on their assemblage and feature compositions, illustrating them to be intensively utilized. As discussed above, 5LR30 and 5LR941 should likely not be classified as cumulative palimpsests and 5LR642 should not be classified as a small, focused activity site. Small sample sizes of lithic tools reflect an adverse result of the Shannon-Wiener index. In total, 15 sites/isolates do not correspond well to their site size classifications (or lack thereof), representing about 23% of the total prehistoric sites.

The area overall has a lack of architectural features that have been recorded such as stone rings, and the frequency of thermal features such as hearths are densely concentrated within a few of the sites. These conclusions on the dataset help to substantiate the ephemeral, seasonal utilization inferred to have taken place in the foothills hypothesized and supported by other studies (Brunswig 2015, 2016; Irwin-Williams and Irwin 1966; Meeker 2017; Travis 1986).

Site Organizational Patterning

Based on ethnographic accounts of hunter-gatherer bands, such as the Hadza people who live in north-central Tanzania, the aggregation of people and their concentration in one area is demonstrated in a few large camps in an area with scattered task group localities (Jochim 1976:67). As posited by Jochim (1976), sites should be less numerous and less densely concentrated if an area was not being used as wintering grounds for bands of people (Jochim 1976:66). In addition, the higher density of resources allows for less dispersion of groups, leading to palimpsests of continual activity (Jochim 1976:66), which exhibits the pattern we see of site spatial distribution within and just outside of the project area.

The range of resource exploitation that directly surrounds this site space is known as the foraging radius of a population (Binford 1982:7). Beyond the foraging radius is the task group localities which demonstrate actions related to resource procurement and/or processing. These are usually arranged and positioned on the landscape in such a way as to allow for the task group to return to the base camp within a day. Sometimes these groups may remain away from their base camps for longer durations of time (Binford 1982:7). This mobility behavior of a group produces a further increase in site density within a given area, specifically that of ephemeral campsites. This pattern is reflected within the project area (see Figure 17).

Figure 16. Densest concentration of sites located along the hogbacks.

Eco-Regional Site Patterns

The organizational relationship between places is crucial before considering the organizational structure of a group of people who lived in the past (Binford 1982:5). Site patterning at an "eco-regional" scale is observed as repetitive utilization of the ecological environment through time. This analysis also allows a comparison between these sites to others that have already been well studied within the South Platte River Basin. Most of these sites also illustrate both Archaic and post-Archaic components including the Late Prehistoric period. All these sites are located within the foothills or in the surrounding valleys along the Front Range. Valley View (Brunswig 2016), Spring Gulch (Kainer 1976), the Ken-Caryl Ranch (Johnson 1997), and Kinney Spring (Perlmutter 2015) offer good Front Range comparisons. Comparison between all these sites along the southern Front Range can also further demonstrate persistent use of the foothills as wintering grounds or as a refuge area from dry seasonal conditions.

Magic Mountain and LoDaisKa demonstrate multiple components of intensive use at the site and represent some of the earliest published works on the Plains Woodland period identified at sites (Irwin-Williams and Irwin 1959; 1966). Spring Gulch (Kainer 1976) similarly includes possible living floors with numerous lithic and bone tools. Large game such as bison and mule deer are also present in the faunal assemblage. Additionally, fauna such as jackrabbit, hawk, pocket gopher, and even clams are also seen. Goosefoot seeds were also recognized within the macro botanical samples (Gilmore et al. 1999). Cherry Gulch (Nelson 1981) also illustrates Middle and Late Archaic components, whereas the Wilbur Thomas Shelter (Breternitz 1971) illustrates McKean, Magic Mountain and LoDaisKa complex artifacts. The Dipper Gap site is located 30 miles northwest of Sterling, Colorado. Bison remains along with antelope, rodents and turtles were also recorded during excavation, and the site exemplifies Middle and Late Archaic components (Metcalf 1973). All these sites are generally located in proximity to water sources, especially springs and along more permanent streams and creeks on terraces. They are also concentrated near vegetative communities. All these resources produce what is recognized as an ecological patch (Brunswig 2015), within the range of mobility for hunter-gatherer groups.

If resources such as water, vegetation, stone, shelter and viewshed were important in determining site location, there are certain expectations on where sites should be in relation to these resources. These sites are expected to be within a day's walking distance from permanent water sources. If the foothills offered grounds for wintering camps, it is expected that most sites would be in protected places with natural barriers from westerly prevailing elements. If viewshed was important, then most sites should not be in the lowlands or on the valley floors, and instead on the hogbacks and hilltops. Vegetation such as ponderosa pine and mountain mahogany would be important wind barriers, fuel sources, shelters, and food sources.

Environmental variables played a large role in Travis' thesis assessment in determining the extent of prehistoric occupation in the northern Plains-Foothills ecotone, and what environmental characteristics would have drawn people to this environment from the Plains and elsewhere (1986). The environmental variables she analyzed with relationship to site locations include water sources, slope, aspect, protection from wind, topography, and vegetation. These environmental characteristics are overall recognized as being important in the determination of the best occupation and/or utilization areas by hunter-gatherer populations (Jochim 1976). This reliance on these variables corresponds in large part with the group's overall subsistence and settlement patterns spatially and temporally.

Variables such as climate, fauna and geology remained constant in prehistoric indigenous group decisions of site location between activity sites as observed and documented by Travis

(1986). The percent grade, or slope, that each site was located on also varied, as well as site exposure or the aspect of each site. The distribution of these sites across the landscape, their site types and chronologies formed the framework for her research in identifying the significance of the Plains-Foothills ecotone. The site density of the area Travis surveyed was extremely high, with a total of 27 sites within a 2.5-mile area along the first Dakota Hogback formation between the Plains and the rest of the foothills (Travis 1986:2). Travis completed a comparative survey along the second hogback, where only four sites were documented in comparison. She argues that the abundance of sites on the first Hogback uplift is due to its overall ecology, where a larger diversity of flora and fauna is present compared to the second Hogback uplift (1986:121).

Previous studies describe the attractive, ecological properties of the foothills and how they would have been important to prehistoric peoples (Travis 1986). A component of this thesis is to test these previous interpretations in the study area. Environmental variables were analyzed utilizing ArcGIS mapping software to recognize which geographic attributes may play a role in site location and density across the landscape. Based on the number of sites that demonstrate such properties, it would then be possible to explore how important these variables indeed are to site location and density.

The project area's settlement pattern illustrates the preference of proximity to raw lithic material sources and ground stone raw material, as well as a possible attraction to water gaps formed by the hogback uplifts and to the occurrence of natural springs, which would provide a source of water even through the winter months. 360-degree views are offered along the hogback ridgelines and on top of Milner Mountain, offering defensive positions against other migrating Native American bands. In addition, the hogback valleys provide areas that are hidden from view from the plains and nearby drainages and canyons, which are major travel routes for animals and people. Water sources, ground stone and lithic raw material sources are further described below.

Natural Springs and Water Gaps

More than 70% of the prehistoric sites within the project area are within a quarter mile to perennial or intermittent water sources (see Figure 18). Fossil Creek, Indian Creek, Redstone Creek, Spring Creek, and the Big Thompson River would all offer significant perennial water sources. Three sites are within a half-mile north of the Big Thompson River (5LR29, 5LR30, and 5LR955). Most of the water sources are represented as drainages between the hogbacks, also known as water gaps, with sites mostly located along the drainages or at the top of the ridgelines where the drainages begin (see Figure 19). Water gaps would also provide a more accessible route for migrating animal populations such as mule deer or elk to cross through the hogbacks. Water gaps also provide shelter from wind and weather and offer proximity to cobble/gravel deposits for lithic raw material resources (Pelton et al. 2016:2). Other water source types include alluvial fans where an artesian well could be dug into the lower slope where ground water would be more accessible (Travis 1986:23), or at the base of hogback vertical walls where water seepage has been found (Travis 1986:31).

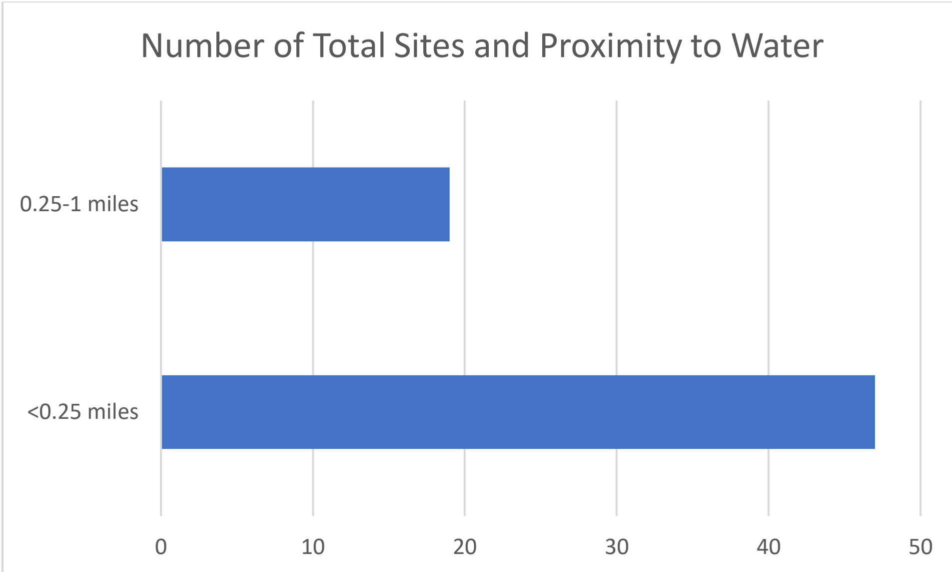


Figure 17. The number of total sites and their proximity to water.

Hogback drainages and these other water sources do not offer a perennial source of water, but springs that are located along the fault and along the valley floors provide near-permanent freshwater sources. There are seven large springs that are recognized within the project area that are plotted on USGS topographic maps (US Geological Survey 2019). There are three additional springs that are recognized during site inventories but are not on any topographic maps (see Figure 18). Additional springs are likely to exist, although as noted by Lauri Travis, some of these springs may be manmade due to Horsetooth Reservoir rising the surrounding water table (1986:28). Some of the natural springs are associated with the hogback fault abruptly extending into the aquifer below, producing natural ground-water discharge (Reiner 2002:10), while others are along the southern flanks of Milner Mountain and along Indian Creek.

In the project area, 5LR31 is 0.1-miles northeast of one of the recognized, seven natural springs. Another spring is along Indian Creek, and no sites have been found within its vicinity. Two other springs are also along Indian Creek. The closest sites are within a quarter mile and they are located on top of the hogback ridgeline to the northeast of them. These sites include

5LR1155, 5LR1156, 5LR1158, and 5LR1159. Another spring is located just southeast of 5LR1159 in a water gap recorded by the Sprenger Valley field school (Jennings 1988). There is at least one additional spring recognized as Twin Springs located along Spring Creek in the northern portion of the project area that has three sites located within one mile to the northeast (5LR48, 5LR49, and 5LR14330).

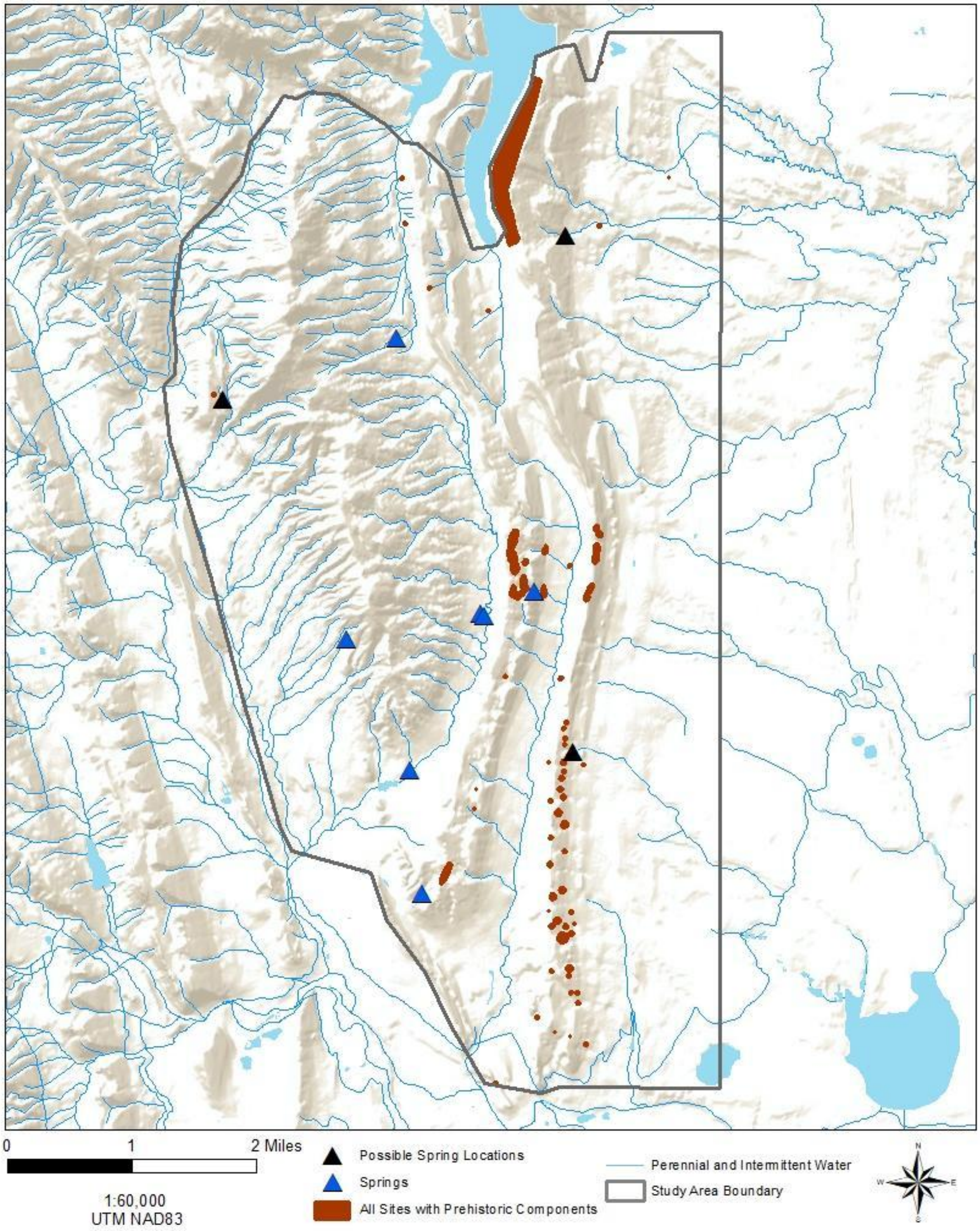


Figure 18. Intermittent and Permanent Water Sources with natural springs and possible spring locations mapped in relation to sites.

A review of Gerald Spence's autobiography, *The Hunter* (1992), reveals the significance of natural springs that are present in these parts of the foothills. Natural springs would not only be a source of freshwater for Native American populations, but would also offer a variety of animal and plant species, particularly during the wintertime as explained by Spencer (1992):

> "In places the creeks were kept warm by underground springs so that there was open water. Although cold, that open water was a better resting place [for ducks] than a sheet of ice covering a frozen lake (1992:41). But when the winter freeze would set in from a cold front, the temperature would drop below zero and hover there for most of that winter. The locals called these cold fronts, 'cold waves.' Spence further explains, "[It is possible to] see open spots of water on the small creeks back in the foothills at the base of the Rockies. The Buckhorn Creek always had open areas and the deep hole at the base of Redrock Cliff never froze over. A sizable spring bubbling out on the bank at the upper end of the pond kept it from freezing. And a couple of hundred yards just below Redrock was another spring-fed pool that stayed open all winter. Here and there downstream for several miles, there were pools that were always free of ice" (1992:95-96).

Natural springs provide favorable environments for animals, plants, and people. Many of them would additionally fluctuate with changes in the water table, providing fresh water at different levels on an annual basis (Haynes and Agogino 1966:818).

Evidence of the importance of springs to prehistoric lifeways may also be indicated in the archaeological record. In Colorado, Benedict (1992) analyzed a 'hog back' (foothills) corner-notched projectile point made of Kremmling chert that was found at the Coney Lake site (5BL94), a subalpine hunting camp in the Indian Peaks Wilderness Area (1992:1). The projectile point illustrated a high level of patina on its surface, indicative of its contact with sodium-rich spring water. Benedict posits that the projectile point underwent ritualistic behavior at Hot Sulphur Springs in Middle Park, Colorado after its manufacturing from a nearby Kremmling-chert quarry, and then brought to the Coney Lake site (1992:3). He compares this process to ethnohistoric records of the Arapaho and Cheyenne who left hunting offerings at springs, with one such sacred spring being in the Pikes Peak region in Colorado (1992:4). Spiritual connections with the southern Rocky Mountains is observed at other sites such as Old Man Mountain, where river cobbles, obsidian flakes, steatite, paint and pottery were left along the mountain slopes and its weathering granite pits (Benedict 1985:32).

A similar pattern is found in surrounding states. At Blackwater Draw, the type-site for the Clovis Culture in New Mexico for example, lithic tools were found discarded in spring conduits, possibly representing ritualistic behavior or a concentration of economic/technological utilization and activity occurring near to them (Boldurian and Agogino 1982:213-214). Similar patterns in artifact density near and within spring conduits have been found at sites in Kansas, Nevada and Wyoming (Haynes and Agogino 1966:814). The Kinney Spring site to the north of the project area is in a hogback valley with a main drainage channel featuring a permanent spring that would have provided year-around water (Perlmutter 2015:3). Killdeer Canyon also features a natural spring, with thirteen stone rings along the terrace nearest to it (Meeker 2017:7). These findings illustrate religious behavior or specific activities near springs and are debated, as they may instead show several different cultural behaviors through time (Boldurian and Agogino 1982:215).

Ground Stone Material Source

The most /significant raw material source for Native American groups in the project area would have been red Lyons sandstone of the Lyons hogback (i.e. see Figure 1). This sandstone is much more durable than the local biotite schist material in the mountain parks, although this local source was used for ground stone as well (Brunswig 2015:63). Brunswig (2015) explains that Lyons sandstone was so desirable because it would last longer during freeze-thaw periods in the alpine tundra environment and in the harsh winds (2015:91). He hypothesizes that specialized procurement trips were taken by montane valley occupants in the mountains down to the eastern foothills to exploit this resource (Brunswing 2015:91). Active trading was occurring between the migrating bands of people from their wintering occupations in the foothills during their seasonal travel into the mountains in the summer and late spring as well (Brunswig 2015:91).

As further evidence of the desirability of this raw material source, 61% of the sites within the project area exhibit ground stone material remains, with some sites only also illustrating ground stone artifacts or having much of their assemblages being ground stone (i.e., 5LR642). This high utilization of ground stone is also demonstrated at surrounding sites in the foothills. The Spring Canyon site (Pelton et al. 2016) is a multicomponent prehistoric site located in the foothills on the Pineridge Natural Area west of Fort Collins, about 0.6-miles from the study area. It represents a large, residential base camp where Native American groups processed plants, animals, and hides, conducted primary lithic reduction and prepared for hunting (Pelton et al. 2016:16). The site had previously been recorded by Lohr (1947), Wheat (1953) and Morris (1971) and was most recently mapped and tested in 2008 and 2011 by Dr. Jason LaBelle (Pelton et al. 2016:4). The site features 1,700 artifacts including 151 ground stone pieces such as manos, metates, and a grooved abrader. It represents one of the largest ground stone assemblages in the Colorado Front Range (Pelton et al. 2016:13).

Sites in the project area located along ridge tops or along the hogback bases would be important raw material procurement localities. Twelve sites are along the ridgelines and ten are along the western-facing bases of the hogbacks, where large boulders and swaths of sandstone bedrock are exposed. These sites account for 33.3% of the total record. Most sites that remain (31.8%) are along east sloping shelves, about halfway up the hogbacks and within a short walking distance from the ridgeline or valleys below.

Lithic Raw Material Sources

Raw material types were evaluated for every artifact within each collection by using data from the original collection inventories provided by Lohr (1947), Travis (1986), the CMPA (2017), and Jenning's field school (1988). If material type was unknown and the assemblage was available, observations were made by evaluating each lithic's translucence, luster, and texture. General lithic raw material types of artifacts found within the project area include quartz, chalcedony, chert, rhyolite, schist, jasper, quartzite, petrified wood, and obsidian (or fused shale). For this analysis, jasper was placed in the same category as chert, due to differences in field recording between assemblages and because both are variations of cryptocrystalline (Andrefsky 1994:25) and a microscopic analysis was not completed.

A formal, raw material source analysis on formal lithic tool types was not conducted for this thesis. Such an analysis would include a comparison to an existing lithic raw material collection that has documented source locations and an administration of ultraviolet light fluorescence analysis to the artifacts to determine the validity of parent materials (LaBelle et al. 2015:56). Possible raw material sources for material exhibited within the project area are hypothesized from existing analysis literature occurring on sites in the surrounding area.

Some of these materials naturally occur within the project area either as exposed rock outcrops or in secondary deposits in creek beds and within drainages. These materials include a red/gray chalcedony and fused/baked shale in exposed outcrops (LaBelle et al. 2017:6, 17; Pelton et al. 2016:6) and orthoquartzite (quartz sandstone) in bedrock and the hogback uplifts. Travis notes gray, medium grained quartzite material exposed at 5LR176 (1986:17), and a limestone outcrop with dark red chert exposed at 5LR955 (1986:34). The project area is also nearby to other known raw material sources within the region.

Chert exists in the Ingleside Formation limestone in Boxelder Canyon and Haygood Canyon (Coffin 1929:11) while quartzite can be found in the Poudre Canyon, Lower Thompson Canyon and Buckhorn Canyon (Coffin 1929:27). Silicified wood can be found on Table Mountain and on the Lindenmeier Ranch (Coffin 1929:26), and jasper and chalcedony are found on Specimen Mountain west of Estes park north of Grand Lake and can also be found in secondary gravels. Chalcedony is found in tertiary gravels at Round Butte and along Boxelder Creek to the east. Quartz is found in the Red Feather Lakes area and along Elkhorn Creek further north (Coffin 1929:25).

Primary lithic sources that are common in the region include Troublesome Formation Kremmling chert, Table Mountain jasper and Windy Ridge Dakota orthoquartzite which are located west of the Continental Divide in Middle Park and North Park (Bamforth 2006; Brunswig 2015). Kremmling chert source analysis at the foothills site of Valley View (Brunswig 2016) illustrates that Kremmling also occurs as nodules in eastern plains paleo-valley gravels. This chert was moved into these secondary deposits as stream outwash from interior montane valley deposits during the Miocene Era (Brunswig 2015:63).

The Kinney Spring assemblage illustrates the Campbell Mountain Raw Material quartzite (Meeker 2017; Perlmutter 2015) while at the Spring Gulch site, Campbell Spring Draw is the primary lithic source located about 3 km to 4 km away and consists of Morrison formation gray quartzite (Kainer 1976:44). T-W Diamond and Killdeer Canyon are also nearby this raw material source (Meeker 2017:44). One site recorded by Travis (1986) exemplifies white chalcedony material in the form of flakes that she assumes was brought from another place (5LR946) since this material is not observed in the project area (1986:26).

In addition, contact to the south in northern New Mexico and to the north in northwestern Wyoming are also exhibited (LaBelle 2015:56). This exotic connection is further evidenced at other foothills sites such as the Spring Canyon site where obsidian artifacts were sourced to Wyoming, northern New Mexico, and Idaho (Pelton et al. 2016:46). A total of only two pieces of obsidian were recovered from the project area. Even though these exotic relationships are present, most of the lithic material used at foothills sites is local or semi-local. This is demonstrated at the Spring Canyon site just to the north, where most lithic material was chalcedony or orthoquartzite (n=350 out of 566), both available locally in the foothills (Pelton et al. 2016:6). In my analysis, most lithic material was quartzite (n=617 out of 1,122). This does not include the number of unknown specimen materials (n=278). Chalcedony is the second most represented lithic raw material (n=176). As shown above, these materials are locally available within 100 km of the northern foothills. Most of the assemblage shows a high proportion of localized material being used, illustrating its abundance in the area (Andrefsky 1994:29). Since little of the lithic material presented within the project area is diagnostically exotic (such as the two obsidian pieces), access and/or need for nonlocal materials by way of raw material expeditions or trade seems to be limited (Andrefsky 1994:29).

Chapter Conclusions

There are definable clusters of favorable locations utilized. Fifty-two site locations are within 0.25 miles of springs, creeks, or intermittent streams and associated riparian zones, while the remaining 14 are within one mile of these resources. Even when not offering a permanent source of water, the drainages and water gaps of these resources provide easier access to both the hogback ridgelines and the valleys. Most of these sites are located along the east slopes of the Lyons and Dakota hogbacks at an elevation between 5,250 to 5,415 feet, protecting them against prevailing west winds. These sites are in a good defensive position from the elements and have an uninterrupted view of the eastern Plains. Thirty-nine sites (59.1%) are located within 20 meters of trails, roads, houses, or agricultural fields. This affects both archaeological survey intensity, as more accessible areas are more likely to be surveyed than remote ones and affects continued exposure to increased erosional disturbances to sites.

The site spatial distribution is heavily weighted to the south of the project area. Along with differing field methodology and sampling strategies between different projects that have taken place, this area likely represents a higher rate of overall preservation of cultural resources as well. Sites with high artifact and feature counts are also more likely to be demonstrated along the first Dakota Hogback to the east. Both the Lyons and Dakota hogback formations have similar environmental characteristics; however, the eastern Dakota hogback would be increasingly protected from the natural elements compared to that of the Lyons hogback closer to the mountains. These reasons may help explain the stark discrepancy between site frequencies represented along both hogbacks.

Sites with low toolkit diversity are spatially differentiated from small, diverse activity sites. Four out of the five single activity sites are located along the Dakota hogback. 5LR49 is located just east of Milner Mountain where sites are sparsely located, further exemplifying what would be expected from a task activity taking place away from the potential primary centers of activity taking place along the hogback ridgelines.

CHAPTER 7: CONCLUSIONS AND FUTURE RESEARCH

The results of this thesis illustrate that the foothills were used on a recurring basis between the Paleoindian and Protohistoric periods, with increased datable material from the Early Archaic to Late Archaic and the Early Ceramic. Because of the lack of intensive duration of occupation exhibited, the study area was occupied on a seasonal basis or visited when raw materials and resources were needed. Reoccupation of the same site spaces did not occur in most of the record, leading to small site sizes and little toolkit diversity. Occupations were likely short-term and seasonal in behavior, with resource exploitation being a primary factor in foothills utilization.

An analysis on site chronological components demonstrates that more than seventy percent of the sites have fewer than three different occupations based on relative dating techniques. The results of the toolkit diversity index also support this conclusion, as about seventy percent of the toolkits represent low-to-moderate diversity in their assemblage compositions. In addition, the toolkits illustrate small site sizes, with only twelve percent of the record demonstrating large site sizes and diverse activities, and only three percent exhibited large site sizes with focused, singular activities occurring. Large prehistoric sites such as the Spring Canyon site (Pelton et al. 2016) are extremely uncommon in the general area.

This thesis also exemplifies how important resource potential was for determining foothills use and occupation by evaluating major ecological attributes and comparing site locations and assemblage data with this data. As described by Cody Newton (2016) in his discussion on the Lykins Valley site (5LR263), it is evident that the Native American groups who occupied and used the foothills were extremely knowledgeable as to where to find localities that are well-protected from the elements and that provide a rich biodiversity of flora, fauna, and of raw materials. In addition, the project area provides locations that can limit view from others or that offer scouting overlooks. East-facing rock shelters and overhangs provide shelter from the prevailing westerly-winds and enable a view to the east over the Plains.

Its most significant raw material source is that of Lyons sandstone, which provides a durable grinding surface that was transported to occupations up in the mountains (Brunswig 2015). Edible plants and seeds are much more readily available in winter in the foothills compared to the Great Plains and at higher altitudes, and the processing of these plants could provide a much-needed source of key nutrients and fats during the harsh winter months (Cummings et al. 2013). Mule deer, elk, and occasionally bighorn sheep would migrate through the foothills and hogback valleys and could be advantageously exploited by using the natural physiography of water gaps and rock shelters as a part of hunting strategies. Bighorn sheep (and elk) provide meat, and hide and fur for clothing and footwear, as well as bone and horn for tools (Lee 2012:174).

This thesis synthesizes past archaeological work and provides a primarily processual framework to guide future studies through questions and challenges faced while working in a diverse and oftentimes developed landscape. Hunter-gatherer populations and their systems of economy, subsistence, and group exchange, are significantly affected by environmental conditions, and their associated social discourse is translated within this landscape. Past social and political behavior also influence these behavioral systems. They are more difficult to observe in studying site formation processes and the environment in which these sites are located. The questions in this thesis are derived by the data itself, and further exemplifies the need for more research to be completed, particularly through examination of site subsurface deposits and further survey inventories.

Although it is postulated that after the Altithermal, hunter-gatherer populations began to dramatically shift their subsistence strategies and residential mobility patterns (Benedict and Olson 1978). The extent to which this occurred is still subject to interpretation, as it seems abandonment in the Plains did not always occur during this period of increased drying (Larson 1997:358). It is argued that hunter-gatherer groups became more dependent on 'refugia' areas where there was much more diversity in flora and fauna compared to what was offered on the Plains or high in the mountains (Benedict and Olson 1978). The foothills illustrate such an area. The Archaic is a lot more evident in the archaeological record overall, and, especially along the Front Range foothills, due to it lasting for over 6,000 years, therefore having more time for artifact production and accumulation compared to other periods like the Late Prehistoric which lasted 1,900 years. Of course, this is also due to several reasons such as increased population density in regions during the Archaic, and not only due to differing behavioral adaptations from their cultural predecessors.

The contribution of examining Archaic components at sites lies in the familiarity we have as archaeologists in over-simplifying or generalizing other temporal periods. Paleoindian groups were originally recognized as highly mobile due to specificity to specialized large game hunting such as that of bison. However, through continued research and re-visitation of these previous hypotheses, it has become more apparent that these groups did not follow such a rigid and exclusive lifeway (Andrews et. al 2008; LaBelle 2005). It is apparent that the foothills and hogback areas have been used for thousands of years based on previous archaeological studies within and adjacent to the project area. Artifacts dating all the way from the Paleoindian to the historic have been recovered at these archaeological sites and are represented within the study area itself.

The Late Prehistoric period illustrates the end of the traditional hunting and gathering way of life. Ceramics, structural remains evident at other localities in the foothills, and an intensification of plant food processing exemplifies what is generally considered to be the Plains Woodland period, however some of this is still previously seen during the Archaic as well (Hofman 1996:41). This shift from highly mobile hunter-gatherers to broad-spectrum foraging in the foothills took place during the year on a seasonal basis when food became scarce on the Plains or at higher elevations.

This pattern of site spatial distribution upon the foothills is even more evident and likely to have occurred during drought years, demonstrating some relative flexibility in the Archaic and Late Prehistoric ways of life (Hofman 1996:80). Although the area presently does not demonstrate overall persistent site-use overtime, the foothills are illustrative of a significant place that was consistently visited, albeit in short durations, and would have been an important geographical landmark to prehistoric peoples.

The foothills provide enough resources for long and short-term occupations and activities, particularly during the Archaic period, which went through dramatic shifts environmentally and which would have a significant effect on both social and economic discourses for populations dependent on it. Natural springs provide permanent water sources along the hogback water gaps and creeks. Ponderosa pine trees and Mountain Mahogany communities offer plenty of fuel sources and shelter material. Stone resources such as Lyons sandstone, quartzite, and shale are also available and were used for ground stone and lithic manufacturing, accordingly. Large sandstone bedrock slabs are also identified at several project area sites and argued to have been utilized as structural supports for shelters (Travis 1986). Occupying this landscape would provide accessibility to all these neighboring resources that are within reach of one another (Travis 1986:7), which are otherwise disparate or non-existent on the Plains or at higher elevations in the mountains.

Procurement strategies change throughout the year or years depending upon resource availability, population growth, and social factors such as exchange of goods and ideas between groups (Hofman 1996). Adaptation to one's environment affected by both ecological and social pressures is what leads to decisions on the best and most reasonable strategy for group survival and for overall well-being (Gilmore et. al 1999:47). Sites in the foothills are illustrative of ephemeral, seasonal land use within the broader pattern of persistent, transhumance migrations. It is a persistent crossroads for prehistoric hunting-gathering groups to and from the Continental Divide. This is evidenced by the presence of Lyons sandstone at sites in the high country and high elevation lithic raw materials in the lowland foothills (Brunswig 2016). Its significance in providing shelter and provisions is illustrated in the high density of single and diverse activity sites.

Differing hunter-gatherer economic models are used in response to group needs as well as due to the fluctuations of environmental factors relevant to subsistence and security. It is likely that hunter-gatherer groups seasonally utilized large game such as Plain's bison in the foothills and on the plains or migrating bighorn sheep along the Continental Divide (Andrews et. al 2008: 465-467). These subsistence strategies are reflected within the archaeological record through site spatial patterning, site size, and assemblage diversity.

On a regional scale, the foothills have remained persistent places of human activity since prehistoric times. The question then, is if this persistent use is also seen at a larger scale within a local site distribution within the valleys and along the foothill hogback ridgelines. Gaining insight into persistent and ephemeral use of this space is possible through defining a local chronology of the area, recognizing the foothills' prehistoric resource potential, and recognizing patterns in toolkit diversity and assemblage size, as has been accomplished in this thesis.

This research may take other forms as well. It is initially important to construct local chronologies based on site and assemblage data to provide a framework for subsequent analysis. In agreement with Gilmore et. al (1999), a "number of strategies" are imperative to gain a more comprehensive interpretation of the past (1999:50). As illustrated in this thesis and other case studies completed in the area (Anderson 2012), cooperation between archaeologists and the public can provide crucial data to both future work and the public, as they learn the importance of stewardship and collaboration with academic partners to preserve the past. This experience led to multiple opportunities to explore topics ranging from artifact collecting, archaeological ethics and methods, and local history and knowledge.

Cultural resource reconnaissance surveys can also provide a tremendous amount of data with limited time and available funds and is worth consideration to be conducted in the future within the study area. Most sites in Larimer county are represented as surface collections and have remained untested (Kainer 1976:8). Testing or excavation of subsurface deposits can provide much needed data at sites in the project area as it can reflect more accurate representations of occupation span and patterns in sedentism and mobility.

There are additional forms of analysis that can take place as well. Lithic tool raw material sourcing could provide a more thorough analysis on the use of exotic and local raw materials within the project area to further demonstrate transhumance in the foothills compared to sites in the high country and on the Great Plains or across the South Platte River Basin.

The Shannon-Wiener index can be tested to recognize its statistical significance in the conclusions presented within this thesis. Its index is highly correlated with sample size, and the small sample sizes reflected in the artifact assemblages used in this thesis have affected the results to varying degrees. For example, Michael Shott (2010) evaluates the use of SHE analysis on testing the goodness-of-fit for Shannon-Wiener Index results. SHE analysis works to recognize the underlying artifact distribution within the total assemblage structure across a range of communities and illustrates how the assemblage size used affects sample equitability (2010:897).

Future research in how a geographic area of the foothills was used can also provide a comparative analogue with the results of this thesis. Most of the research studies that have occurred in the foothills focus on large, intensively occupied sites (Brunswig 2016; Irwin-Williams and Irwin 1959; 1966; Johnston 2016; LaBelle 2015; Pelton et al. 2016; Perlmutter 2015). This work is necessary and important, however also analyzing more isolated occurrences of activity is important to gain a more thorough recognition of prehistoric occupation and resource exploitation occurring in the Colorado Front Range.

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APPENDIX

Appendix A: AMS Date and Sample Identification from 5LR.1157

Paleoscapes Archaebotanical Services Team LLC Letter Received by Kathryn Puseman:

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Tucson, AZ 85716
Phone: 303-501-5768
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COLORADO
Kathryn Puseman
734 Mockingbird Trail
Bailey, CO 80421-2036
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Email: paleoscapes@gmail.com

March 5, 2019

PAST Project 19021

Identification of charcoal from a hearth at Site 5LR1157:

	Identification		Weight	
Sample No.	Scientific Name	Common Name	(g)	Identification Notes
AN-4	*Pinus ponderosa*	Ponderosa pine	0.165 g	Conifer with resin canals averaging 160-200 µm; Pinoid cross-field pits, Dentate ray tracheids

The sample was broken to expose fresh cross, tangential, and radial sections, then examined under a Bausch and Lomb Stereozoom microscope at a magnification of 70x and under a Nikon Optiphot 66 microscope at magnifications of 100-600x. This charcoal exhibits tracheids, identifying it as a conifer. The presence of resin canals measuring 160-200 µm, pinoid cross-field pits, and dentate ray tracheids further identifies this conifer as *Pinus ponderosa* (ponderosa pine).

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
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ISO/IEC 17025:2005-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Caitlin Holland
Colorado State University

Report Date: March 22, 2019
Material Received: March 14, 2019

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 520987	**5LR1157_AN-4**	**1310 +/- 30 BP**	IRMS δ13C: -23.9 o/oo

(68.0%)	**656 - 727 cal AD**	**(1294 - 1223 cal BP)**
(27.4%)	**737 - 769 cal AD**	**(1213 - 1181 cal BP)**

Submitter Material: Charcoal
Pretreatment: (charred material) acid/alkali/acid
Analyzed Material: Charred material
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 84.95 +/- 0.32 pMC
Fraction Modern Carbon: 0.8495 +/- 0.0032
D14C: -150.48 +/- 3.17 o/oo
Δ14C: -157.54 +/- 3.17 o/oo(1950:2,019.00)
Measured Radiocarbon Age: (without d13C correction): 1290 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

BetaCal 3.21

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL13)

(Variables: d13C = -23.9 o/oo)

Laboratory number **Beta-520987**

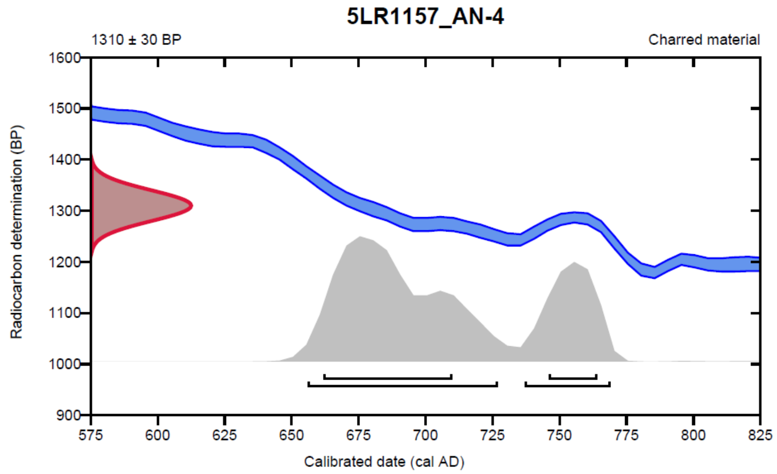
Conventional radiocarbon age **1310 ± 30 BP**

95.4% probability

(68%)	656 - 727 cal AD	(1294 - 1223 cal BP)
(27.4%)	737 - 769 cal AD	(1213 - 1181 cal BP)

68.2% probability

(50.1%)	662 - 710 cal AD	(1288 - 1240 cal BP)
(18.1%)	746 - 764 cal AD	(1204 - 1186 cal BP)



Database used

INTCAL13

References

References to Probability Method

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References to Database INTCAL13

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Appendix B: Project Area Site Descriptions

Edison Lohr Site by Site Descriptions

The sites generally are characterized by Lohr as either open lithic, open camp, or open architecture. Both open architecture and open camp were the most numerous site types in the project area, not only for Lohr's sites but also for sites found by other researchers as well. Many of Lohr's sites demonstrated features as well such as hearths and stone rings, and there is high potential for subsurface cultural deposits at others.

What follows is a thick description of the assemblages represented in the collection. Below are site descriptions for each of the nine cultural resources that Lohr recorded in the study area. Only significant information from each original site description is provided here. Site descriptions are referenced from Lohr's 1947 report, *Indian Campsites in Northern Colorado (Larimer County).*

5LR.29
Lohr Site 2
Type: Open Lithic
Photographs: #56, 98
Features: N/A

Artifacts from this site were collected from the unplowed saddles bordering the east slope. One artifact came from the west side of the hogback while the other three came from the plowed field below the hogback's east slope. Tools were found slightly clustered around draws containing springs for several miles north up to 5LR.50 on Spring Canyon road. Lohr Site 1 is located 1 mile to the south. Lithic flakes and projectile points are found at the top of the hogback. Lohr states that there were more than likely sites located in the cultivated valley to the east but were destroyed by agriculture and development. Boy Scouts and Mr. Mattoon collected at the site through time. There is one stained area at the site measuring 4'x10' ft. No prehistoric artifacts were present in this area; therefore, it may be historic in age.

5LR.30/5LR428
Lohr Site 3/Renaud Site 206
Type: Open Lithic or Open Camp
Lohr Photographs: #57-58, 116
Features: N/A

This site was originally recorded by E. B. Renaud in 1935 from the University of Denver (UDMA 5LR428 Site Cards). Renaud found 'chips, arrows, etc. Implements- scrapers.' He also noted metate[s] and mano[s] and recognized the site as a 'campsite.' The site card also states, "No 66-C/#3 of Lohr collection." Reported in Renaud's 4th report (1935), p. 17.

This site is located on a low ridge running north to south. The Big Thompson River borders the site to the south and runs west to east. Lohr Site 1 is located 0.7 miles to the east. A cherry orchard is in the valley to the east, where the main camp could have been prior to agricultural development. The site was accessible to local collectors, such as Mrs. Colin Clymer who lives in Loveland. Lohr states that she had about "the middle third of a light brown jasper Folsom point. Specimen was about 3/4 '' wide, with a good groove [flute] down one side and attempt at grooving [fluting] on the other."

5LR.31
Lohr Site 4
Type: Open Camp
Photographs: #58-59, 60
Features: High potential of subsurface features due to black surface sediment staining.

The site is on a series of small flats between two parallel north-south ridges. 64 of the 75 artifacts recovered came from a small flat at the site located by a spring at the head of a draw. There is evidence of a subsurface cultural layer due to blackened sediment around the spring, along with manos which also came from the vicinity of the spring. Small sandstone fragments are possibly the remains of ground stone as well. 11 artifacts came from the possible lookout area within a ponderosa pine concentration at the south end of the ridge. 5LR.30 is located 1.7 miles to the south.

5LR.40
Lohr Site 13
Type: Open Architectural
Photographs: #86
Feature: About 30 stone rings present near the site. Several firepits present, no count given.

This site is in a very large water gap between 5LR.29 and 5LR.52. The site has a good lookout to the northwest at the top of the hogback. There is evidence of firepits and darkened sediment at the top of the hogback and surrounding the spring. Donald Burgener and the Mattoon brothers west of Loveland collected at the site and found several Plains Woodland ceramic sherds and Woodland stemmed projectile points. The artifact collectors have dug at the site's location. A sandstone mano was recovered by the spring by Lohr but has been misplaced. A light scatter of artifacts exists between 5LR.40 and 5LR.52 but is not concentrated. 5LR.29 lies 2.5 miles to the south of this site while thirty stone rings and nearby firepits are to the north.

5LR.42; Lohr Site 15
Type: Campsite-Lookout
Photographs:
Features: N/A

This site is located on a high red sandstone cliff to the east of Masonville. Not very much has been found in the area. There is a spring, however, at the south end of this ridge. The isolated knife came from this spring location. Two hollow depressions resembling stone rings are observed near the spring and some cottonwood trees. Milner Mountain borders the cliffs on the east side.

5LR.48
Lohr Site 21
Type: Open Camp
Photographs: #79
Features: N/A

This site has largely been destroyed due to gulley erosion, quarry activity, development, and ease of accessibility by collectors. Lohr dug two small test pits (Trenches 1 and 2) and a small test pit (2A) at the site to determine the extent of cultural deposits based on the presence of blackened-sediment stains on the surface. Test-trench 1 was a four-foot pit dug on a slope. Cultural deposits extended at a maximum of three inches below the ground surface and included a few lithic flakes, faunal remains, charcoal, and a beer bottle glass fragment. Test-trench 2 exhibited 12 inches of a blackened cultural layer below 7 inches of sterile topsoil, except for the ground surface where artifacts were present. The cultural layer included projectile point fragments, lithic flakes, and faunal remains.

The lithic material was scattered throughout the cultural deposit; however, the faunal remains were recovered at the bottom of the cultural layer. Flat, sandstone rocks were found throughout the cultural layer, however no arrangement of them was seen. The trench was sterile at a depth of 2 feet. Lohr argues that the cultural deposit here may have washed in coming from upslope to the west or north. Test trench 2A was dug at the base of the slope below test-trench 2 based on the ground surface presence of several ground stone fragments and a large metate, along with numerous lithic flakes. The area does not represent an intact cultural deposit. Instead, it has been washed down from the slope.

5LR.49
Lohr Site 22
Type: Open Camp
Photographs: #78
Features: 6 firepits

This site is located on top of a hogback ridge. It includes 6 firepits located on the westerly edge of the ridge, along with most of the artifacts collected. Stone rings are not present at the site. Lohr suggests instead that wickiups could have been used on top of the ridge in their stead, and that artifacts are of possible Ute origin.

5LR.50
Lohr Site 23
Type: Open Architectural
Photographs: #81-82
Features: Stone rings present, no count given

Lohr states that this site represents a "Typical water-gap foothill site." The site does not offer a good viewshed. The Spring Canyon highway cuts through the site, however, Lohr states that this has not impacted its integrity. There are stone rings noted to be present, however the number is unknown. The draw to the south has the potential of cultural deposits as illustrated through a blackened area inside the gap.

5LR.52
Lohr Site 25
Type: Open Architectural
Photographs: #83, 85
Features: Stone rings possible, however not relocated and no count given.

This site is located on the same ridge as 5LR.50 on the east slope. Springs are within the site's vicinity. Stone rings are noted to be present by collectors, however Lohr could not relocate them.

Sprenger Valley Site by Site Descriptions

SHPO Number: 5LR1148
Temp Site Number: 88-1
Site Type: Sheltered Camp
Site Age: 8,000-2500 BP
Site Size: 36.5m x 11.6m = 423.4 sq. m or 0.104 acres
Site Elevation: 5,390 ft

The site is located on a southwest facing slope which has an 8% grade. The site consists of a rock shelter that is a collapsed overhang and is located at the base of a sandstone cliff of the Dakota hogback formation. Vegetation consists of mountain mahogany, sagebrush, buffalo grass, prickly pear, snakeweed, prairie cone flower, and ponderosa pine atop the ridges with their reduction in number towards the northwest. Soil consists of a sandy loam. The closest permanent water source is Indian Creek located 1.5 km west.

The site consists of a rock shelter that is related to short-term prehistoric occupation and tool retouch activities. Due to its location on a west facing slope with mountain mahogany and ponderosa pine, the rock shelter would provide shelter from weather, and represents a good place to find wildlife. The collapsed overhang is associated with burned bone, charcoal, a quartzite hammerstone with battering on one end, as well as a debitage flake. A feature observed at the site is a rock wall. About 25% of artifacts from the site have been collected.

SHPO Number: 5LR1149
Temp Site Number: 88-2
Site Type: Multicomponent; Open Camp and Historic Isolate
Site Age: 8,000-2500 BP; 1880s-1960s
Site Size: 32m x 1m = 32 sq. m or 0.008 acres
Site Elevation: 5,430 ft

This site represents a temporarily used, prehistoric open camp. It consists of a firepit that was found along with several artifacts. The firepit is evidenced by a stone ring that also illustrated blackening and darkened soil within it. Artifacts are scattered nearby and include: One small broken mano which has been shaped and smoothed on one side, a metate, one broken hammerstone, and some debitage. A historic, violet-colored glass shard was also found at the site.

The site is located on a west facing slope which has an 9% grade. Vegetation consists of mountain mahogany, sagebrush, buffalo grass, prickly pear, snakeweed, prairie cone flower, and ponderosa pine atop the ridges with their reduction in number towards the northwest. Soil consists of a sandy loam. The closest permanent water source is Indian Creek located 1660 meters west. The southern, eastern and western boundaries of the site are based on the natural topography of the area while the northern boundary of the site is based on the extent of artifacts on the observable surface. There is one fire pit at the site that measures 0.80 m x 0.73 m and consists of a stone ring that exemplifies blackened soil. It is in a flat part of the site. About 25% of the site has been surface collected.

SHPO Number: 5LR1150
Temp Site Number: 88-3
Site Type: Open Camp
Site Age: 8,000-2500 BP
Site Size: 244m x 61m = 14,884 m2 or 3.67 acres
Site Elevation: 5,585 ft

The site consists of three stone-ring features, eleven firepits, as well as an artifact scatter. The site represents a large campsite possibly used during the winter. There is evidence for camp activities, food processing, and lithic reduction. The site also has an excellent view shed of the Plains and valley bottoms to the east, north, and south. The site is located on top of the eastern slope of the first Dakota hogback. The site lies on a 12% slope grade. The western boundary of the site is defined by a sandstone rock outcrop while the eastern site boundary is defined by a steep slope to the valley below.

A road running north-south cuts through most of the site and through 5LR1151 and 5LR1152. This road was a previous fire-access route for the fire department. Soil at the site consists of a sandy loam with gravel intrusions and approximately 30 cm of deposition. Blackened sediment exemplifies areas of possible midden deposits or large ash mounds where artifacts are also concentrated. Vegetation at the site includes ponderosa pine, gramma grass, mountain mahogany, snake weed, and buffalo grass. The nearest permanent water source is Indian Creek which is located 1,488 meters to the southwest.

Three stone rings are concentrated in the southern portion of the site. One of the stone rings has an associated antechamber. The artifact scatter includes ceramics, chipped stone flakes and tools such as projectile points and scrapers, a variety of ground stone, and fire-cracked rock. Less than 1% of the site was collected as part of a grab sample. Two of the stone ring features have been sketched. Most of the fire pit features were defined by blackened, ashy soil, oxidized fire-cracked rock, a concentration of artifacts, as well as with irregular stone patterns.

Upon the 2018 re-visitation, two possible hearth features were relocated within the deflated roadbed. One of the features is located towards the northern portion of the site while another was relocated near the present fence line to the south. A light scatter of lithics and ground stone were observed in the vicinity of the features, particularly near the northernmost firepit. Artifacts may be continuing to erode from the roadbed due to its significant disturbance through the site. Due to access restrictions, the southern portion of the site where the stone rings are present was unable to be re-visited. Two “disturbed areas” are exhibited on the original site sketch map in the northern portion of the site; neither of these were uniquely definable from the natural geography demonstrated at the site.

SHPO Number: 5LR1151
Temp Site Number: 88-4
2019 Site Type: Open Camp
Original Site Type: Lithic Procurement
Site Age: 8,000-2500 BP
Site Size: 34m x 89m = 3,026 m2 or 0.748 acres
Site Elevation: 5,580 ft

5LR1151 is a large lithic procurement site that is located on a knoll situated on an east-facing slope of the first Dakota hogback. The site is directly south of 5LR1150. The site topography is very rocky with some dense mountain mahogany and ponderosa pine concentrations. Other vegetation includes snakeweed, prickly pear, and buffalo grass. Soils at the site are a sandy loam. The site is located 1,440 meters east of Indian Creek. The site consists of six high-density fine-grained quartzite flake concentrations that exemplify all stages of lithic reduction.

There are numerous primary, secondary, and tertiary flakes along with both large and small cores. Artifacts are located on either side of the dirt road that runs northwest to south and crosses through the site. There are two features at the site. There is one possible water catchment feature which is formed out of the natural sandstone bedrock in an outcrop in the northeastern portion of the site, as well as a firepit which is outlined with native sandstone situated near the southwestern site boundary. Approximately 5% of the flake concentration has been collected by K. Barnett and J. Bubany in 1988. Due to the presence of a firepit feature, this site is *now* characterized as an open camp.

SHPO Number: 5LR1152
Temp Site Number: 88-5
Site Type: Temporary camp, lithic retouch
Age: 8,000-2500 BP
Site Size: 19m x 93m = 1,767 m2 or 0.436 acres
Site Elevation: 5,580 ft

5LR1152 is a prehistoric, temporary camp and lithic retouch activity site. It is situated on a flat area of the east-facing slope of the first Dakota hogback ridge. The site is located south of 5LR1151. The topography of the site is very rock with semi-dense mountain mahogany and ponderosa pine concentrations upon the western edge of the escarpment. Other vegetation at the site includes snakeweed, blue gramma, prickly pear cactus, and buffalo grass. Soils consist of a sandy loam. The site is approximately 1,440 meters east of Indian Creek. Artifacts are on either side of the dirt road that runs north to south through the site. Materials at the site include one mano, two metate fragments, and two tertiary flakes produced out of a tan, fine-grained quartzite like that found in the 5LR1151 lithic concentrations. Approximately 5% of the site has been collected by J. Bubany and K. White in 1988.

SHPO Number: 5LR1153
Temp Site Number: 88-6
Site Type: Sheltered Camp
Age: 8,000-2500 BP
Site Size: 4m x 20m = 80 m2 or 0.019 acres
Site Elevation: 5,560 ft

5LR1153 is a rock shelter situated directly below the ridge of the first Dakota hogback. The overhang shelter has a northwest aspect. The ground floor of the rock shelter consists of flat sandstone slabs and fallen roof material from the shelter itself. Some of the sandstone slabs have been modified to stand upright. Artifacts within the shelter include lithic flakes and ground stone metates. Soils are a sandy loam. Vegetation includes choke cherry trees and mountain mahogany surrounding the shelter. Understory includes prickly pear cactus, service berry, gramma grass, and prairie cone flower. The site is 1,440 meters east of Indian Creek which is the closest permanent water source. Approximately 10% of the site has been collected. Only lithic flakes were collected on the north to south transect of the survey.

SHPO Number: 5LR1154
Temp Site Number: 88-7
Site Type: Agricultural Historic and Prehistoric Isolate
Age: CE 1800s-1960s
Site Size: 114m x 62m = 7068 m2 or 1.75 acres

This site consists of a water storage tank (F1), slag deposit (F2), rock piles (F3, F4), rock lining (F5), as well as post holes (F6). The site was determined to have been used as a water storage holding tank for cherry orchard irrigation in the valley. The water storage tank is made of cement. The water tank is surrounded by an unimproved road to the east that continues southwest, and a hogback directly to the west. The post holes are located south of the water storage tank and south of the unimproved road. Four isolated, historic artifacts were also located at the site. One was a yellow-colored glass shard fragment (FS. 1) made from molded glass that measures 4.4 cm in length, 4.2 cm in width, and 0.7 cm in thickness.

Another was an almost complete, glass whiskey bottle (FS. 3) with the letters "BEAM" written across the top of the bottle, with "Since 1795" written around the bottle's side at the bottom. The bottle is missing part of the neck and the rest of the top, and measures 16.2 cm in length, 8.5 cm in width, and 3.6 cm in thickness. The other artifacts include three glass jug fragments (FS. 5). Two are base fragments, with one being larger than the other. One of them measures 15.8 cm in length, 9.8 cm in width, and 1 cm in thickness. The other measures 9.6 cm in length, 6.3 cm in width, and 1 cm in thickness. The third glass shard is a neck fragment which measures 13.9 cm in length, 12.2 cm in width, and 11.2 cm in thickness. The last artifact is a ceramic crockery sherd (FS. 4) which measures 2.4 cm in length, 1.6 cm in width, and 1 cm in thickness. There is one metate fragment associated with this site.

SHPO Number: 5LR1155
Temp Site Number: 88-8
Site Type: Open Camp
Age: 8,000-2500 BP
Site Size: 4m x 20m = 80 m2 or 0.019 acres
Site Elevation: 5,560 ft

The site consists of a prehistoric open camp situated on the southeast-facing slope of the second Dakota hogback ridge. The ridge has sandstone outcrops and relatively flat grassy areas. Vegetation includes ponderosa pine which would have been good for abundant prehistoric pine nut collection. Several drainages occur over the slope face. The site includes five separate localities that are concentrated near one another. Each locality consists of artifact concentrations of manos, metates, projectile points, lithic tools such as scrapers and fleshers, hammerstones, lithic flakes, as well as lithic cores. The localities also include two stone rings, one fire pit, and one cairn. Natural water erosion in the sandstone outcrops have also created water catchments.

Upon re-visitation, the site is divided between two private landowners. One of the stone rings has been re-located within a cluster of mountain mahogany, and a chert biface fragment was situated in the southern portion of the site on an escarpment next to the landowner’s home. The stone ring is approximately 1 meter by 1.5 meter across. It consists of a circular arrangement of large granitic stones connecting to a larger granitic boulder on one side. Within the arrangement is a deflation of soil. No surface soil staining is observed. A small and unsystematic pedestrian survey then took place in the northern portion of the site to identify any other cultural features or a site datum. A few piles of local sandstone were located concentrated together, however they are likely modern and are probably remains of the landowner’s driveway construction.

SHPO Number: 5LR1156
Temp Site Number: 88-9
Site Type: Open Camp
Age: 8,000-2500 BP
Site Size: 171m x 135.5m = 23,167 m2 or 5.7 acres
Site Elevation: 5,600 ft

5LR1156 is an open campsite situated on an east-facing ridge slope of the hogback. There are three distinct localities of cultural material. Two localities lie on the east-facing ridge slope that is covered with mountain mahogany and has sandstone outcrops with small areas of soil. Cultural Material includes lithic flakes of raw material types such as quartzites and cherts. Other artifacts included ground stone, lithic tool fragments, hand stones and sandstone slabs, and 3 projectile points. One projectile point was a Hanna point of gray local quartzite, another was a Scottsbluff Type 1 or Eden point of pumpkin chert, and there is 1 mid-section that was unidentifiable. The site likely represents an area for activities such as hunting, lithic reduction, and food processing. Based on the presence of Paleoindian-age materials and the existence of areas with deposition, it is possible that there are intact deposits at the site as well.

SHPO Number: 5LR1157
Temp Site Number: 88-10
Site Type: Sheltered Camp
Age: 8,000-2500 BP
Site Size: 36m x 60m = 2160 m2 or 0.8 acres
Site Elevation: 5,560 ft

5LR1157 is a north-facing and south-facing rock shelter located on the western slope of the first Dakota hogback. The site is located south of 5LR1149. The rock shelter is formed beneath a fallen boulder. The environment at the site is rocky with dense mountain mahogany and grasses. Cultural Material at the site includes manos, metates, and lithic flakes. Both charcoal and soil samples were taken. The field school set up 3 test pits that were placed over an eroding cultural layer approximately 10 meters from the base of the rockshelter. There was also an exposed culture layer in the gravel road cut. Based on the test pits, the cultural layer is between 40-60 cmbs. There are two fire pits also at the site. One of them has an exposed lithic flake and a ^{14}C sample was collected from it. Another fire pit was found within one of the test units and had two cord-marked pottery fragments within it. Seven flakes, one scraper, and one core were observed as well.

SHPO Number: 5LR1158
Temp Site Number: 88-11
Site Type: Open Camp
Age: 8,000-2500 BP
Site Size: 70m x 60m = 4200 m2 or 1.03 acres
Site Elevation: 5,560 ft

5LR1158 is a possible temporary camp situated over a flat grass area atop a ridge saddle. Several ground stone fragments were scattered across the site. Due to the site's location within the saddle of a ridge, natural colluvium likely buried any other artifacts and/or cultural components. Cultural materials at the site include both complete and fragmentary manos and metates.

SHPO Number: 5LR1159
Temp Site Number: 88-12
Site Type: Open Camp
Age: 4,500-3,500 BP
Site Size: 60m x 60m = 3600 m2 or 0.9 acres
Site Elevation: 5,560 ft

5LR1159 is a campsite which is identified by two distinct localities divided by a deep gully which is densely covered with mountain mahogany and other vegetation. The site lies near an intermittent stream bed with an associated spring downslope to the east which was still flowing in 1988. A livestock trail is also present at the site. Cultural materials include ground stone, lithic flakes, one McKean projectile point base (FS. 14), and one unifacial scraper (FS. 33).

SHPO Number: 5LR1160
Temp Site Number: 88-13
Site Type: Open Camp
Age: 8,000-2500 BP; 1880s-1960s
Site Size: 65m x 165.5m = 1057.5 m2 or 2.65 acres
Site Elevation: 5,400 ft

This site is multicomponent with both historic and prehistoric features. The boundaries of the site are roads east, north and partly west up until the hogback ridge. There is a drainage that runs northwest to southeast into a historic well. Prehistoric artifacts include lithic flakes, metates, and a mano. Historic artifacts include glass bottles and metal cans, a cistern, a trash dump, and a shack. This site is inferred to represent a camp.

SHPO Number: 5LR1161
Temp Site Number: 88-14
Site Type: Sheltered Camp
Age: 8,000-2500 BP
Site Size: 59m x 71m = 4189 m2 or 0.967 acres
Site Elevation: 5,600 ft

This site consists of a prehistoric sheltered camp. It is situated within a rock shelter facing west with a collapsed stone wall at the shelter entrance. There is an artifact midden that is eroding downslope on an east facing slope above the rock shelter. Artifacts include ground stone, lithic flakes, a biface, two firepits, one midden, and one rock wall. It is likely that there are undisturbed deposits and therefore a high probability for intact subsurface cultural deposits in the midden and the shelter floor. Based on the features and artifacts present, this site was most likely used as a temporary camp.

SHPO Number: 5LR1162
Temp Site Number: 88-15
Site Type: Lithic Scatter
Age: 8,000-2500 BP
Site Size: 55m x 45m = 2475 m2 or 0.61 acres
Site Elevation: 5,600 ft

This site consists of a lithic scatter situated on top of the first Dakota hogback ridge. The scatter includes several lithic flakes, two biface midsections that attach to one another, ground stone, and one Mt. Albion projectile point base. Based on artifact present, the site was most likely used for food processing and as a tool reduction site. The site is located by a property fence line.

SHPO Number: 5LR1168
Temp Site Number: 88-IF1
Isolate Type: Ground Stone
Age: 8,000-2500 BP
Site Elevation: 5,420 ft

This isolated find consists of one, unifacially ground metate fragment. Most of the grinding surface is eradicated. The ground stone fragment measures 4.5 cm in length by 3 cm in width. It is in a dissected colluvial slope at a drainage head with sandy loam soil. The nearest water source in an intermittent stream located 100 meters east while the nearest permanent water source is Indian Creek located 600 meters to the west. Vegetation on site includes salt brush, sage, yucca, opuntia, and mixed grasses. The surrounding vegetation consists primarily of mountain mahogany.

SHPO Number: 5LR1169
Temp Site Number: 88-IF2
Isolate Type: Ground Stone
Age: 8,000-2500 BP
Site Elevation: 5,380 ft

This isolated find represents one rectangular, metate fragment which is ground on one side and measures 20 cm in length by 19 cm in width and 4 cm in thickness. It is in a disturbed context which is an open level plowed wheat field with sandy loam soil. The nearest water source is an intermittent stream 48 meters to the east while the nearest permanent water source is Indian Creek located 1,296 meters to the west. Vegetation at the site consists of sage and buffalo grass.

SHPO Number: 5LR1170
Temp Site Number: 88-IF3
Isolate Type: Glass Shard
Age: 1800s-1960s
Site Elevation: 5,400 ft

This isolated find consists of one violet-colored glass shard fragment. It is molded glass with the letters "BOLD" stamped on the base. The isolate is in a plowed field in the valley between the first and second hogbacks with sediment being a sandy loam. The nearest water source in an unnamed, intermittent stream 144 meters to the east while the nearest permanent water source is Indian Creek 960 meters to the west. Vegetation is a mix of buffalo grass and other grasses.

Appendix C: Evenness and Richness Analysis

The following are tables related to the Shannon-Wiener Index analysis.

Sprenger Valley Site Assemblages: Evenness and Richness

5LR1148			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#NUM!	-1
Utilized flakes	0	#NUM!	
Lithic Cores	0	#NUM!	H max
Scrapers	0	#NUM!	#NUM!
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	0%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	1	-0.34657359	0%
Groundstone	0	#NUM!	
Retouched Flakes	1	-0.34657359	Percent Surf Collected
Choppers	0	#NUM!	25%
Total	2		
# Tool Classes (Rich)	0 out of 7		

5LR1149			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	1	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Hammerstone	0	#DIV/0!	0%
Groundstone	3	#DIV/0!	
Retouched Flakes	2	#DIV/0!	Percent Surf Collected
Choppers	0	#DIV/0!	25%
Total	0		
# Tool Classes (Rich)	0 out of 7		

5LR1150			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	232	10.19557592	1.318032628
Utilized flakes	2	-0.149786614	
Lithic Cores	4	-0.230258509	H max
Scrapers	15	-0.36781097	1.609437912
Knives	1	-0.092221986	
Bifaces	55	-0.259930193	Evenness
Projectile Points	15	-0.36781097	82%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	71%
Groundstone	17	-0.363658097	
Retouched Flakes	0	#NUM!	Percent Surf Collected
Choppers	0	#NUM!	<1%
Total	40		
# Tool Classes (Rich)	5 out of 7		

5LR1151			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	203	285.1875064	0.636514168
Utilized flakes	0	#NUM!	
Lithic Cores	2	-0.270310072	H max
Scrapers	0	#NUM!	0.693147181
Knives	0	#NUM!	
Bifaces	1	-0.366204096	Evenness
Projectile Points	0	#NUM!	92%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	29%
Groundstone	0	#NUM!	
Retouched Flakes	0	#NUM!	Percent Surf Collected
Choppers	0	#NUM!	5%
Total	3		
# Tool Classes (Rich)	2 out of 7		

5LR1152			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	2	1.386294361	0
Utilized flakes	0	#NUM!	
Lithic Cores	1	0	H max
Scrapers	0	#NUM!	0
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	14%
Groundstone	3	3.295836866	
Retouched Flakes	0	#NUM!	Percent Surf Collected
Choppers	0	#NUM!	5%
Total	1		
# Tool Classes (Rich)	1 out of 7		

5LR1153			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	6	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Hammerstone	0	#DIV/0!	0%
Groundstone	0	#DIV/0!	
Retouched Flakes	0	#DIV/0!	Percent Surf Collected
Choppers	0	#DIV/0!	10%
Total	0		
# Tool Classes (Rich)	0 out of 7		

5LR1154			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Hammerstone	0	#DIV/0!	0%
Groundstone	1	#DIV/0!	
Retouched Flakes	0	#DIV/0!	
Choppers	0	#DIV/0!	
Total	0		

# Tool Classes (Rich)	0 out of 7		

5LR1155			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	51	0.442332263	1.255183392
Utilized flakes	2	-0.157717337	
Lithic Cores	4	-0.240499843	H max
Scrapers	6	-0.294998666	1.609437912
Knives	2	-0.157717337	
Bifaces	4	-0.240499843	Evenness
Projectile Points	21	-0.321467702	78%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	71%
Groundstone	45	0.238067729	
Retouched Flakes	3	-0.203700456	Percent Surf Collected
Choppers	0	#NUM!	10%
Total	37		
# Tool Classes (Rich)	5 out of 7		

5LR1156			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	6	0.218785868	0.500402424
Utilized flakes	1	-0.321887582	
Lithic Cores	1	-0.321887582	H max
Scrapers	0	#NUM!	0.693147181
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	4	-0.178514841	72%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	29%
Groundstone	24	7.529356406	
Retouched Flakes	0	#NUM!	Percent Surf Collected
Choppers	0	#NUM!	1%
Total	5		
# Tool Classes (Rich)	2 out of 7		

5LR1157			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	7	1.977028341	0.636514168
Utilized flakes	0	#NUM!	
Lithic Cores	1	-0.366204096	H max
Scrapers	2	-0.270310072	0.693147181
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	92%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	29%
Groundstone	16	8.927874312	
Retouched Flakes	0	#NUM!	Percent Surf Collected
Choppers	0	#NUM!	5%

Total	3		
# Tool Classes (Rich)	2 out of 7		

5LR1158			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#NUM!	0
Utilized flakes	0	#NUM!	
Lithic Cores	1	0	H max
Scrapers	0	#NUM!	0
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	14%
Groundstone	16	44.36141956	
Retouched Flakes	0	#NUM!	
Choppers	0	#NUM!	
Total	1		
# Tool Classes (Rich)	1 out of 7		

5LR1159			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#NUM!	0.693147181
Utilized flakes	0	#NUM!	
Lithic Cores	0	#NUM!	H max
Scrapers	1	-0.34657359	0.693147181
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	1	-0.34657359	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	29%
Groundstone	31	42.48302037	
Retouched Flakes	0	#NUM!	Percent Surf Collected
Choppers	0	#NUM!	1%
Total	2		
# Tool Classes (Rich)	2 out of 7		

5LR1160			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	9	6.768348285	0
Utilized flakes	0	#NUM!	
Lithic Cores	0	#NUM!	H max
Scrapers	0	#NUM!	0
Knives	0	#NUM!	
Bifaces	2	0	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	14%
Groundstone	13	12.16671415	
Retouched Flakes	0	#NUM!	

Choppers	0	#NUM!	
Total	2		
# Tool Classes (Rich)	1 out of 7		

5LR1161			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	16	16.63553233	0.693147181
Utilized flakes	0	#NUM!	
Lithic Cores	0	#NUM!	H max
Scrapers	1	-0.34657359	0.693147181
Knives	0	#NUM!	
Bifaces	1	-0.34657359	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	29%
Groundstone	21	24.6894402	
Retouched Flakes	0	#NUM!	Percent Surf Collected
Choppers	0	#NUM!	<1%
Total	2		
# Tool Classes (Rich)	2 out of 7		

5LR1162			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	1	-0.34657359	0.693147181
Utilized flakes	0	#NUM!	
Lithic Cores	0	#NUM!	H max
Scrapers	0	#NUM!	0.693147181
Knives	0	#NUM!	
Bifaces	1	-0.34657359	Evenness
Projectile Points	1	-0.34657359	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	29%
Groundstone	2	0	
Retouched Flakes	0	#NUM!	Percent Surf Collected
Choppers	0	#NUM!	25%
Total	2		
# Tool Classes (Rich)	2 out of 7		

Lauri Travis Site Assemblages: Evenness and Richness

5LR155			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	856	78.18758575	1.365478318
Utilized flakes	0	#NUM!	
Lithic Cores	7	-0.321887582	H max
Scrapers	11	-0.363770876	1.386294361
Knives	0	#NUM!	
Bifaces	7	-0.321887582	Evenness
Projectile Points	10	-0.357932277	98%

Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	334	21.52670969	57%
Hammerstone	67	1.243031011	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	35		

5LR156			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	56	6.290963897	1.265856752
Utilized flakes	0	#NUM!	
Lithic Cores	5	-0.367504402	H max
Scrapers	3	-0.338385477	1.386294361
Knives	0	#NUM!	
Bifaces	1	-0.197303797	Evenness
Projectile Points	4	-0.362663076	91%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	10	-0.201818665	57%
Hammerstone	0	#NUM!	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	13		

5LR157			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	17	9.829405981	1.098612289
Utilized flakes	3	0	
Lithic Cores	1	-0.366204096	H max
Scrapers	0	#NUM!	1.098612289
Knives	0	#NUM!	
Bifaces	1	-0.366204096	Evenness
Projectile Points	1	-0.366204096	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	24	16.63553233	43%
Hammerstone	0	#NUM!	
Retouched Flakes	0	#NUM!	
Choppers	1	-0.366204096	
Total	3		

5LR175			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	3	3.295836866	0
Utilized flakes	1	0	
Lithic Cores	1	0	H max
Scrapers	0	#NUM!	0
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness

Groundstone	10	23.02585093	14%
Hammerstone	0	#NUM!	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	1		

5LR176			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Groundstone	0	#DIV/0!	0%
Hammerstone	3	#DIV/0!	
Retouched Flakes	0	#DIV/0!	
Choppers	0		
Total	0		

5LR948			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	6	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Groundstone	5	#DIV/0!	0%
Hammerstone	0	#DIV/0!	
Retouched Flakes	0	#DIV/0!	
Choppers	0		
Total	0		

5LR949			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	1	#DIV/0!	-1
Utilized flakes	1	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Groundstone	0	#DIV/0!	0%
Hammerstone	0	#DIV/0!	

Retouched Flakes	0	#DIV/0!	
Choppers	0		
Total	0		

5LR641			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	7	0.979327629	1.039720771
Utilized flakes	1	-0.34657359	
Lithic Cores	2	-0.34657359	H max
Scrapers	0	#NUM!	1.098612289
Knives	1	-0.34657359	
Bifaces	1	-0.34657359	Evenness
Projectile Points	0	#NUM!	95%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	2	-0.34657359	43%
Hammerstone	0	#NUM!	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	4		

5LR642			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	31	106.4536033	0
Utilized flakes	0	#NUM!	
Lithic Cores	0	#NUM!	H max
Scrapers	1	0	0
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	56	225.4196947	14%
Hammerstone	4	5.545177444	
Retouched Flakes	0	#NUM!	
Choppers	1	0	
Total	1		

5LR939			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	2	0	0.693147181
Utilized flakes	2	0	
Lithic Cores	0	#NUM!	H max
Scrapers	0	#NUM!	0.693147181
Knives	0	#NUM!	
Bifaces	1	-0.34657359	Evenness
Projectile Points	1	-0.34657359	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	2	0	29%
Hammerstone	0	#NUM!	
Retouched Flakes	0	#NUM!	
Choppers	0		

Total	2		

5LR940			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	2	0	0
Utilized flakes	0	#NUM!	
Lithic Cores	2	0	H max
Scrapers	0	#NUM!	0
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	0	#NUM!	14%
Hammerstone	1	-0.34657359	
Retouched Flakes	0	#NUM!	
Choppers	1	-0.34657359	
Total	2		

5LR941			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	4	0	1.386294361
Utilized flakes	0	#NUM!	
Lithic Cores	1	-0.34657359	H max
Scrapers	1	-0.34657359	1.386294361
Knives	0	#NUM!	
Bifaces	1	-0.34657359	Evenness
Projectile Points	0	#NUM!	100%
Drills	1	-0.34657359	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	0	#NUM!	57%
Hammerstone	0	#NUM!	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	4		

5LR956			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	8	2.615544675	1.098612289
Utilized flakes	1	-0.366204096	
Lithic Cores	1	-0.366204096	H max
Scrapers	1	-0.366204096	1.098612289
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	1	-0.366204096	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	5	0.85137604	43%
Hammerstone	0	#NUM!	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	3		

5LR942			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	29	21.93060757	1.098612289
Utilized flakes	3	0	
Lithic Cores	1	-0.366204096	H max
Scrapers	0	#NUM!	1.098612289
Knives	1	-0.366204096	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	1	-0.366204096	Richness
Groundstone	0	#NUM!	43%
Hammerstone	8	2.615544675	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	3		

5LR943			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Groundstone	19	#DIV/0!	0%
Hammerstone	2	#DIV/0!	
Retouched Flakes	0	#DIV/0!	
Choppers	0		
Total	0		

5LR944			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#NUM!	0
Utilized flakes	0	#NUM!	
Lithic Cores	0	#NUM!	H max
Scrapers	1	0	0
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	13	33.34434165	14%
Hammerstone	4	5.545177444	
Retouched Flakes	0	#NUM!	
Choppers	1	0	
Total	1		

5LR945			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Groundstone	5	#DIV/0!	0%
Hammerstone	0	#DIV/0!	
Retouched Flakes	0	#DIV/0!	
Choppers	0		
Total	0		

5LR947			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	1	-0.34657359	0.693147181
Utilized flakes	0	#NUM!	
Lithic Cores	1	-0.34657359	H max
Scrapers	1	-0.34657359	0.693147181
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	6	3.295836866	29%
Hammerstone	14	13.62137104	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	2		

5LR958			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#NUM!	0
Utilized flakes	0	#NUM!	
Lithic Cores	0	#NUM!	H max
Scrapers	1	0	0
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	2	1.386294361	14%
Hammerstone	0	#NUM!	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	1		

5LR950			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Groundstone	6	#DIV/0!	0%
Hammerstone	0	#DIV/0!	
Retouched Flakes	0	#DIV/0!	
Choppers	0		
Total	0		

5LR951			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#NUM!	0
Utilized flakes	0	#NUM!	
Lithic Cores	0	#NUM!	H max
Scrapers	0	#NUM!	0
Knives	0	#NUM!	
Bifaces	1	0	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	2	1.386294361	14%
Hammerstone	1	0	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	1		

5LR952			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Groundstone	2	#DIV/0!	0%
Hammerstone	0	#DIV/0!	
Retouched Flakes	0	#DIV/0!	
Choppers	0		
Total	0		

5LR953			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	10	8.047189562	0
Utilized flakes	0	#NUM!	
Lithic Cores	2	0	H max
Scrapers	0	#NUM!	0
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	0	#NUM!	14%
Hammerstone	0	#NUM!	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	2		

5LR954			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	19	11.69023571	0.636514168
Utilized flakes	0	#NUM!	
Lithic Cores	0	#NUM!	H max
Scrapers	0	#NUM!	0.693147181
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	2	-0.270310072	92%
Drills	1	-0.366204096	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	7	1.977028341	29%
Hammerstone	2	-0.270310072	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	3		

5LR956			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	8	2.615544675	1.098612289
Utilized flakes	1	-0.366204096	
Lithic Cores	1	-0.366204096	H max
Scrapers	1	-0.366204096	1.098612289
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	1	-0.366204096	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	5	0.85137604	42.86%
Hammerstone	0	#NUM!	
Retouched Flakes	0	#NUM!	
Choppers	0		
Total	3		

5LR957			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	7	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Groundstone	1	#DIV/0!	0.00%
Hammerstone	0	#DIV/0!	
Retouched Flakes	0	#DIV/0!	
Choppers	0		
Total	0		

Edison Lohr Site Assemblages: Evenness and Richness

5LR29/L2 Tool Classes	# of Artifacts/Class	Summation Value	H
Retouched Flakes	2	-0.152328947	1.477489731
Utilized flakes	5	-0.263349197	
Lithic Cores	6	-0.287969566	H max
Scrapers	13	-0.366204096	1.609437912
Knives	5	-0.263349197	
Bifaces	3	-0.197303797	Evenness
Projectile Points	12	-0.362663076	92%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	0	#NUM!	71%
Hammerstone	0	#NUM!	
Flakes	0	#NUM!	
Choppers	0	#NUM!	
Total	39		
# Tool Classes (Rich)	5 out of 7		

5LR30/L3 Tool Classes	# of Artifacts/Class	Summation Value	H
Retouched Flakes	3	-0.363127654	1.320888343
Utilized flakes	3	-0.363127654	
Lithic Cores	0	#NUM!	H max
Scrapers	0	#NUM!	1.386294361
Knives	3	-0.363127654	
Bifaces	2	-0.357932277	Evenness
Projectile Points	2	-0.34657359	95%
Drills	1	-0.277987164	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	0	#NUM!	57%
Hammerstone	0	#NUM!	
Flakes	0	#NUM!	
Choppers	0	#NUM!	

Total	8		
# Tool Classes (Rich)	4 out of 8		

5LR31/L4 Tool Classes	# of Artifacts/Class	Summation Value	H
Retouched Flakes	15	-0.35993395	1.143418279
Utilized flakes	6	-0.25177249	
Lithic Cores	0	#NUM!	H max
Scrapers	10	-0.319458929	1.609437912
Knives	5	-0.227685071	
Bifaces	3	-0.166659608	Evenness
Projectile Points	31	-0.302607672	71%
Drills	0	#NUM!	
Perforators/Gravers	2	-0.127006998	Richness
Groundstone	4	-0.199649511	71%
Hammerstone	0	#NUM!	
Flakes	0	#NUM!	
Choppers	0	#NUM!	
Total	51		
# Tool Classes (Rich)	5 out of 7		

5LR40/L13 Tool Classes	# of Artifacts/Class	Summation Value	H
Retouched Flakes	5	-0.151934631	0.450561209
Utilized flakes	3	-0.34657359	
Lithic Cores	1	-0.298626578	H max
Scrapers	5	-0.151934631	0.693147181
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	65%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	1	-0.298626578	29%
Hammerstone	0	#NUM!	
Flakes	0	#NUM!	
Choppers	0	#NUM!	
Total	6		
# Tool Classes (Rich)	2 out of 7		

5LR48/L21 Tool Classes	# of Artifacts/Class		H
Retouched Flakes	18	0.450584862	1.265856752
Utilized flakes	17	0.350806752	
Lithic Cores	0	#NUM!	H max
Scrapers	5	-0.367504402	1.386294361
Knives	1	-0.197303797	
Bifaces	3	-0.338385477	Evenness
Projectile Points	4	-0.362663076	91%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	12	-0.073885576	57%
Hammerstone	0	#NUM!	
Flakes	0	#NUM!	
Choppers	0	#NUM!	
Total	13		
# Tool Classes (Rich)	4 out of 7		

5LR49/L22 Tool Classes	# of Artifacts/Class	Summation Value	H
Retouched Flakes	13	-0.228273359	0.67303587
Utilized flakes	15	-0.247130877	
Lithic Cores	1	-0.036990924	H max
Scrapers	8	-0.169900629	1.945910149
Knives	4	-0.105954775	
Bifaces	6	-0.14050193	Evenness
Projectile Points	111	-0.145705766	35%
Drills	1	-0.036990924	
Perforators/Gravers	1	-0.036990924	Richness
Groundstone	1	-0.036990924	100%
Hammerstone	1	-0.036990924	
Flakes	0	#NUM!	
Choppers	0	#NUM!	
Total	132		
# Tool Classes (Rich)	7 out of 7		

5LR50/L23 Tool Classes	# of Artifacts/Class	Summation Value	H
Retouched Flakes	8	-0.104696032	1.214889654
Utilized flakes	2	-0.334239422	
Lithic Cores	0	#NUM!	H max
Scrapers	3	-0.366204096	1.386294361
Knives	1	-0.244136064	
Bifaces	0	#NUM!	Evenness
Projectile Points	4	-0.360413429	88%
Drills	0	#NUM!	
Perforators/Gravers	1	-0.244136064	Richness
Groundstone	0	#NUM!	57%
Hammerstone	0	#NUM!	
Flakes	0	#NUM!	
Choppers	0	#NUM!	
Total	9		
# Tool Classes (Rich)	4 out of 7		

5LR52/L25 Tool Classes	# of Artifacts/Class	Summation Value	H
Retouched Flakes	4	0	0.693147181
Utilized flakes	1	-0.34657359	
Lithic Cores	0	#NUM!	H max
Scrapers	2	-0.34657359	0.693147181
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	2	-0.34657359	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Groundstone	0	#NUM!	29%
Hammerstone	0	#NUM!	
Flakes	0	#NUM!	
Choppers	0	#NUM!	
Total	4		
# Tool Classes (Rich)	2 out of 7		

CMPA Site Assemblages: Evenness and Richness

NS-2017-5			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	1	#DIV/0!	-1
Utilized flakes	0	#DIV/0!	
Lithic Cores	0	#DIV/0!	H max
Scrapers	0	#DIV/0!	#NUM!
Knives	0	#DIV/0!	
Bifaces	0	#DIV/0!	Evenness
Projectile Points	0	#DIV/0!	0%
Drills	0	#DIV/0!	
Perforators/Gravers	0	#DIV/0!	Richness
Hammerstone	0	#DIV/0!	0%
Groundstone	0	#DIV/0!	
Retouched Flakes	0	#DIV/0!	
Choppers	0	#DIV/0!	
Total	1		
# Tool Classes (Rich)	0 out of 7		

NS-2017-9			
Tool Classes	# of Artifacts/Class	Summation Value	H
Flakes	0	#NUM!	0
Utilized flakes	0	#NUM!	
Lithic Cores	1	0	H max
Scrapers	0	#NUM!	0
Knives	0	#NUM!	
Bifaces	0	#NUM!	Evenness
Projectile Points	0	#NUM!	100%
Drills	0	#NUM!	
Perforators/Gravers	0	#NUM!	Richness
Hammerstone	0	#NUM!	14%
Groundstone	0	#NUM!	
Retouched Flakes	0	#NUM!	Percent Surf Collected
Choppers	0	#NUM!	5%
Total	1		
# Tool Classes (Rich)	1 out of 7		

Appendix D: Projectile Point Analysis

For this thesis, a projectile point analysis was conducted for the Lohr artifact collection and the Sprenger Valley artifact collection. All projectile points (incomplete and complete) were analyzed for a variety of matrices. These measurements are provided when possible.

Edison Lohr Projectile Point Analysis

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
5LR.29	2	1	projectile point	chalcedony	0.9	G2	3.02	20.92	16.22	7.65	7.52	Broken very tip and one barb, missing most of base.	Foothill's Corner-notched
5LR.29	2	2	projectile point	chert	3.4	G1	4.86	40.92	21.51	8.3	10.95	Broken barb tips and one base ear, broken very tip	Foothill's Corner-notch
5LR.29	2	3	projectile point	chert	1	G2	3.81	19.35	18.27	10.65	12.92	Missing both base ears and broken very tip and one barb corner	Foothill's Corner-notched
5LR.29	2	4	projectile point	chert	1.6	G2	4.29	19.73	17.74	12.3	12.25	Missing base with horizontal	Foothill's Corner-notched

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												hinge fracture, tip and one shoulder	
5LR.29	2	5	projectile point	petrified wood	1.9	-	5.68	24.68	15.03	10.97	12.72	No defined base. Tip is present. Distal midsection	N/A
5LR.29	2	6	projectile point	quartzite	6.6	G1	6.67	38.62	19.52	15.17	15.99	Missing part of one basal ear and the other basal tip, as well as the one barb's tip and also point tip due to diagonal hinge fracture	Mckean Duncan-Hanna
5LR.29	2	8	projectile point	quartzite	2.2	G2	6.19	21.77	18.05	13.14	14.74	Tip broken with diagonal fracture, both barb tips missing and one base ear missing	Mount Albion Corner-notched
5LR.29	2	11	projectile point	quartzite	0.7	G3	3.78	16.73	11.06	10.75	13.77	Tip missing due to transverse fracture. Really small point.	Plains Side-notched

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
5LR.29	2	12	projectile point	chalcedony	0.5	G2	2.47	21.32	11.98	8.01	10.34	Very tip missing as well as one shoulder tip and one basal ear. Concave base	Plains Side-notched
5LR.29	2	14	projectile point tip	quartzite	0.8	G3	4.27	17.25	-	-	-	-	N/A
5LR.29	2	16	projectile point midsect	quartzite	1.2	G2	4.24	17.75	15.44	14.33	14.42	Fractured midsection and base bottom missing. One notch is less obvious than the other.	N/A
5LR.29	2	17	projectile point tip	quartzite	1.3	G2	5.35	21.31	-	-	-	Very tip missing as well as shoulders and base.	N/A
5LR.30	3	8	projectile point	chert	0.5	G2	3.06	15.41	11.76	6.94	13.63	Missing point tip and one basal ear tip as well as one shoulder.	Plains Side-notched
5LR.31	4	1	projectile point	petrified wood	1.5	G2	6.5	21.7	10.4	6	6.7	Missing one shoulder and entire side of point along with	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												most of base.	
5LR.31	4	2	projectile point	chalcedony	3	G2	5.3	25	16.3	15.5	18.6	One vertical and horizontal hinge fracture. Missing top half and one side.	N/A
5LR.31	4	3	projectile point	quartzite	5.2	G2	7.1	34.3	21.1	16.4	14.9	One notch present, very tip missing and part of base.	Mount Albion
5LR.31	4	4	projectile point	jasper	0.5	G3	2.7	15.3	14.7	5.9	5.8	Complete and very resharpened/ utilized. Tiny portion of tip missing.	Late Archaic, Unspec
5LR.31	4	5	projectile point	chalcedony	1.5	G2	5.1	18.2	13.4	11	13.8	Missing top portion and one notch	Hanna
5LR.31	4	6	projectile point	quartzite	3.4	G2	4.6	25.3	26.7	14.3	16.3	Missing top half and portion of one shoulder and base	Pelican Lake
5LR.31	4	7	projectile point	quartzite	2.4	G2	4	28.3	20.7	9.7	9.1	Missing top portion near tip and both shoulder tips.	Archaic, Unspec

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
5LR.31	4	8	projectile point	chalcedony	1.1	G2	4	20.9	16.3	10.3	11.1	Missing one side of base and very tip. Another notch created after basal side broke off.	Plains Side-notched
5LR.31	4	9	projectile point base	jasper	1.5	G2	4.7	13.4	19.7	10.9	18.5	Missing most of midsection and top as well as one notch.	N/A
5LR.31	4	10	projectile point	chalcedony	1.2	G2	3.5	19	15	9.8	11.1	Missing part of side and side of base and top and tip of shoulder, notch, and basal tip.	N/A
5LR.31	4	11	projectile point	jasper	1.2	G2	3.4	26.9	13.7	4.9	7.3	Missing one shoulder and very tip.	Rosegate Desert-Stemmed
5LR.31	4	12	projectile point	chalcedony	0.4	G3	2.3	14.9	12	8	7.8	Missing base, one notch and very tip.	N/A
5LR.31	4	13	projectile point	quartzite	1.1	G2	3.8	17.3	15.5	10.5	10.6	Missing top, one basal ear, and shoulder tips.	Hanna
5LR.31	4	14	projectile point	chalcedony	1	G3	5.1	11.2	15.2	12.1	13.2	Missing top half of point	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												and one shoulder.	
5LR.31	4	15	Biface frag	jasper	0.9	G2	3.2	17.3	12.8		13	Missing top half	N/A
5LR.31	4	16	knife	quartzite	1.4	G2	3.2	27.1	14.3		9.7	Complete	N/A
5LR.31	4	17	projectile point	chalcedony	0.5	G3	2.8	15.7	11	10	12.3	Missing very tip, one shoulder, tip of one basal ear and entire basal ear and shoulder tip.	N/A
5LR.31	4	18	projectile point	quartzite	0.8	G2	3	17.5	12.9	9.2	15.7	Missing tip and shoulder tips and one basal ear	Plains Side-notched
5LR.31	4	19	projectile point	chalcedony	0.7	G2	2.8	18.8	12.7	8.8	14.6	Missing very tip, one shoulder tip, and one basal ear	Plains Side-notched
5LR.31	4	20	projectile point	chalcedony	0.6	G3	0.9	13.9	11.9	7.8	10.4	Missing top and half of base and one notch.	Late Prehistoric, Unspec
5LR.31	4	21	projectile point	chalcedony	0.7	G2	2.5	19.3	12.6	9.1	13	Missing tip and one shoulder tip and one basal side with ear.	Plains side-notched
5LR.31	4	23	projectile point	chalcedony	1	G2	3.6	16.1	14.5	11.2	15.9	Missing very tip and part of one	Desert Side-notched

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												shoulder and small portion of basal side with ear.	
5LR.31	4	24	projectile point	jasper	2.5	G2	5.3	33.7	13.8	-	-	Missing base	N/A
5LR.31	4	26	projectile point midsect	jasper	1.1	G2	3.5	17.2	-	-	-	Missing tip, base and one edge.	N/A
5LR.31	4	27	projectile point	quartzite	2.4	G2	5.8	24.2	14.5	11.3		Missing base and very tip	N/A
5LR.31	4	28	projectile point frag	chalcedony	0.8	G2	2.9	15	18.6	11	9.2	Missing top half.	N/A
5LR.31	4	29	projectile point tip	jasper	0.4	G3	2.8	14.3	-	-	-	Missing most of point.	N/A
5LR.31	4	30	projectile point	chalcedony	0.6	G3	2.4	17.6	13	-	-	Missing base. Shoulders measured were the widest portion of the point at the distal end directly above a lateral hinge fracture.	N/A
5LR.31	4	31	projectile point tip	chalcedony	0.2	G3	2.3	7.6	-	-	-	point tip missing very tip. Very tiny point.	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
5LR.31	4	32	projectile point midsect	jasper	0.6	G3	3.8	12.8	-	-	-	Missing very tip and proximal end	N/A
5LR.31	4	34	projectile point midsect	quartzite	1.5	G2	4.8	20.1	-	-	-	Missing proximal end and very tip.	N/A
5LR.31	4	37	projectile point midsect	jasper	1.1	G2	3.5	14.9	-	-	-	Missing one edge, very tip and proximal end.	N/A
5LR.31	4	42	projectile point base	chalcedony	0.5	G2	2.4	-	-	-	-	-	N/A
5LR.48	21	1	Projectile Point	chalcedony	2.1	G2	4.6	22.1	19.6	12.5	15.1	Missing tip and shoulder tips	Late Archaic Corner-notched
5LR.48	21	27	projectile point	quartzite	2.9	G1	5.4	36.8	18.6	14.9	12	Base end missing along with one "neck" ear	Mount Albion
5LR.48	21	46	projectile point	quartzite	3.7	G2	4.9	32.6	22.5	16.3	18.1	Very tip missing, shoulder ears missing and corners of base.	Mount Albion
5LR.48	21	49	projectile point	chalcedony	2.5	G2	4.8	22.8	21.5	12.4	15.7	Missing distal end, shoulder ears, and	Mount Albion

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												one basal ear.	
5LR.49	22	1	projectile point	jasper	5.6	G1	6.2	40.7	23.4	15.3	17.2	Missing tip. Notched base, side notched and extended stem	Duncan
5LR.49	22	2	projectile point	chert	1.7	G2	3.5	25.8	21.6	9.8	12.8	Missing tip, basal ear, and shoulder barb. Notched base	Late Archaic, Unspec
5LR.49	22	3	projectile point	chalcedony	2.4	G2	4.2	21.3	23.6	13.2	16.7	Missing distal end, both shoulder barbs and one basal ear. Notched base	Late Archaic, Unspec
5LR.49	22	4	projectile point	jasper	1	G2	3.6	22.9	14.6	5.8	8.7	Side-notched and missing very tip. Notched fishtail base	N/A
5LR.49	22	5	projectile point	chert	2.2	G2	4.8	29	19.9	8.6	11.5	Missing side or tip and most of base except for one basal ear and missing one shoulder. Serrated	Elko Corner-notched

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												with notched base	
5LR.49	22	6	projectile point	chert	1.9	G2	3.9	17.5	21.9	10.4	8.7	Missing distal end, almost all of base except near neck and one basal ear. Corner-notched	N/A
5LR.49	22	7	projectile point	chert	1.4	g2	3.1	23.4	18.4	9.3	8.7	Missing tip, one shoulder, and side of base. Heavily reworked.	Foothill's Corner-notched
5LR.49	22	8	projectile point	chalcedony	1.5	g2	5.1	15	19.8	12.2	11.2	Missing distal end and one shoulder and one basal ear. Side-notched	N/A
5LR.49	22	9	projectile point	chalcedony	2.6	g1	3.8	36.2	18.4	13.7	13.7	Missing very tip, one shoulder, one shoulder barb, and base except near "neck"	Unspec Archaic Side-notched
5LR.49	22	10	projectile point	chalcedony	1.3	g2	3.3	20.2	17	7.5	7.9	Missing tip, one shoulder barb, and base except	Foothill's Corner-notched

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												near neck. Notched base	
5LR.49	22	11	projectile point	chalcedony	0.8	g2	2.5	17.7	15.3	5.1	7.5	Missing tip, one shoulder barb, one side of base with ear missing. Serrated w/ notched base.	Foothill's Corner-notched
5LR.49	22	12	projectile point	chalcedony	2.4	g1	4.2	27.7	22.2	10.1	12.3	Missing tip, half of base, the other half's basal ear, and one shoulder. Notched base	Elko Corner-notched
5LR.49	22	13	projectile point	chalcedony	1	g2	3.9	14.4	19.7	10.1	9.9	Missing shoulder barb, one basal ear and distal end. Corner notched	N/A
5LR.49	22	14	projectile point	chert	1.3	g2	3.2	22.2	15.5	-	-	Missing tip and proximal end	N/A
5LR.49	22	15	projectile point	chalcedony	0.4	g3	2.6	12.4	9.9	8.5	10.1	Missing almost half of point (tip down to basal edge).	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												Heavily reworked.	
5LR.49	22	16	projectile point	chalcedony	0.5	g2	3.1	13.4	14.8	5.3	7	Missing distal end and one shoulder barb. Notched base.	Foothill's Corner-notched
5LR.49	22	17	projectile point	chert	0.4	g3	3.1	9.6	12.6	10.4	12	Missing base and tip. Side-notched	N/A
5LR.49	22	18	projectile point	chert	0.6	g2	2.7	15	14.6	6.2	8.5	Missing distal end and one shoulder barb. Partially serrated	Foothill's Corner-notched
5LR.49	22	19	projectile point	quartzite	3.2	g1	5.8	28	20.6	13.6	15.2	Missing tip and one shoulder. Extended stem	Mount Albion
5LR.49	22	20	projectile point	quartzite	1.2	g2	3.9	23.3	13.1	9.1	11.2	Missing very tip, one shoulder and one basal ear. fishtail	Pinto Basin
5LR.49	22	21	projectile point	quartzite	1.7	g2	4.5	25.7	16.5	12.6	13.6	Missing very tip, shoulder tip. Fishtail	Shoulder less Pinto
5LR.49	22	22	projectile point	quartzite	2.7	g2	5.5	24.4	18.4	12.4	14.2	Missing shoulder,	Mount Albion

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												very tip and one basal ear	
5LR.49	22	23	projectile point	quartzite	3.8	g1	5.2	30.9	22.4	12.8	15.5	Missing tip, both shoulder barbs, both basal ears	Pelican Lake
5LR.49	22	24	projectile point	quartzite	2.3	g2	5.8	25.7	16.6	12.4	13.7	Missing tip, one shoulder, and one basal ear. Concave base, asymm-etrical and partially serrated.	Mount Albion
5LR.49	22	26	projectile point	petrified wood	2.2	g2	4.5	26.9	17.6	8.7	10.2	Missing tip, one shoulder barb, one basal tip. Notched base	Hanna
5LR.49	22	27	projectile point	quartzite	1.7	g2	5	23.5	14.7	10.5	10.8	Missing part of very tip, one shoulder, and one part of base with basal ear. Side notched	N/A
5LR.49	22	28	projectile point	quartzite	2	g2	3.6	24.1	17.8	13.3	12.8	Missing tip, one shoulder, the other	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												shoulder's barb, and one basal ear. Side-notched	
5LR.49	22	29	projectile point	quartzite	3.4	g2	5.6	32.4	20.1	13.2	12.6	Missing tip, one shoulder barb and one basal ear. Corner notched	Pelican Lake
5LR.49	22	30	projectile point	quartzite	3.4	g2	6.4	32.5	16.8	14	9.8	Missing very tip and possibly some of base. Concave base	N/A
5LR.49	22	31	projectile point	chert	0.9	g3	3.5	17.4	14.2	11.3	5.6	-	N/A
5LR.49	22	32	projectile point	chalcedony	1.3	g2	4.5	18.8	12.4	9	11.2	Missing tip and basal ear. Notched base and reworked	Duncan-Hanna
5LR.49	22	33	projectile point	quartzite	3.6	g2	7.2	23.2	17.5	13.7	13.7	Missing tip and portions of shoulder barbs and one basal ear. Concave base.	N/A
5LR.49	22	34	projectile point	quartzite	2	g2	4.5	19.5	20.5	11.5	16.9	Missing distal end, shoulder barbs and	Plains Side-notched

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												most of base with one basal ear.	
5LR.49	22	35	projectile point	chalcedony	0.7	g2	2.7	18.8	11.9	10	12.6	Missing tip and one shoulder barb and one basal ear. Fox-eared w/ notched base	Late Prehistoric Side-notched
5LR.49	22	36	projectile point	quartzite	1.5	g2	4.7	18	14.5	13.9	18.1	Missing very tip, one entire edge including shoulder and basal ear. Side-notched	N/A
5LR.49	22	37	projectile point	chert	0.4	g3	3	13.6	9.2	7.6	10.6	Missing tip and one entire edge including shoulder and basal ear. Unspec side-notched, small point.	N/A
5LR.49	22	38	projectile point	quartzite	0.7	g2	3.3	19.6	13	7.4	8.1	Missing very tip, one shoulder and one basal ear, and one basal ear tip. Side-notched	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
5LR.49	22	39	projectile point	chalcedony	0.4	g3	2.5	15.2	10.4	7.1	8.6	Missing tip, one shoulder barb and one basal ear. Small point, partially serrated	N/A
5LR.49	22	40	projectile point	chert	0.6	g3	2.6	16.9	11			Missing tip and base, neck. Serrated	Foothill's Corner-notched
5LR.49	22	41	projectile point	chalcedony	0.9	g2	2.8	16.8	13.5	11.6	11.2	Missing tip and one entire edge including shoulder and all of base except near neck. Partially serrated, poss corner-notched	N/A
5LR.49	22	42	projectile point	chert	1.3	g2	4.5	19	14	-	-	Missing tip and one entire edge including shoulder and all of base	N/A
5LR.49	22	43	projectile point tip	jasper	0.5	g3	3.6	10.5	12.4	-	-	Missing very tip and proximal end	N/A
5LR.49	22	44	projectile point tip	chert	0.2	g3	1.9	12	9.3	-	-	Missing proximal end	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
5LR.49	22	45	projectile point	chalcedony	1.3	g2	4.7	12.8	16.8	16.1	19.2	Missing distal end, one side notch, shoulder, and basal ear. Side-notched with notched base	N/A
5LR.49	22	46	projectile point	chert	0.6	g3	3	15.5	6.7	6.2	8.7	Missing distal end and one entire side with shoulder missing and basal edge. Side-notched	N/A
5LR.49	22	47	projectile point	rhyolite	1.8	g2	4.7	21.5	12.8	10.6	9	Missing tip, one shoulder barb and one basal edge and another basal tip. Corner-notched	N/A
5LR.49	22	48	projectile point tip	chalcedony	1	g2	4.5	17.8	16.3	-	-	Missing proximal end and small piece of very tip	N/A
5LR.49	22	49	projectile point	chert	1.6	g2	4.5	21.7	16.3	-	-	Missing very tip and base along	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												with shoulders	
5LR.49	22	50	projectile point	chert	0.4	g3	2.6	13.3	7.6	7.7	12.6	Missing tip and one entire side with shoulder and basal edge missing.	Plains side notched
5LR.49	22	51	projectile point midsect	chalcedony	1.3	g2	4.8	11.3	17	-	-	Missing distal and proximal ends including shoulders.	N/A
5LR.49	22	52	projectile point tip	chalcedony	0.7	g3	4.6	16.2	13.9	-	-	Missing proximal end including shoulders	N/A
5LR.49	22	53	projectile point tip	chalcedony	0.5	g3	3.5	10.6	13.8	-	-	Missing very tip and proximal end including shoulders	N/A
5LR.49	22	54	projectile point midsect	chalcedony	1.4	g2	4.5	19.7	16.9	-	-	Missing tip and proximal end including shoulders	N/A
5LR.49	22	55	projectile point	chalcedony	1.4	g2	5.1	21.1	15.3	12.5	12.9	Missing very tip and shoulder barbs and	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												basal tips. Side-notched with notched base	
5LR.49	22	56	projectile point	chalcedony	1	g3	4.6	10.7	16.5	14.5	11.8	Missing distal end and both shoulders and one basal tip and one basal ear. Side-notched with notched base.	N/A
5LR.49	22	57	projectile point	chalcedony	0.8	g3	3.6	17.1	12.5	11.3	13.3	Missing tip and one shoulder barb and one basal ear. Partially serrated. Side-notched with notch in base.	N/A
5LR.49	22	58	projectile point	chalcedony	0.8	g2	3	18.5	14.2	13.6	14.6	Missing very tip and most of base and one basal ear and one shoulder	N/A
5LR.49	22	59	projectile point	chert	1.9	g2	6.7	16.3	15.9	-	-	Missing proximal end and basal tip	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
5LR.49	22	61	Projectile point tip	chalcedony	1.1	g2	4	18	16.2	-	-	Missing distal end and very tip	N/A
5LR.49	22	62	Projectile point tip	chalcedony	1	g2	3.5	20	11.5	-	-	Missing distal end and very tip	N/A
5LR.49	22	63	Projectile point tip	chalcedony	0.4	g3	2.7	11.1	12.1	-	-	Missing proximal end and very tip	N/A
5LR.49	22	64	Projectile point tip	chalcedony	1.3	g2	4	17.1	15.1	-	-	Missing proximal end and very tip. Serrated	N/A
5LR.49	22	65	Projectile point midsect	chalcedony	1	g3	4.8	11.2	16.5	11.3	12	Missing base and distal end	N/A
5LR.49	22	66	Projectile point tip	chalcedony	0.8	g3	3.4	16.5	11.9	-	-	Missing proximal end and tip and one edge	N/A
5LR.49	22	67	Projectile point fragment	chalcedony	1.3	g2	3.2	19.9	16.8	10.4	11	Missing portion of base and one barb and very tip	N/A
5LR.49	22	68	Projectile point midsect	quartzite	0.9	g3	5	10.2	15.2	-	-	Missing distal and proximal ends	N/A
5LR.49	22	69	Projectile point tip	quartzite	1.6	g2	4.5	19.6	18.4	-	-	Missing proximal end and very tip	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
5LR.49	22	70	Projectile point tip	quartzite	0.6	g3	4	12.5	11.1	-	-	Missing proximal end and tip	N/A
5LR.49	22	71	Projectile point tip	quartzite	0.6	g3	4.1	12.4	12.4	-	-	Missing proximal end and very tip	N/A
5LR.49	22	72	Projectile point tip	quartzite	1.1	g2	4.2	14	18.9	-	-	Missing proximal end and very tip. Asymm-etrical	N/A
5LR.49	22	73	Projectile point midsect	quartzite	1.8	g2	5.1	19	14	-	-	Missing proximal end and tip	N/A
5LR.49	22	74	projectile point tip	quartzite	2.5	g2	5.2	28.6	15.5	-	-	Missing g base and tip	N/A
5LR.49	22	75	point tip	quartz	4.3	g2	7.2	28	21.6	-	-	Missing proximal end and tip	N/A
5LR.49	22	76	Projectile point fragment	quartzite	1.4	g2	4.1	21.3	14.4	-	-	Missing base and tip and has one side notch	N/A
5LR.49	22	77	Projectile point tip	quartzite	0.7	g3	3.5	12.8	15.4	-	-	Missing proximal end and tip	N/A
5LR.49	22	79	Projectile point frag	quartzite	1.3	g2	3.5	21.8	16.3	-	-	Missing proximal end and very tip. Asymm-etrical, one side notch	N/A
5LR.49	22	80	Projectile point midsect	quartzite	1.1	g2	3.6	12.9	15.2	-	-	Missing proximal	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												end and tip. Serrated	
5LR.49	22	82	Projectile point fragment	chert	1.5	g2	4.5	16.8	17.7	10.7	10.3	Missing base and tip	N/A
5LR.49	22	83	Projectile point fragment	quartzite	1.9	g2	5.7	19.9	9.1	-	-	Missing one shoulder and proximal and very tip	N/A
5LR.49	22	84	Projectile point tip	quartzite	0.5	g3	2.8	14.8	11.4	-	-	Missing proximal end and very tip	N/A
5LR.49	22	85	Projectile point tip	quartzite	1.5	g2	4.7	13.7	19.7	-	-	Missing proximal end and tip	N/A
5LR.49	22	88	Projectile point base	quartzite	0.6	g3	4	9.4	11.3	-	-	Missing distal end	N/A
5LR.49	22	89	Projectile point tip	quartzite	1.4	g2	4.7	13.9	18.4	-	-	Missing proximal end and tip	N/A
5LR.49	22	90	Projectile point midsect	quartzite	1.2	g2	3.7	16.1	16.8	-	-	Missing proximal end and tip. Has one side notch.	N/A
5LR.49	22	91	Projectile point tip	quartzite	1.2	g2	3.8	18.9	14.7	-	-	Missing proximal end and very tip	N/A
5LR.49	22	92	Projectile point fragment	quartzite	1.5	G2	4.9	17.8	17.4	9.8	7.7	Missing portion of base and distal end	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
												and one shoulder	
5LR.49	22	93	Projectile point frag	quartzite	1.1	G2	3.4	17.6	15.1	10.2	8.4	Missing portion of base, shoulder, and tip. Serrated	N/A
5LR.49	22	94	Projectile point tip	quartzite	0.7	G3	3.1	14.6	12.1	-	-	Missing proximal end and very tip	N/A
5LR.49	22	95	Projectile point midsect	quartzite	1.7	G2	5.2	12.1	16.8	15.6	18.4	Missing most of base and distal end	N/A
5LR.49	22	97	Projectile point tip	quartzite	1.7	G2	6	14.4	19.4	-	-	Missing proximal end and very tip	N/A
5LR.49	22	98	Projectile point tip	quartzite	0.5	G3	3.3	12.5	10.9	-	-	Missing proximal end and very tip	N/A
5LR.49	22	99	Projectile point tip	quartzite	1.5	G2	4.6	16.8	17.4	-	-	Missing proximal end and tip	N/A
5LR.49	22	101	projectile point	quartzite	1.9	G2	4.6	22.8	14.5	-	-	Missing the very tip one edge and proximal	N/A
5LR.49	22	102	projectile point	quartzite	1.7	G2	4.4	17.7	15.9	13.5		Missing distal and proximal	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
5LR.49	22	103	projectile point	quartzite	0.7	G3	3.9	7.9	14.4	-	-	Missing distal and proximal	N/A
5LR.49	22	104	projectile point	quartzite	1.4	G2	4.2	13.7	17	12	-	Missing distal and proximal	N/A
5LR.49	22	106	projectile point	quartzite	1.2	G2	4.1	12.4	17	15.1	-	Midsection	N/A
5LR.49	22	107	projectile point	quartzite	0.9	G3	3.7	9.8	15.9	-	-	Midsection. Lightly serrated	N/A
5LR.49	22	108	projectile point	chert	3.1	G2	7.5	20.6	15	-	-	Midsection fragment	Lohr: Yuma point
5LR.49	22	109	projectile point	quartzite	1.3	G2	5.4	13.6	15.4	14.4	15.3	Proximal end	Duncan-Hanna
5LR.49	22	110	projectile point	jasper	3.7	G2	5.7	25.4	20.7	-	-	Midsection	Lohr: Yuma point
5LR.49	22	111	projectile point	quartzite	1.8	G2	5.5	13.3	16.9	-	16.5	-	McKean
5LR.49	22	112	projectile point base	quartzite	9.3	G1	7.9	49.2	21.7	18.4	16.1	-	McKean
5LR.49	22	113	projectile point	chalcedony	2	G2	4.1	21.8	24.6	-	-	Distal midsection. Lightly serrated	Lohr: Yuma point
5LR.49	22	114	projectile point base	quartzite	3.1	G2	7.1	17	18.2	-	18.3	-	Scottsbluff/ Kersey
5LR.49	22	115	projectile point	quartzite	1.8	G2	5.8	16	17.4	-	11.3	Proximal end and stemless	Lohr: Yuma point
5LR.49	22	117	projectile point	quartzite	5.9	G2	8.8	18.2	26.2	-	-	Midsection	Scottsbluff

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
5LR.49	22	118	projectile point	quartzite	1.6	G2	4.2	17.2	20.4	-	-	Midsection	N/A
5LR.49	22	153	projectile point base	chert	0.6	G3	4.6	9.3	12.7	-	12.2	Proximal. Lohr: Drill	Duncan-Hanna
5LR.49	22	U	projectile point	chert	1.2	G2	2.9	24.6	14.8	7.3	-	Missing tip base and one notch	N/A
5LR.49	22	U	projectile point	chalcedony	1	G2	3.8	20.4	13.9	6.2	-	Missing base and barbs and very tip	N/A
5LR.50	23	2	projectile point	chalcedony	1.4	G2	4.5	22.29	14.86	6.96	7.05	Missing one shoulder, the tip, and one side of base	Foothill's Corner-notched
5LR.50	23	3	projectile point	quartzite	2.7	G2	5.8	24.72	19.48	11.68	9.52	Missing the tip, most of base, and possibly one shoulder where there is a large notch (either purposefully or not)	Mount Albion
5LR.50	23	4	projectile point	chalcedony	0.5	G3	2.9	15.19	13.85	8.78	9.53	Missing proximal half of point, shoulder barb, and both basal ears.	Plains Side-notched
5LR.50	23	5	projectile point tip	oolitic chert chalcedony	2.6	G2	6.04	25.53	13.97	-	-	Distal end with base missing	Eden/ Scottsbluff

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Greatest Length (GL)	Shoulder Width (mm)	Neck width (mm)	basal width (mm)	PP Portion	Type
				jasper								along with point tip.	
5LR.52	25	1	projectile point	chalcedony	0.8	G3	3.44	18.42	15.04	9.84	10.94	Broken one ear and very tip	Foothill's Corner-notched
5LR.52	25	2	projectile point	quartzite	2	G2	4.1	30.73	14.86	12.42	12.8	Broken very tip and one ear. Vertical hinge fracture along low edge.	Prairie Side-notched

Sprenger Valley Projectile Point Analysis

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Max Width (mm)	Max Length (mm)	Greatest Thickness (GT) (mm)	PP Portion	Type
5LR1150	CO:D:12:3.3	3	Projectile Point tip	Quartzite	0.9g	G2	14.3	16.6	4.1	Projectile point tip	N/A
5LR1150	CO:D:12:3.11	11	Projectile Point	Chert	2.2g	G2	17.4	21.5	3.9	Midsection	N/A
5LR1150	CO:D:12:3.49	42	projectile point	Quartzite	-	-	14	18	3	point missing, one tang missing and has straight stem	Mount Albion
5LR1150	CO:D:12:3.48	44	Projectile Point	Chert	0.2g	G3	9.6	10.3	2.1	-	Late Prehistoric, Unspec
5LR1150	CO:D:12:3.44	45	Projectile Point	Quartzite	-	-	14	17	3	one tang missing, expanding stem	Foothill's Corner-notched
5LR1150	CO:D:12:3.45	46	Projectile Point	Missing	-	-	20	22	5	tip	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Max Width (mm)	Max Length (mm)	Greatest Thickness (GT) (mm)	PP Portion	Type
5LR1150	CO:D:1 2:3.47	48	Projectile Point	Chalcedony	0.2g	G3	10.8	11.6	2	Serrated edges	Late Prehistoric, Unspec
5LR1150	CO:D:1 2:3.53	51	projectile point base	chert	-	-	16	18	2	mustard in color, stem corners missing, expanding stem present	Plains Desert
5LR1150	CO:D:1 2:3.59	54	Projectile point	missing	-	-	13	19	2	one side tang missing, expanding stem present, straight sided, basal notch	Foothill's Corner-notched
5LR1150	CO:D:1 2:3.60	55	Projectile point	missing	-	-	11	22	3.5	tang and margin missing, straight sided expanding stem	Pelican Lake
5LR1150	CO:D:1 2:3.64	61	projectile point	Chalcedony	-	-	13	16	3	blade form is straight. tang missing. Expanding stem present, narrower than tang.	Foothill's Corner-notched
5LR1150	CO:D:1 2:3.65	62	projectile point	Chalcedony	-	-	24	16	6	blade missing. Expanding stem, narrower than tang.	Hanna
5LR1150	CO:D:1 2:3.66	63	projectile point	Chalcedony	-	-	15	25	3	side notched, tip of tang missing. Side notched to corner.	Plains Desert
5LR1150	CO:D:1 2:3.67	64	projectile point	Chalcedony	-	-	11	14	3	Midsection/base. Bottom of straight base projectile point. Rest of base missing. No notches present.	N/A

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Max Width (mm)	Max Length (mm)	Greatest Thickness (GT) (mm)	PP Portion	Type
5LR1150	CO:D:12:3.68	65	projectile point	petrified wood	-	-	16	24	4	missing tang tip. Expanding stem. Blade form is straight.	Mount Albion
5LR1155	CO:D:12:8.1	1	Projectile Point	chert	-	-	14	28	6	one margin appears to be retouched or broken. Basal portion missing. Ovate blade form	N/A
5LR1155	CO:D:12:8.2	2	Projectile Point	Obsidian	1.8g	G2	15.8	17.2	5.1	Midsection	Archaic, Unspec
5LR1155	CO:D:12:8.2	2	Projectile Point	chert	-	-	15	19	5	basal portion and tip missing, parallel blade form, side-notched	N/A
5LR1155	CO:D:12:8.9	10	Projectile Point	Chert	1.2g	G2	19.1	12	4.3	Midsection. Triangular blade form, tip and base missing.	N/A
5LR1155	CO:D:12:8.12	13	Projectile Point	chert	-	-	12.5	24	2.5	late prehistoric, triangular blade form, side-notched, concave base, expanding stem	Plains Desert
5LR1155	CO:D:12:8.14	15	projectile Point base	chert	-	-	13	6.5	3.5	side-notched, expanding stem. Pressure flaked.	N/A
5LR1155	CO:D:12:8.17	19	Projectile Point	Quartzite	1.5g	G2	18.6	15.8	6.4	Midsection. Tip and lower half missing. Ovate blade form.	N/A
5LR1155	CO:D:12:8.20	21	Projectile Point	Chalcedony	0.6g	G3	132.3	11.3	4.8	Projectile point tip. Concave blade tip	N/A

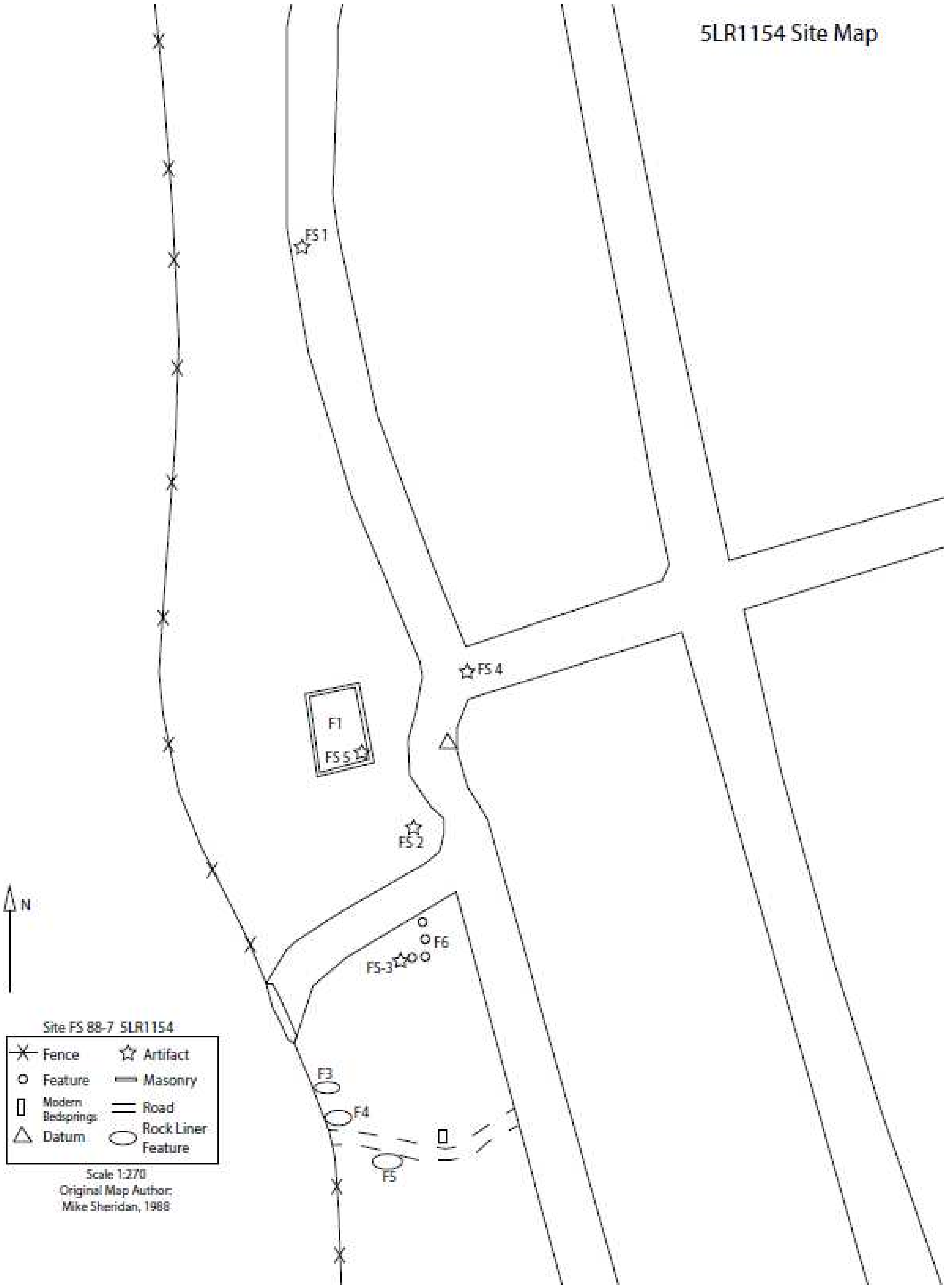
Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Max Width (mm)	Max Length (mm)	Greatest Thickness (GT) (mm)	PP Portion	Type
5LR1155	CO:D:1 2:8.33	34	projectile point base	quartzite	-	-	18	30	5.5	roughly made, parallel sides, concave base	Duncan
5LR1155	CO:D:1 2:8.34	35	projectile point	quartzite	-	-	14	28.5	7	Midsection. straight stem, elongate triangular blade form, side notched.	Archaic, Unspec
5LR1155	CO:D:1 2:8.35	36	projectile point	missing	-	-	16	37.5	6	diamond-shaped blade form, side-notched, concave base.	McKean Duncan-Hanna
5LR1155	CO:D:1 2:8.36	37	projectile point	chert	-	-	21.5	17	4.5	Midsection. tip and lower half missing. Side-notched (?), margins converging toward tip	N/A
5LR1155	CO:D:1 2:8.40	41	Projectile Point	Quartzite	3.0g	G2	17.9	27.7	6.3	Midsection	N/A
5LR1155	CO:D:1 2:8.44	51	projectile point	quartzite	-	-	12.5	28	5.5	long sides converging toward tip, convex base, expanding stem, side-notched. Tip and one tang broken off.	Archaic, Unspec
5LR1155	CO:D:1 2:8.45	52	Projectile Point	Quartzite	2.2G	G2	18.3	19.8	4.6	Midsection. Blade form appears to be long, triangular.	N/A
5LR1155	CO:D:1 2:8.46	53	projectile point	Chalcedony	-	-	16.5	2.7 cm	3	triangular, flat base with basal thinning, side-	Plains Desert

Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Max Width (mm)	Max Length (mm)	Greatest Thickness (GT) (mm)	PP Portion	Type
										notched, expanding stem.	
5LR1155	CO:D:12:8.52	64	Projectile Point	Chert	1.2g	G2	16.3	15.4	4.3	Midsection. Side notched (?), triangular blade	N/A
5LR1155	CO:D:12:8.53	66	projectile point tip	Chalcedony	-	-	11.5	18	2.5	specimen is particularly finely flaked. Triangular blade form	Archaic, Unspec
5LR1155	CO:D:12:8.55	69	projectile point base	Chalcedony	-	-	17	9	3.5	corner notched, expanding stem, shallow concave base main blade missing.	Pelican Lake
5LR1155	CO:D:12:8.57	80	projectile point	quartzite	-	-	13.5	25	2.5	tip and stem missing, triangular blade form, notched, parallel flaking.	Archaic, Unspec
5LR1155	CO:D:12:8.64	109	Projectile Point	Quartzite	0.3g	G3	11.5	11.2	2.1	-	N/A
5LR1156	CO:D:12:9.1	1	Projectile point base	chert	-	-	19.3	16	4.3	base only of point. Concave base, no apparent basal grinding. Parallel sides.	Eden/ Scottsbluff
5LR1156	CO:D:12:9.5	5	Projectile Point	Chert	0.9g	G3	14.5	16.3	3.5	Midsection	N/A
5LR1156	CO:D:12:9.3	27	Projectile point	quartzite	-	-	13.8	29.5	48	(chip on tang where broken). Roughly made, sign-notched, deep basal notch, concave blade form, no basal grinding.	Hanna

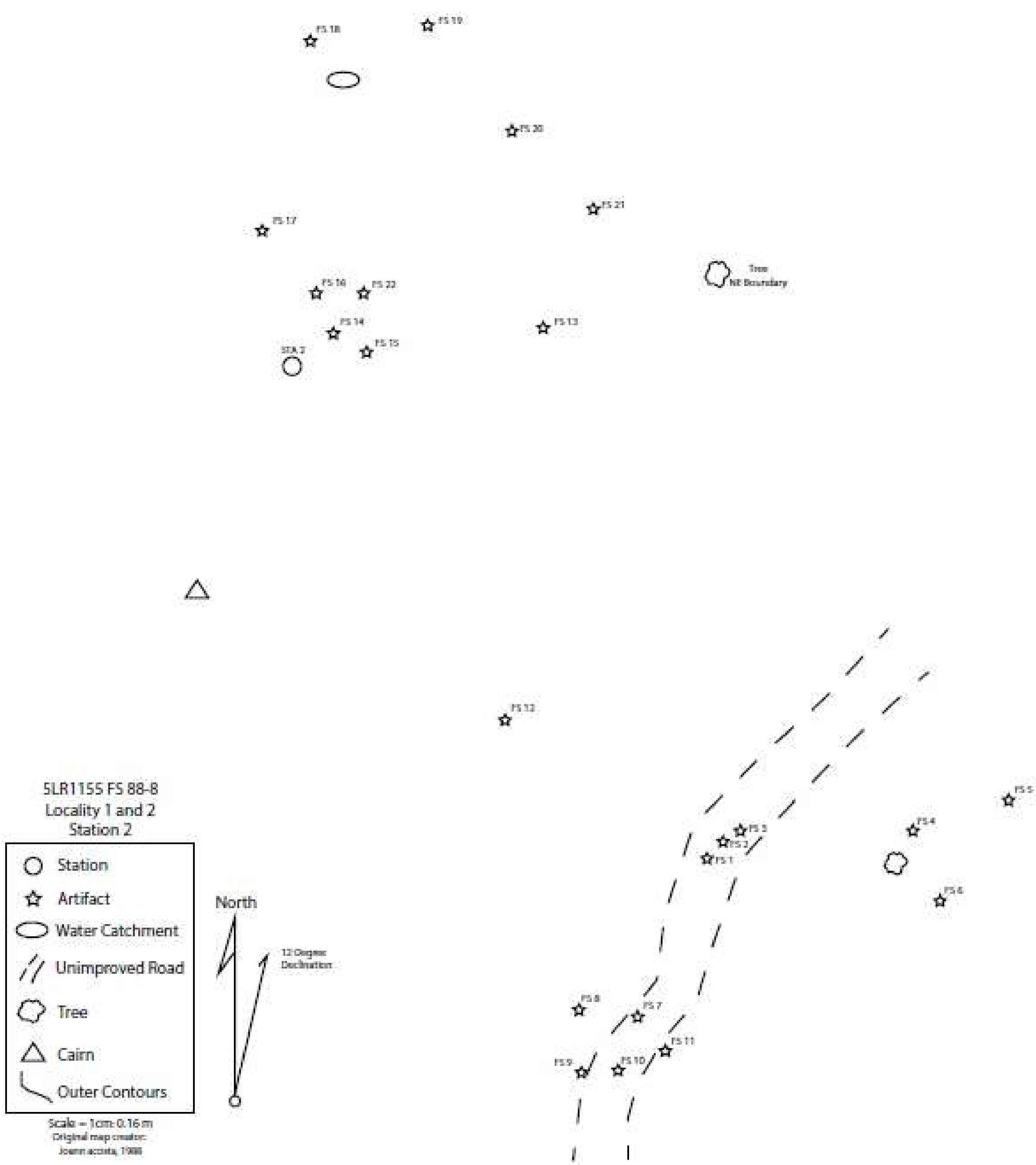
Site Smith No.	Temp Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Max Width (mm)	Max Length (mm)	Greatest Thickness (GT) (mm)	PP Portion	Type
5LR1156	CO:D:12:9.5	30	projectile point	chert	-	-	16	14.1	3.3	Midsection. corner notched (?), basal thinning	N/A
5LR1159	CO:D:12:12.1	14	projectile point	Quartzite	-	-	17	22	5	listed on field bag as McKean base by Dan Hall. Basally ground with deep basal notch.	McKean
5LR1162	CO:D:12:15.1	1	Projectile point	Quartzite	-	-	20.5	26	6	Side-notched, contracting stem, no basal grinding, basal thinning, tang(s) broken off (?), upper blade missing, apparently ovate blade form. Very roughly made.	Mount Albion

Appendix E: Sprenger Valley Digitized Sketch and Location Maps

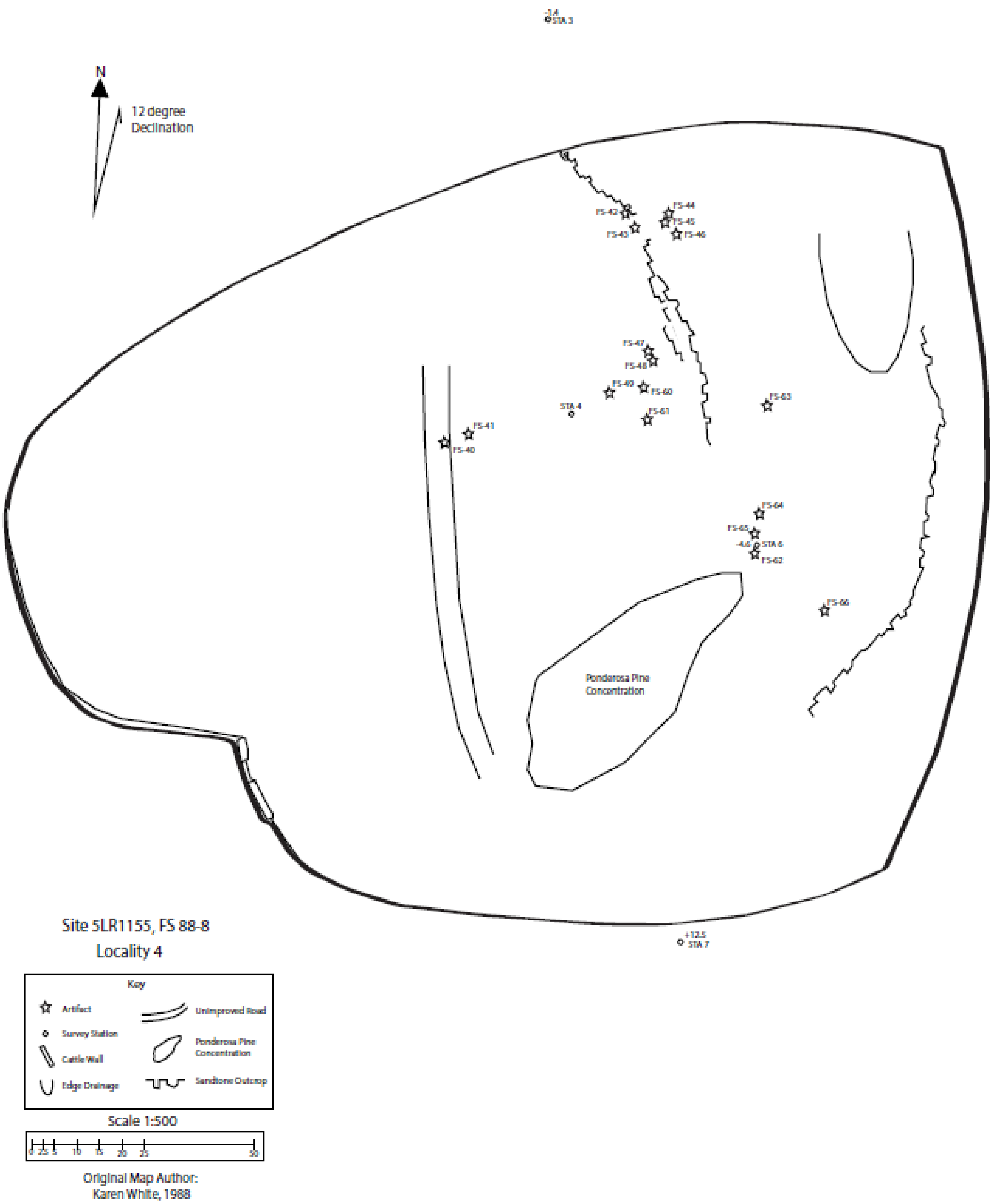
The following maps were digitized by the author in Adobe Illustrator from photographs of large physical maps from the Sprenger Valley Field School (1988) that are housed at the CSU Archaeological Repository.


5LR1154 Site Map
FS 1
FS 4
F1
FS 5
FS 2
N
F6
FS-3
Site FS 88-7 5LR1154
Fence
Artifact
Feature
Masonry
Modern Bedsprings
Road
Datum
Rock Liner Feature
F3
F4
F5
Scale 1:270
Original Map Author:
Mike Sheridan, 1988

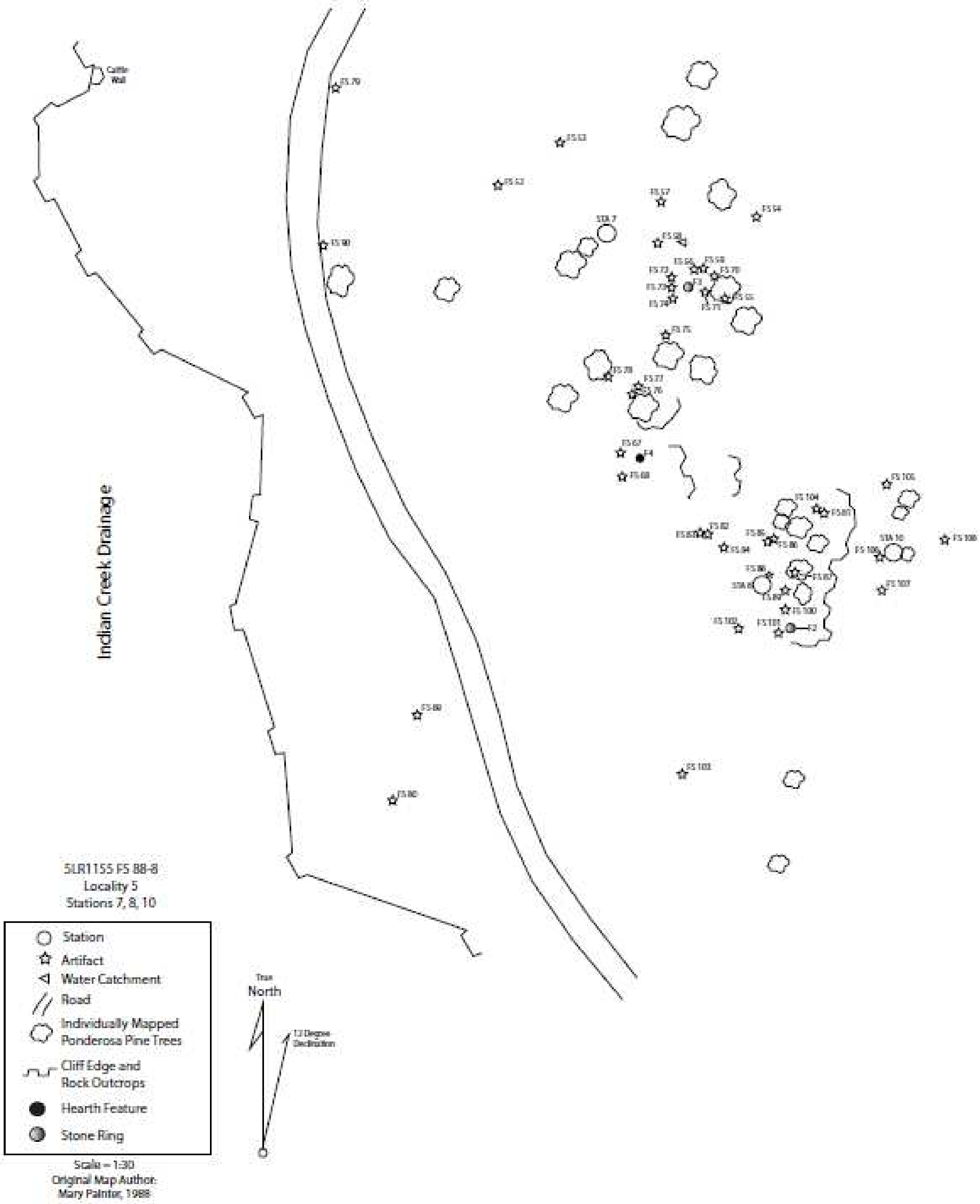
5LR1155 Site Map
Locality 1 and 2



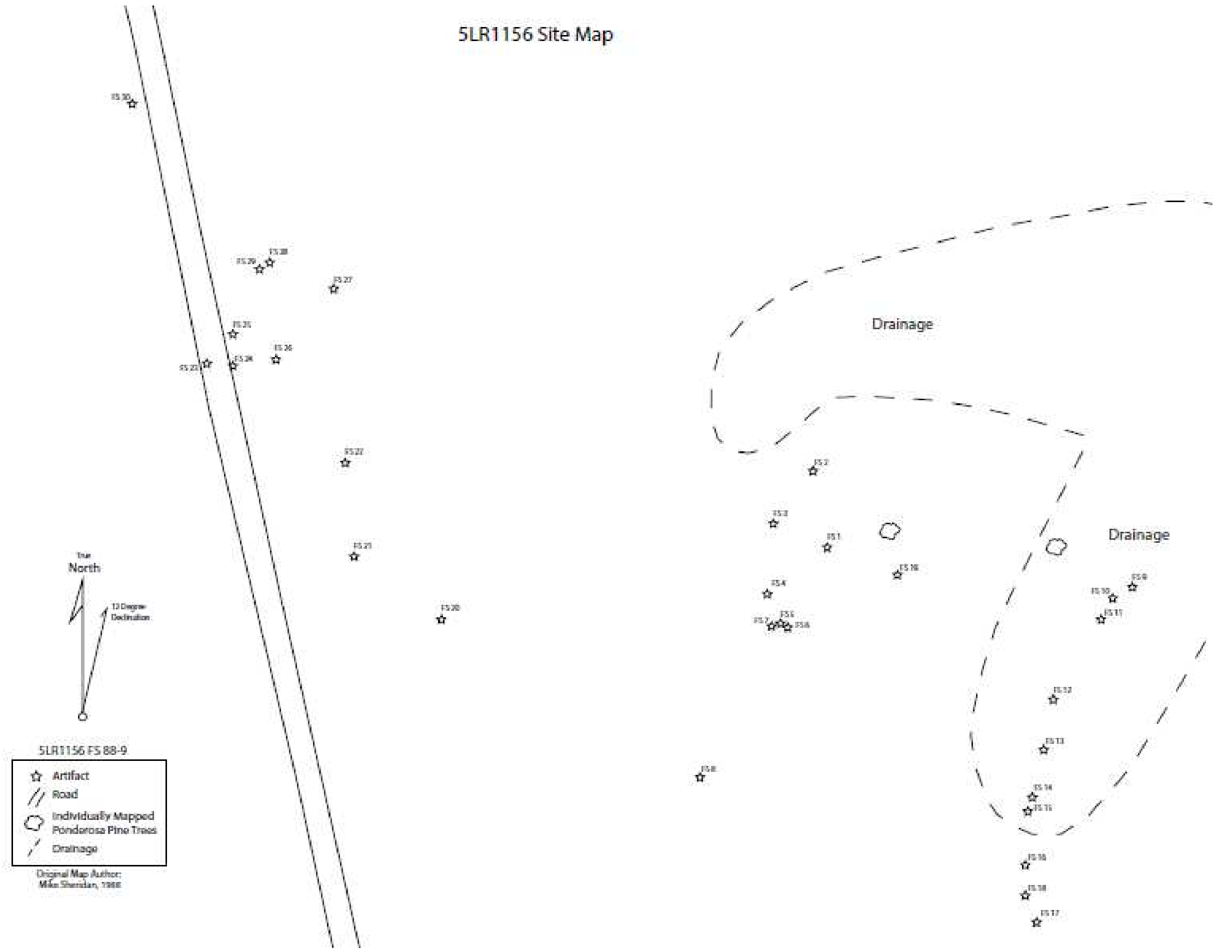
5LR1155 Site Map
Locality 4



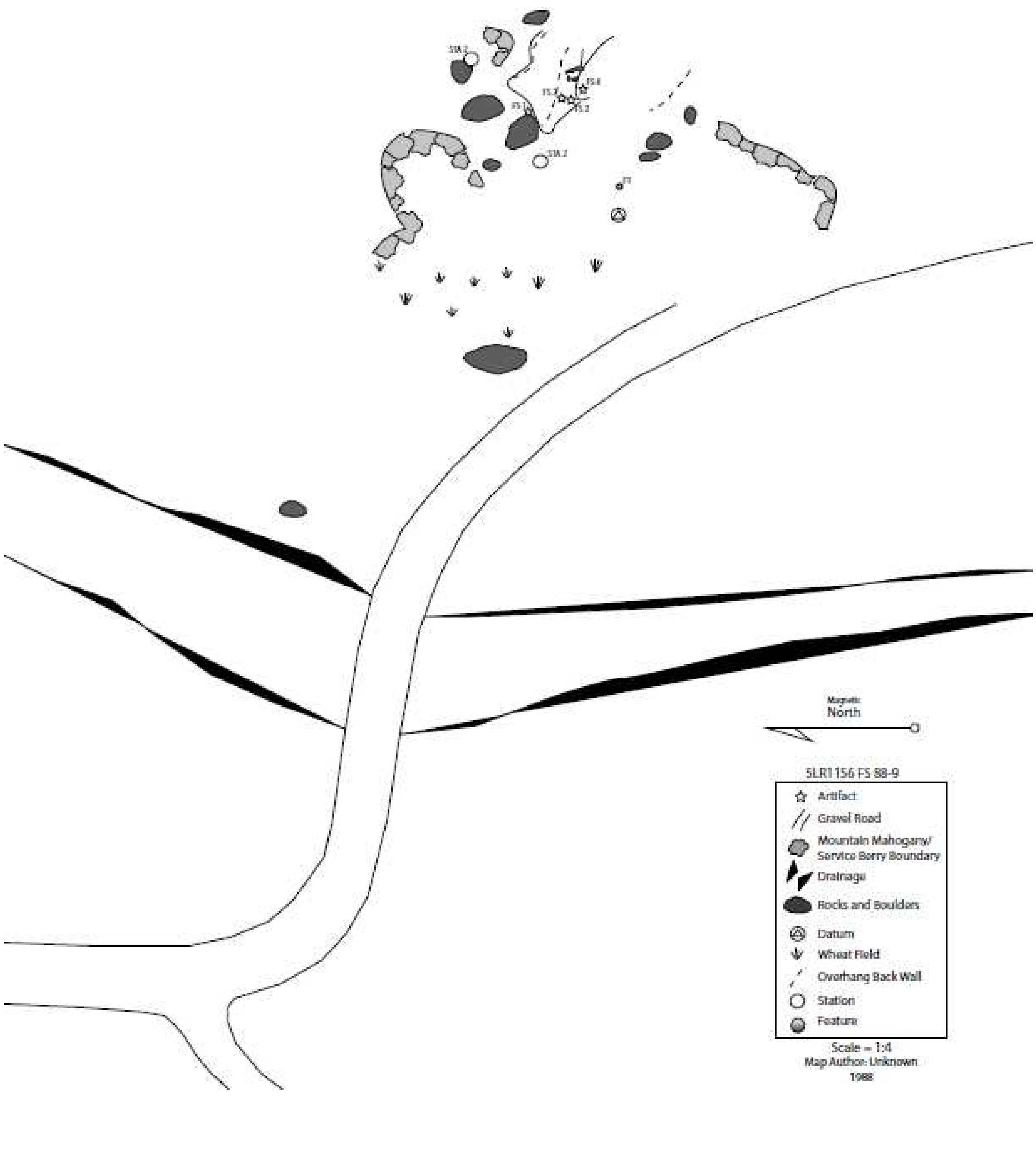
5LR1155 Site Map
Locality 5



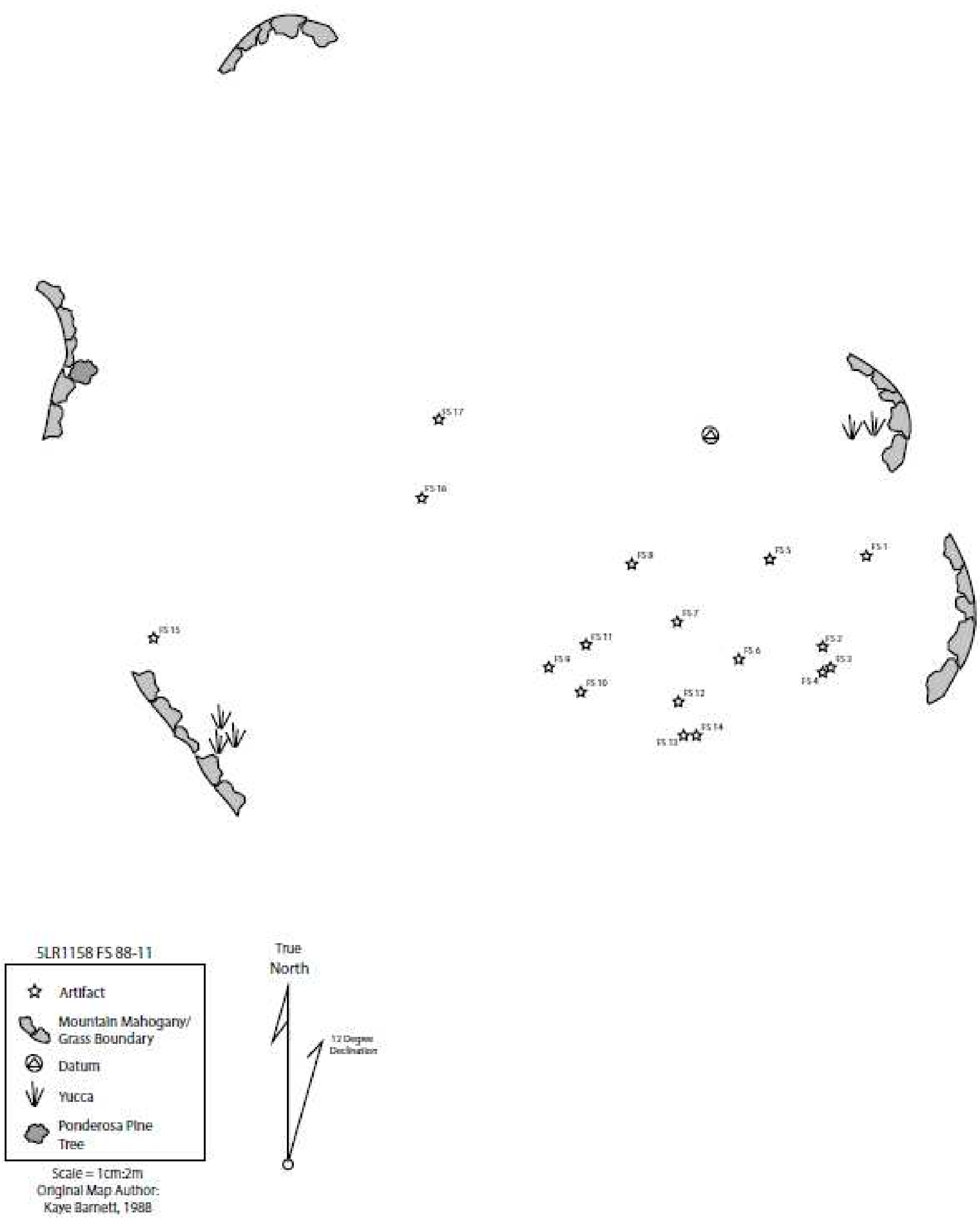
5LR1156 Site Map

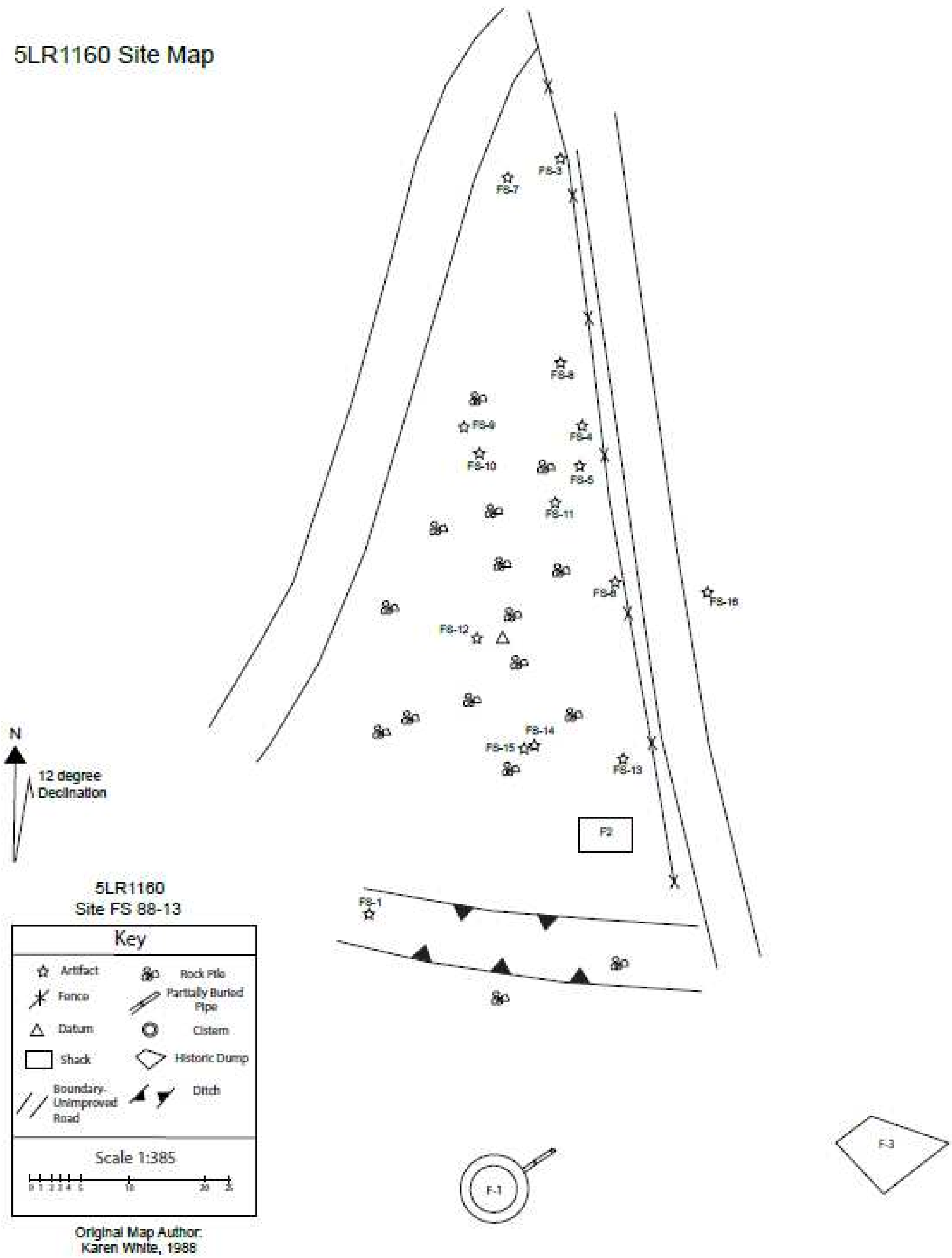


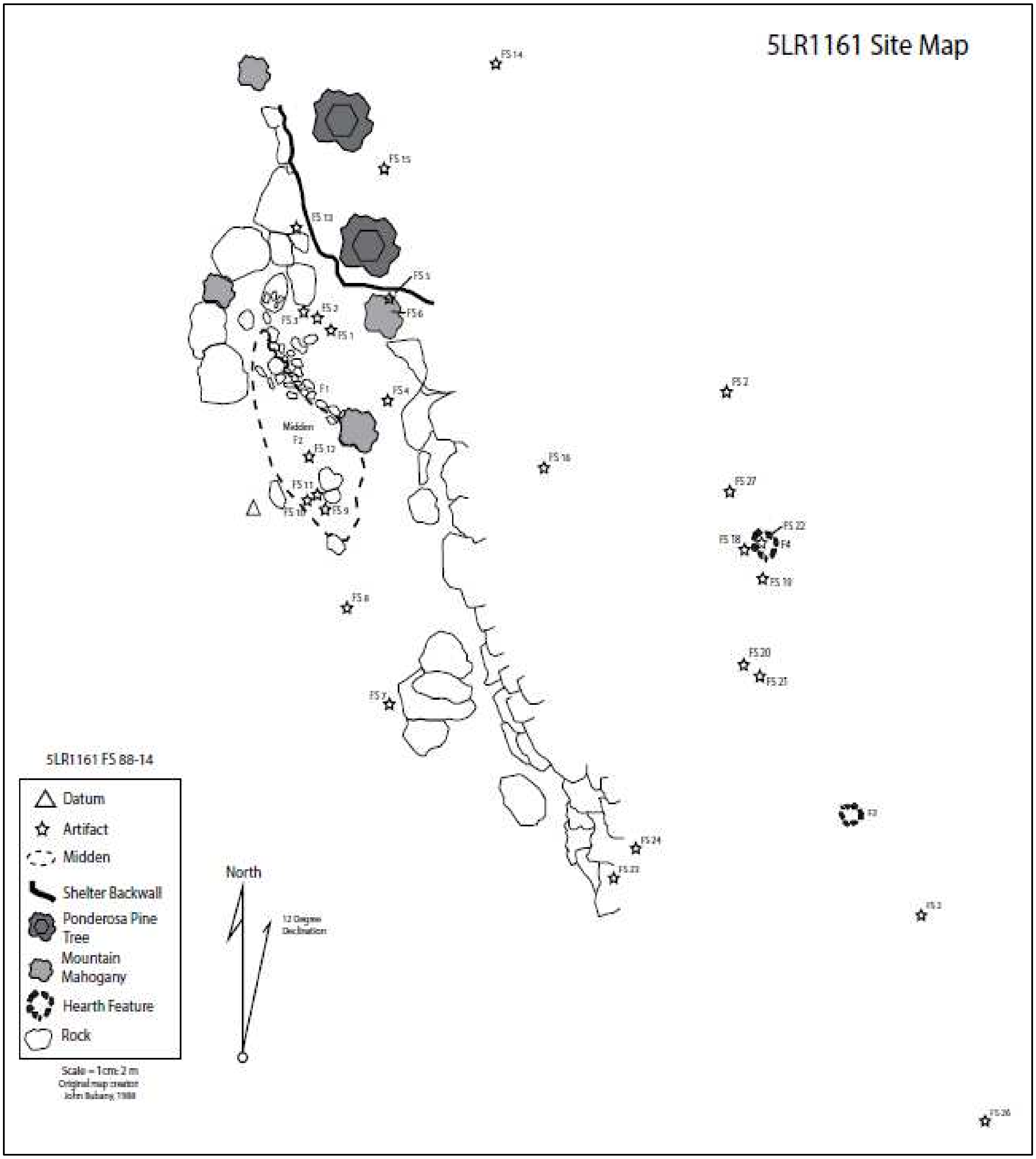
5LR1156 Site Map



5LR1158 Site Map




5LR1160 Site Map
FS-3
FS-7
FS-6
FS-9
FS-4
FS-10
FS-5
FS-11
FS-8
FS-16
FS-12
FS-14
FS-15
FS-13
F2
FS-1
F-1
F-3
N
12 degree Declination
5LR1160
Site FS 88-13
Key
Artifact
Rock Pile
Fence
Partially Buried Pipe
Datum
Cistern
Shack
Historic Dump
Boundary-Unimproved Road
Ditch
Scale 1:385
Original Map Author:
Karen White, 1988


5LR1161 Site Map
5LR1161 FS 88-14
Datum
Artifact
Midden
Shelter Backwall
Ponderosa Pine Tree
Mountain Mahogany
Hearth Feature
Rock
Scale = 1cm: 2 m
North
12 Degree Declination

Appendix F: Artifact Inventories

Edison Lohr Artifact Inventory

All tools were measured for weight (gm), size grade, greatest thickness (mm), max width and max length, when possible. Additional measurements are provided when possible and includes greatest length, shoulder width, neck width, and basal width. Additional Lohr comments are provided within the description column.

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.29	2	7	knife	chert	2.8	G2	4.71			corner-notched, stemmed base	broken stem corner and barb and very tip of other barb; missing point tip with horizontal hinge fracture.
5LR.29	2	9	knife possibly	chert	1	G2	3.47	14.47	18.63		Knife/biface midsection
5LR.29	2	10	Knife base	chert	1.4	G2	3.81	17.31	19.09		Knife/biface midsection and base
5LR.29	2	13	biface midsection	quartzite	2.1	G2	4.55	17.7	20.54	midsection	two transverse fractures
5LR.29	2	15	Poss knife frag	chalcedony	1.4	G2	5.19	10.26		Reutilized	possibly half of midsection
5LR.29	2	18	End Scraper	quartzite	9.8	G1	8.81	35.38	31.67		
5LR.29	2	19	End Scraper	chert	17.1	G1	13.42	34.79	35.02		
5LR.29	2	20	End Scraper	quartzite	33.8	G1	13.68	43.92	46.19		

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.29	2	21	Side Scraper	quartzite	9.8	G1	7.69	33.43	37.18		
5LR.29	2	22	utilized flake	quartzite	15.2	G1	12.6	27.37	41.67		
5LR.29	2	23	Side Scraper	quartzite	13.7	G1	10.94	30.33	36.6		
5LR.29	2	24	Side Scraper	quartzite	29.5	G1	14.58	38.43	52.53		
5LR.29	2	25	Worked Flake	chalcedony	1.1	G2	2.48	21.61	16.9		
5LR.29	2	26	Side Scraper	petrified wood	2.4	G2	4.95	15.27	29.98		
5LR.29	2	27	utilized flake	quartzite	8.2	G1	9.09	22.92	35.45		
5LR.29	2	28	Side Scraper	quartzite	4.8	G2	5.57	33.31	25.46		
5LR.29	2	29	utilized flake	chert	2.8	G2	4.6	17.34	29.06		
5LR.29	2	31	Side Scraper	quartzite	28.2	G1	11.3	37.7	53.53		
5LR.29	2	32	knife possibly	petrified wood	2.3	G2	6.82	13.34	27.81		
5LR.29	2	34	Worked Flake	quartzite	5.2	G2	8.96	20.31	30.57		
5LR.29	2	35	Side Scraper	quartzite	19.1	G1	8.21	42.47	49.53	good representation of side scraper	
5LR.29	2	36	Side Scraper	chalcedony	9.7	G2	12.47	23.93	40.23	possible one notch; Lohr: notched scraper	
5LR.29	2	37	Side Scraper	quartzite	7.5	G2	10.42	29.04	26.95	one notch; Lohr: Notched scraper	
5LR.29	2	38	Biface chip	quartzite	1	G3	5.34	14.8	12.08		
5LR.29	2	39	Biface chip	chalcedony	0.6	G3	3.75	15.15	11.44		

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.29	2	40	Utilized chip	chalcedony	0.3	G3	2.28	12.81	13.48		
5LR.29	2	41	Utilized chip	chalcedony	1.1	G2	3.85	16.71	17.8		
5LR.29	2	43	Utilized core	quartzite	40.6	G1	21.09	40.05	53.89		used on one edge; Lohr: "Rougly flaked quartzite tool-may be only core, although some appear to have been fashioned deliberately."
5LR.29	2	44	core	quartzite	159.9	G1	33.98	61.7	65.41	used on one edge	
5LR.29	2	45	utilized core	quartzite	112.4	G1	35.25	53.27	65.09	utilized and worked; possible side scraper	
5LR.29	2	46	core	quartzite	57.4	G1	25.45	59.2	43.69		
5LR.29	2	47	utilized core	quartzite	19.6	G1	14.52	42.55	34.29		
5LR.29	2	48	utilized core	quartzite	23.8	G1	17	30.93	49.34	utilized and worked	
5LR.29	2	49	End Scraper	quartzite	25.5	G1	16.73	41.1	43.25	used as end scraper	
5LR.30	3	6	Biface base	chert	0.7	G2	3.49	19.21	8.57	small notch in center	
5LR.30	3	7	Biface chip	quartzite	0.8	G2	3.61	15.28	18.21		
5LR.30	3	3	drill	quartzite	6.7	G1	9.48	27.12	32.59		
5LR.30	3	1	Knife	chert	138.5	G1	11.44	80.48	789.81		
5LR.30	3	2	Knife	chert	20.8	G1	7.83	41.44	61.72		
5LR.30	3	5	Knife tip	chert	6.9	G1	8.46	33.87	25.59		
5LR.30	3	9	utilized flake	chalcedony	1.7	G2	4.89	26.1	15.67		
5LR.30	3	13	utilized flake	obsidian	1	G2	4.62	15.76	13.95		

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.30	3	4	Worked Flake	chert	0.8	G3	4.18	15.36	14.85		
5LR.30	3	10	Worked Flake	chalcedony	2.2	G2	6.64	16.63	23.99		
5LR.30	3	11	worked flake	chalcedony	0.6	G2	3.38	18.14	11.63		
5LR.31	4	22	tang knife	chalcedony	0.3	G3	2.5			side notched, with notch in base but not in center- unique. Square base	missing very tip and one side of base and one shoulder/side notch. This side was resharpened and used as a cutting edge.
5LR.31	4	25	Possible Knife	quartzite	2.3	G2	5.6			one side notch, possible convex base. Very rounded shape. Possibly reused as knife.	missing tip and one edge with shoulder and notch as well as portion of base.
5LR.31	4	33	Tang knife	jasper	2.2	G2	4.4			like No. 22 with two adjacent notches.	missing very tip and base. One side was resharpened and reused, possibly as knife.
5LR.31	4	35	Biface Frag	quartzite	2.7	G2	6.5			uncertain if point frag. Rounded shape	missing top portion and base. Neck is possibly present. One definite notch
5LR.31	4	36	Worked chip	chalcedony	1.2	G2	6.2	12.1	19.8		
5LR.31	4	38	worked chip	chalcedony	1.4	G2	4.4	24.9	20.2		
5LR.31	4	39	Biface Frag	chalcedony	3.2	G2	8.8	15.7		uncertain if point frag. Rounded and bulky.	no definable features except for two edges. Possible shoulders present and missing tip and base.
5LR.31	4	40	worked flake	jasper	1.1	G2	3.8	21.9	13.6		

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.31	4	41	utilized chip	chalcedony	1	G2	4.2	19.7	13.5		
5LR.31	4	43	worked chip	quartzite	1.1	G2	4.5	17.9	14.1		
5LR.31	4	44	perforator	chert	0.3	G3	2.7	12.6	10.3		
5LR.31	4	45	utilized chip	chalcedony	0.6	G3	3	13.1	16.6		
5LR.31	4	46	knife	chalcedony	11.5	G1	5.9			large, basal notch with convex base; Lohr: Lance point?	
5LR.31	4	47	End Scraper	quartzite	16	G1	12.4	33.2	38.9		
5LR.31	4	48	End Scraper	jasper	3	G2	6.4	21	21.4		
5LR.31	4	49	Side Scraper	chalcedony	5.3	G2	9.5	32.4	20.5		
5LR.31	4	50	End Scraper	jasper	1.4	G3	5.4	14	16.4	notched	
5LR.31	4	51	Side Scraper	quartzite	38.9	G1	8.6	55.4	78	asymmetrical	missing proximal end
5LR.31	4	52	Side Scraper	quartzite	39	G1	16.4	32.1	73.5	produced from primary flake	
5LR.31	4	53	Side Scraper	jasper	43.5	G1	12.5	53.8	61		
5LR.31	4	54	utilized flake	quartzite	1.6	G2	4.1	16.3	22.1		
5LR.31	4	55	utilized flake	chalcedony	3.4	G2	6.6	19.3	27.4		
5LR.31	4	56	worked flake	chalcedony	1.6	G2	2.2	26.3	24.1		
5LR.31	4	57	worked flake	chalcedony	3.9	G2	7.4	18.3	27.9		
5LR.31	4	58	Side Scraper	jasper	4.5	G2	7.6	23.9	22.6		

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.31	4	59	worked flake	chalcedony	1.5	G2	3.9	23.9	18.7		
5LR.31	4	60	worked flake	jasper	0.7	G2	2.6	10.8	18.1		
5LR.31	4	61	end scraper	jasper	2.6	G2	6.9	20.5	18.8		missing proximal end
5LR.31	4	62	worked flake	petrified wood	2.1	G2	4.5	17	27.2		
5LR.31	4	63	worked flake	chalcedony	2.9	G2	5.5	20.5	25.7		
5LR.31	4	64	utilized flake	chalcedony	3.1	G2	7.8	27.2	16.3	notched	
5LR.31	4	65	worked flake	chalcedony	1.2	G2	4	20.1	14.8		
5LR.31	4	66	Side Scraper	jasper	1.9	G2	4.6	20.6	16.3		
5LR.31	4	67	worked flake	chalcedony	1.8	G2	8.2	11	27.9		
5LR.31	4	68	worked flake	jasper	2.7	G2	5.7	17.7	23.5		
5LR.31	4	69	perforator	quartz	2.9	G2	6.6	22	21.5		
5LR.31	4	70	worked flake	chalcedony	2.2	G2	6.9	18.8	25.5		
5LR.31	4	71	worked flake	petrified wood	3.5	G2	5.5	19.6	25.5		
5LR.31	4	72	utilized flake	chalcedony	4.1	G2	6	18	31.4		
5LR.31	4	N/A	Bone	Tooth/ enamel	52.2	G1	22.8	34	73.1	bison or elk	
5LR.31	4	N/A	Ground stone (4)							Not Analyzed, Missing from Collection	
5LR.40	13	1	Worked Flake	quartzite	12.5	G1	14.3	29.54	34.02		
5LR.40	13	2	Side Scraper	quartzite	9.3	G1	10.88	21.71	44.58		

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.40	13	3	Worked Flake	quartzite	6.8	G2	9.13	27.08	26.66		
5LR.40	13	4	Side Scraper	quartzite	17.6	G1	13.34	30.62	47.06	possibly burnt	
5LR.40	13	5	utilized core	quartzite	39.5	G1	23.38	35.72	55.2	cortex present	
5LR.40	13	6	Side Scraper	quartzite	5.8	G1	8.98	19.23	38.05	with notch	
5LR.40	13	7	Worked chip	petrified wood	0.8	G3	4.82	10.57	13.49		
5LR.40	13	8	utilized chip	petrified wood	0.6	G3	1.99	12.9	17.41		
5LR.40	13	9	worked chip	chalcedony	0.3	G3	2.85	8.99	16.03	Lohr: "utilized chip"	
5LR.40	13	10	worked chip	chalcedony	0.2	G3	3.08	13.35	7.42	bifacially worked	
5LR.40	13	11	utilized chip	chalcedony	2.1	G2	8.42	15.87	19.7	spalling	
5LR.40	13	13	Side Scraper	quartzite	13	G1	8.54	24.99	56.54		
5LR.40	13	14	utilized flake	quartzite	6.3	G1	9.01	42.43	18.7		
5LR.40	13	15	Side Scraper	quartzite	12	G1	9.36	28.42	47.23	possibly burnt	
5LR.48	21	2	worked flake	quartzite	11.3	G1	12.2	23.2	42.4		
5LR.48	21	3	utilized flake	quartzite	8.6	G1	9.9	23	37.6		
5LR.48	21	4	worked flake	quartzite	21.2	G1	18.7	30.1	44.2		
5LR.48	21	5	worked flake	quartzite	7.7	G2	8.5	29.9	30.8		
5LR.48	21	6	worked flake	quartzite	5.8	G2	10.8	24.1	37		

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.48	21	7	utilized flake	quartzite	3	G2	6.8	20.5	22.7		
5LR.48	21	8	worked flake	chert	10.6	G1	8.6	33.4	29		
5LR.48	21	9	utilized flake	quartzite	7.3	G1	7.4	32.5	28.7		
5LR.48	21	10	utilized flake	jasper	2	G2	5.1	18.6	20		
5LR.48	21	11	utilized flake	quartzite	13.7	G1	13.1	23.7	39.4		
5LR.48	21	12	utilized flake	quartzite	13	G1	10.7	36.8	30.1		
5LR.48	21	13	worked flake	quartzite	1.2	G2	4	18.2	19.4	Lohr: utilized flake. However, edges worked and one notch	
5LR.48	21	14	utilized flake	quartzite	9.5	G1	10.2	31	30.7		
5LR.48	21	15	worked flake	chalcedony	9.8	G1	10.3	28.8	36		
5LR.48	21	16	utilized flake	quartzite	17.5	G1	15.3	33.8	38		
5LR.48	21	17	worked flake	quartzite	9.7	G1	8.4	33.3	41.7		
5LR.48	21	18	utilized flake	chert	1.3	G2	3.8	19.8	17.4		
5LR.48	21	19	worked flake	quartzite	1.6	G2	4.6	18.8	14.4		
5LR.48	21	20	worked flake	chalcedony	0.5	G3	3.6	14.1	8		
5LR.48	21	21	worked flake	quartzite	1	G2	3.8	14.3	16.1	one notch	
5LR.48	21	26	side scraper	chalcedony	7.2	G1	8.9	27.2	38.2		
5LR.48	21	28	end scraper	quartzite	10.1	G1	10.7	30.8	38.8		

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.48	21	29	End Scraper	quartzite	2.2	G2	3.8	25.5	23.1		
5LR.48	21	30	side scraper	quartzite	3.5	G2	5.8	25	23.8	Lohr: side scraper, blade	
5LR.48	21	31	side scraper	quartzite	3.4	G2	5.6	22	28	Lohr: side scraper, worked flake	
5LR.48	21	32	worked flake	quartzite	2.1	G2	3.4	27.5	28.8	Lohr: utilized flake, also used as perforator	
5LR.48	21	33	worked flake	quartzite	5.3	G1	7.4	23.3	42.8	one notch	
5LR.48	21	34	Orna-ment frag	jasper	0.9	G2	2.2	15.1	19.9	fine grinding along both edges, curvature to fragment.	
5LR.48	21	35	utilized flake	quartzite	8.5	G1	8.6	37.6	31.6		
5LR.48	21	36	Biface/ blade tip	quartzite	8.1	G1	8.9	34.4	27.2		
5LR.48	21	44	biface edge	chalcedony	1.1	G2	3.2			stemless	distal and part of midsection present
5LR.48	21	45	utilized flake	quartzite	6.9	G1	7.1	29.6	41.3	Lohr: utilized flake, also used as perforator	
5LR.48	21	47	worked flake	jasper	3.3	G2	4.1	20.4	28.6		
5LR.48	21	48	worked flake	chalcedony	10.2	G1	10	27.4	40.9	Lohr: utilized flake?	
5LR.48	21	50	worked flake	chalcedony	2.8	G2	5.1	21.6	20.7		
5LR.48	21	51	Biface/ blade frag	quartzite	3.7	G2	6.5	24.6	22.4	Lohr: blade frag or side scraper. However, serration present	

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.48	21	52	worked flake	quartzite	2.8	G2	9.8	18.2	20		
5LR.48	21	53	utilized flake	chalcedony	2.8	G2	6.2	19.2	32.9		
5LR.48	21	54	utilized flake	quartzite	6.9	G1	8.2	22	40.4		
5LR.48	21	55	utilized flake	chalcedony	1.5	G2	4.4	18.7	27.9		
5LR.48	21	56	mano frag	schist	74.8	G1	34.1	35.4	67.7	smoothed on both sides	
5LR.48	21	Unknown	knife mid-section	quartzite	10.2	G1	12	34.6	22.9		
5LR.48	21	Unknown	utilized flake	quartzite	0.6	G2	2	19.4	13.4		
5LR.48	21	Unknown	utilized flake	quartzite	1	G2	3.7	21	16.3		
5LR.48	21	Unknown	utilized flake	quartzite	0.8	G2	3	16.3	19.5		
5LR.48	21	Unknown	worked flake	quartzite	1.8	G2	4.3	18.8	26.1		
5LR.49	22	25	knife	quartzite	5.3	G1	7.2			Mt Albion, side-notched knife, concave base	missing very tip, one slightly broken basal ear
5LR.49	22	60	Biface/ blade frag	chalcedony	3.7	G2	7.7	16.9	26.3		
5LR.49	22	78	Biface/ blade distal end	quartzite	4	G2	8.1				missing proximal end and very tip
5LR.49	22	81	Biface/ blade frag	quartzite	2.9	G2	5.9				missing base, one side, and very tip

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.49	22	86	knife base	quartzite	1.7	G2	5.2	18.3	17.2		
5LR.49	22	87	Biface/ blade mid-section	quartzite	1.8	G2	5.7				missing proximal and distal ends
5LR.49	22	96	worked flake	quartzite	1.9	G2	5	22.4	17.6		
5LR.49	22	100	Biface/ blade tip	quartzite	4.1	G2	7.5	26.6	25.4		
5LR.49	22	105	Biface/ blade frag	quartzite	2	G2	5	21.2	15.5		
5LR.49	22	116	drill frag	chert	0.8	G3	3.6	13.5	13.4	Lohr: Yuma point	
5LR.49	22	119	End Scraper	quartz	57.8	G1	17.5	44.8	59.8		
5LR.49	22	120	End Scraper	jasper	120	G1	5.7	22.6	37.5		
5LR.49	22	121	worked flake	quartzite	19.9	G1	12.5	30.7	39.2	possible end scrapper	
5LR.49	22	122	End Scraper	jasper	2.3	G2	5.7	18.1	15.7		
5LR.49	22	123	End Scraper	jasper	22.2	G1	12.9	36.8	43.5	cortex present	
5LR.49	22	124	End Scraper	chalcedony	2	G2	4.4	18.8	23.8		
5LR.49	22	125	Utilized Chip	petrified wood	2.3	G2	9.5	18.5	17.8		
5LR.49	22	126	End Scraper	chalcedony	15.1	G1	11.3	30.6	38.8		
5LR.49	22	127	Side Scraper	chalcedony	18.4	G1	8.7	37.8	56.2	Multi-functional perforator	
5LR.49	22	128	Core	quartzite	36.3	G1	20.6	37.4	47.5	Lohr: flaked blank amorphous disc	
5LR.49	22	129	side scraper	quartzite	18.3	G1	11.6	38	31.3		
5LR.49	22	130	utilized flake	unknown	3.8	G2	8.6	19.4	34.9	has one used edge Lohr: worked flake	

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.49	22	131	utilized flake	quartzite	4.5	G2	8.6	20	29.5	one used edge	
5LR.49	22	132	worked flake	quartzite	5.4	G2	8	29.7	24.1	one worked edge	
5LR.49	22	133	worked flake	Jasper	1.4	G2	4.8	17.2	20.9		
5LR.49	22	134	utilized flake	quartzite	13.4	G1	15	29.2	34.6		
5LR.49	22	135	worked flake	chalcedony	2.2	G2	6.3	18.2	24.2	cortex present	
5LR.49	22	136	worked flake	quartzite	12.4	G1	16	33.9	27		
5LR.49	22	137	worked flake	Jasper	3.7	G2	10	18.5	24.2		
5LR.49	22	138	worked flake	quartzite	2.9	G2	5.8	18.3	26.7		
5LR.49	22	139	worked flake	quartzite	10.5	G1	12.7	27.8	41.3		
5LR.49	22	140	utiized flake	quartzite	5.1	G2	17.7	17.8	33.5	one notch	
5LR.49	22	141	knife	quartzite	7.2	G1	9.4	20.2	42.1		
5LR.49	22	142	worked flake	quartzite	12.7	G1	12	24.3	38.9		
5LR.49	22	143	side scraper/ knife	quartzite	17.2	G1	9.8	34	46.2	Multi-functional	
5LR.49	22	144	utilized flake	quartzite	1.2	G2	4	16.9	17.2		
5LR.49	22	145	knife	quartzite	7.7	G1	8.4	23.5	32.1		knife midsection
5LR.49	22	147	utilized flake	quartzite	3	G2	6.1	23.3	21.9		
5LR.49	22	148	worked flake	chalcedony	1.9	G2	4.6	20.5	18	cortex present	
5LR.49	22	149	worked flake	chalcedony	1.2	G2	5.6	14.6	17.2		

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.49	22	150	utilized chip	chalcedony	1	G3	4.8	14.2	11.3	cortex present	
5LR.49	22	151	utilized chip	quartzite	1.1	G2	3	15.2	19		
5LR.49	22	152	utilized chip	Jasper	1	G3	7.1	15.4	13.1		
5LR.49	22	154	utilized chip	quartzite	1.8	G2	5.2	17.2	19.6		
5LR.49	22	155	utilized chip	quartzite	2.4	G2	7	13.2	26.5		
5LR.49	22	156	utilized chip	chalcedony	0.7	G2	3	16.5	17.2		
5LR.49	22	159	Ochre	hematite	11.9	G1	7.4	43.4	21.3	Lohr: Paint Stone	
5LR.49	22	Un kno wn	utilized chip	quartzite	0.4	G3	2.7	13.8	11.6		
5LR.49	22	Un kno wn	utilized chip	chalcedony	0.6	G2	4	13.1	20.4	cortex present	
5LR.49	22	Un kno wn	worked chip	quartzite	1.8	G2	5.5	17.5	14		
5LR.50	23	1	knife tip	quartzite	1.6	G2	3.7	24	17.93	Lohr: Knife or side scraper. However, bifacially worked, thinned, and shaped (knife)	
5LR.50	23	6	worked flake	quartzite	7.3	G2	9.5	29.8	23.26		
5LR.50	23	7	worked flake	quartzite	3.7	G2	8.37	23.74	15.78		
5LR.50	23	8	End Scraper	jasper	1.8	G2	8.18	12.57	16.43		fragment
5LR.50	23	9	Perfo-rator	quartzite	6.6	G2	10.11	29.48	26.71	Lohr: utilized flake. However,	

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
										two notched made leading to perforator, rest missing. Dark stain on surface	
5LR.50	23	10	worked flake	chert	2.2	G2	6.58	16.17	23.9		
5LR.50	23	11	worked flake	chert	3	G2	8.88	25.19	24.85	cortex present	
5LR.50	23	12	utilized flake	quartzite	18	G1	20.89	21.01	49.6		
5LR.50	23	13	worked chip	quartzite	0.9	G2	3.1	15.44	13.01		
5LR.50	23	14	utilized flake	jasper	3	G2	6.9	25.85	17.89		
5LR.50	23	15	worked chip	jasper	1.8	G2	4.8	18.03	21.14	notch near bulb	
5LR.50	23	16	Side Scraper	quartzite	28.1	G1	12.26	33.17	69.35		
5LR.50	23	18	worked chip	quartzite	0.7	G3	3.65	13.95	13		
5LR.50	23	19	worked chip	quartzite	0.5	G3	2.98	12.06	11.59		
5LR.50	23	20	End Scraper	jasper	18	G1	10.66	23.16	44.49		
5LR.52	25	3	End Scraper	chalcedony	18.7	G1	16	31.2	41.2		
5LR.52	25	4	Worked Flake	chert	18.3	G1	13.58	34.83	41.14		
5LR.52	25	5	Worked Flake	chalcedony	3.6	G2	8.78	26.83	27.54		
5LR.52	25	6	Worked Flake	chert	3.3	G2	5.16	22.01	26.77		
5LR.52	25	7	Side Scraper	chalcedony	14.6	G1	9.58	27.95	43.56		

Site No.	Lohr Site No.	FS	Artifact Class	Material Type	Weight (gm)	Size grade	Greatest Thickness (GT) (mm)	Max Width (Tools)	Max Length (Tools)	Description	Artifact Portion
5LR.52	25	8	Worked Flake	quartzite	12.5	G1	10.14	33.31	41.24		
5LR.52	25	9	Utilized chip	chalcedony	3.2	G2	7.79	21.55	19.28		

Sprenger Valley Artifact Inventory

The Sprenger Valley artifact collection is primarily a private collection, with macrobotanical samples, faunal remains, and historic artifacts curated at the Center for Mountain and Plains Archaeology. Material type, weight (gm), size grade, and greatest thickness (mm) are provided below for most artifacts based on prior site records and current analysis. Descriptions are based on 1988 artifact catalogue and includes current analysis information. Due to project constraints, lithic analysis did not occur for all lithic flakes. Most ground stone was left in the field during the 1988 CSU Sprenger Valley field school, and therefore weight, size and material type are incomplete for the ground stone collection. Due to artifact collection accessibility limitations, some projectile points, lithic tools and ceramics do not have a corresponding size grade or weight.

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1148	CO:D:12: 1.1	1	Retouched Flake	Unknown	-	-	-	-	-	Missing from collection. Bifacial, black flake. Not analyzed	**1**
5LR1148	CO:D:12: 1.2	2	Hammerstone	quartzite	-	-	56.5	78.5	40	broken river cobble	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1149	CO:D:12: 2.1A	1	Flake	Chalcedony	0.7g	G3	13.6	16.8	3.8	Bifacial Flake	1
5LR1149	CO:D:12: 2.2	2	Groundstone	Sandstone	-	-	72	70	41	Mano fragment. Most smoothing on one flattened surface.	1
5LR1149	CO:D:12: 2.3	3	Groundstone	Sandstone	-	-	104	130	28	Metate fragment	1
5LR1149	CO:D:12: 2.1B	5	Flake	Chert	2.9g	G2	17.6	21.6	9.5	Bifacial Flake	1
5LR1149	CO:D:12: 2.1C	6	Flake	Quartzite	0.7g	G3	12.0	13.8	3.8		1
5LR1149	CO:D:12: 2.4	7	Groundstone	Quartzite	-	-	-	-	-	Mano fragment. Not analyzed	1
5LR1149	CO:D:12: 2.5	8	Glass	n/a	2.3g	-	16.2	26.3	9.2	Historic glass	1
5LR1150	CO:D:12: 3.1	1	Groundstone	Schist	-	-	61	74.5	31.9	Mano fragment	1
5LR1150	CO:D:12: 3.2	2	Groundstone	Sandstone	-	-	A 80, B 95.8	A 108.2, B 109	A 25, B 21	metate fragment. The larger of the fragments is fire blackened on the numbered side. This fragment is bifacially ground.	1
5LR1150	CO:D:12: 3.4	4	Scraper	Quartzite	13.8g	G1	34.3	46.3	9.3		1
5LR1150	CO:D:12: 3.5	5	Scraper	chert	-	-	13	27	9	fragment	1
5LR1150	CO:D:12: 3.6	6	Groundstone	schist	-	-	55	102	40.2	Mano fragment	1
5LR1150	CO:D:12: 3.7	7	Scraper	Chalcedony	-	-	11	32	8	Fragment. Worked on one side	1
5LR1150	CO:D:12: 3.8	8	Groundstone	Sandstone	-	-	75	115	43	mano	1
5LR1150	CO:D:12: 3.9	9	Groundstone	Sandstone	-	-	45	69	17	worked on one side, fire blackened	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1150	CO:D:12: 3.10	10	Groundstone	Sandstone	-	-	44	80	18		1
5LR1150	CO:D:12: 3.12	12	Scraper	Chalcedony	3.0g	G2	18.8	27.0	6.7		1
5LR1150	CO:D:12: 3.13	13	Scraper	Chert	2.8g	G2	17.9	26.6	5.8	Unifacial	1
5LR1150	CO:D:12: 3.14	14	ceramic	n/a	-	-	32	51	9		1
5LR1150	CO:D:12: 3.15	16	Groundstone	Sandstone	-	-	59	76	43	mano	1
5LR1150	CO:D:12: 3.16	17	Scraper	Chert	1.4g	G3	15.9	18.7	4.9	Piece of scraper	1
5LR1150	CO:D:12: 3.17	18	Scraper	Chert	1.7g	G3	14.6	21.4	5.3	Piece of scraper	1
5LR1150	CO:D:12: 3.18	19	Scraper	Jasper	26.8g	G1	35.1	50.3	17.8		1
5LR1150	CO:D:12: 3.19	20	utilized flake	Chalcedony	-	-	15	20	2.2		1
5LR1150	CO:D:12: 3.20	21	ceramic	n/a	-	-	22	27	8		1
5LR1150	CO:D:12: 3.21	22	Scraper	Quartzite	7.2g	G2	23.1	37.9	8.7		1
5LR1150	CO:D:12: 3.22	23	Scraper	Chalcedony	1.5g	G2	18.2	18.6	4.2	End scraper	1
5LR1150	CO:D:12: 3.23	24	Scraper	Chert/ Jasper	10.2g	G1	29.6	33.7	10.9	End scraper	1
5LR1150	CO:D:12: 3.24	25	Ground Stone	-	-	-	-	-	-	collected metate fragment. Not analyzed	1
5LR1150	CO:D:12: 3.25	26	Ground Stone	-	-	-	-	-	-	collected metate fragment. Not analyzed	1
5LR1150	CO:D:12: 3.26	27	Ground Stone	-	-	-	-	-	-	collected metate fragment. Not analyzed	1
5LR1150	CO:D:12: 3.27	28	Ground Stone	-	-	-	-	-	-	collected metate fragment. Not analyzed	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1150	CO:D:12: 3.28	29	Biface	Quartzite	6.4g	G1	20.4	35.2	7.8	Fragment	1
5LR1150	CO:D:12: 3.29	30	Groundstone	Sandstone	-	-	40	101	34	mano	1
5LR1150	CO:D:12: 3.30	31	Groundstone	Sandstone	-	-	79	156	29	mano	1
5LR1150	CO:D:12: 3.31	32	flake	-	-	-	-	-	-	collected. South transect. Not analyzed	1
5LR1150	CO:D:12: 3.33	33	flake	-	-	-	-	-	-	Collected. Not analyzed	1
5LR1150	CO:D:12: 3.32	33	flakes	-	-	-	-	-	-	collected. Not in original inventory 1988 but in Aten's collection. Not analyzed	2
5LR1150	CO:D:12: 3.32	33	scraper	-	-	-	-	-	-	collected. Not in original 1988 inventory but in Aten's collection.	1
5LR1150	CO:D:12: 3.32	33	Scraper	Quartzite	10.7g	G1	28.6	40.4	10.8	Originally bagged with two flakes	1
5LR1150	CO:D:12: 3.34	35	flake	-	-	-	-	-	-	Collected. Not analyzed	1
5LR1150	CO:D:12: 3.35	36	core	Chalcedony	-	-	34 c	38	19.4	fragment	1
5LR1150	CO:D:13: 3.37	37	Scraper	Quartzite	37.6g	G1	32.5	43.5	18.9		1
5LR1150	CO:D:12: 3.36	37	Utilized Flake	-	-	-	-	-	-	collected. SW bulldozer pile. Not analyzed	1
5LR1150	CO:D:12: 3.37	38	Scraper	Quartzite	-	-	30	42	18	fragment	1
5LR1150	CO:D:12: 3.38	39	Cores	-	-	-	-	-	-	collected. SW bulldozer pile. Not analyzed	3
5LR1150	CO:D:12: 3.39	40	flakes	-	-	-	-	-	-	collected. SE bulldozer pile. General Flake Collection. Not analyzed	8
5LR1150	CO:D:12: 3.40	41	flakes	-	-	-	-	-	-	collected. General Flake Collection. Not analyzed	18

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1150	CO:D:12: 3.50	42	Biface	Chalcedony	1.6g	G2	13.7	22.5	6.2	discovered as an artifact during the cataloging of general flake collection FS 42, in which it was a part of.	1
5LR1150	CO:D:12: 3.41	42	flakes	-	-	-	-	-	-	collected. General Flake Collection. Not analyzed	56
5LR1150	CO:D:12: 3.42	43	ceramics	n/a	-	-	-	-	-	3 pieces discarded before cataloging. General pottery collection.	10
5LR1150	CO:D:12: 3.42	43	ceramics	n/a	-	-	15-39	10-43.5	3-8	3 pieces discarded before cataloging. Cord marked pottery with mica temper	3
5LR1150	CO:D:12: 3.43	44	flakes	-	-	-	-	-	-	collected. General Flake Collection	74
5LR1150	CO:D:12: 3.43	44	Bone	n/a	-	-	-	-	-	Not analyzed	1
5LR1150	CO:D:12: 3.46	47	ceramic	n/a	-	-	15	23	7	cord marked	1
5LR1150	CO:D:12: 3.51	49	Biface	Chalcedony	1.7g	G2	17.2	21.0	4.4		1
5LR1150	CO:D:12: 3.52	50	Biface	Quartzite	2.7g	G2	18.8	23.7	6.2		1
5LR1150	CO:D:12: 3.58	53	Knife	Quartzite	-	-	43	108	10	looks like a biface knife	1
5LR1150	CO:D:12: 3.56	56	flakes	-	-	-	-	-	-	collected. SW bulldozer pile. General Flake Collection	18
5LR1150	CO:D:12: 3.54	57	flakes	-	-	-	-	-	-	collected. SE bulldozer pile. General Flake Collection	51
5LR1150	CO:D:12: 3.54	57	Bone	n/a	-	-	-	-	-	Not analyzed	1
5LR1150	CO:D:12: 3.55	57	Scraper	Chalcedony	5.3g	G2	24.2	28.4	7.9		1
5LR1150	CO:D:12: 3.61	58	ceramic	n/a	-	-	21	38	8	form says "5LR1159" incorrectly. Cord-marked	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1150	CO:D:12: 3.61	58	Ceramic	n/a	-	-	-	-	-	SW Bulldozer Pile	1
5LR1150	CO:D:12: 3.62	59	ceramic	n/a	-	-	27	27	8	burned, cord marked	1
5LR1150	CO:D:12: 3.62	59	Ceramic	n/a	-	-	-	-	-	E Bulldozer Pile	1
5LR1150	CO:D:12: 3.63	60	Biface	Unknown	0.9g	G2	15.1	20.7	3.8		1
5LR1151	CO:D:12: 4.2	1	Core	Quartzite	-	-	35	50	25		1
5LR1151	CO:D:12: 4.1	1	Flakes	Fine Grain Quartzite	-	-	-	-	-	Not Analyzed	40
5LR1151	CO:D:12: 4.3	2	Flakes	Fine Grain Quartzite	-	-	-	-	-	Not Analyzed	12
5LR1151	CO:D:12: 4.4	3	Flakes	Quartzite	-	-	-	-	-	Not Analyzed	27
5LR1151	CO:D:12: 4.6	4	Biface	Quartzite	7.9g	G1	24.4	33.3	8.4		1
5LR1151	CO:D:12: 4.5	4	Flakes	Fine Grain Quartzite	-	-	-	-	-	"Quartz Flake Discarded KJW 9/27/1988"; Not sure how many are left.	21
5LR1151	CO:D:12: 4.7	5	Flakes	Quatzite	-	-	-	-	-	Not Analyzed	35
5LR1151	CO:D:12: 4.8	6	Flakes	Quatzite	-	-	-	-	-	Not Analyzed	51
5LR1151	CO:D:12: 4.9	7	Flake	Fine Grain Quartzite	-	-	-	-	-	Not Analyzed	1
5LR1151	CO:D:12: 4.10	8	Flake	Quatzite	-	-	-	-	-	Not Analyzed	1
5LR1151	CO:D:12: 4.11	9	Flake	Quatzite	-	-	-	-	-	Not Analyzed	1
5LR1151	CO:D:12: 4.12	10	Core	Quartzite	-	-	66	80	45		1
5LR1151	CO:D:12: 4.13	11	Flakes	-	-	-	-	-	-	N transit. Not analyzed	9

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1151	CO:D:12: 4.14	12	Flakes	-	-	-	-	-	-	S transit. Not analyzed	5
5LR1152	CO:D:12. 5.1	1	Groundstone	sandstone	-	-	107	135	29	Metate frag. Found in association with CO:D:12:5.2. Smoothing confined to one face. Not collected	1
5LR1152	CO:D:12. 5.2	1-B	Groundstone	sandstone	-	-	116	147	38	metate frag. Found in association with CO:D:12:5.1. Not collected	1
5LR1152	CO:D:12. 5.3	2	Groundstone	Schist	-	-	69	97	28	mano. Shows great deal of smoothing through much use. Not collected	1
5LR1152	CO:D:12. 5.4	3	core	quartzite	-	-	44	44	6-20		1
5LR1152	COD:12:5 .5	4	Flake	-	-	-	-	-	-	Collected. Not analyzed	1
5LR1152	COD:12:5 .6	5	Flake	-	-	-	-	-	-	Collected. Not analyzed	1
5LR1153	CO:D:12: 6.1	1	Flakes	-	-	-	-	-	-	From South Transect. Not analyzed	4
5LR1153	CO:D:12: 6.2	2	Flakes	-	-	-	-	-	-	From North Transect. Not analyzed	2
5LR1154	CO:D:12: 7:1	1	Glass	Molded glass	-	-	42	44	7	Collected.	1
5LR1154	CO:D:12: 7.2	2	Tin Can Lid	tin	-	-	-	-	-	Not Collected or missing. Rusted can lid.	1
5LR1154	CO:D:12: 7:3	3	Bottle	Molded glass	-	-	85	162	36	whiskey bottle. Has "BEAM" written clearly across the top of bottle. Not Collected or Missing	1
5LR1154	CO:D:12: 7:4	4	Cookware	ceramic	-	-	16	24	10 cm	crockery sherd; collected.	1
5LR1154	CO:D:12: 7:5	5	jug	Molded glass	-	-	A-98 B-63 C-122	A-158 B-96	A-10 B-10 C-112	A-large bottom frag. B-small bottom frag. C-neck	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
								cm, C-139		frag. Glass jug fragments. Not Collected or Missing	
5LR1154	CO:D:12: 7:6	6	ground stone	sandstone	-	-	99	149	34	metate frag. Not Collected or missing	1
5LR1155	CO:D:12: 8.3	3	Groundstone	Sandstone	-	-	120	135	28	metate frag. smoothing on both sides.	1
5LR1155	CO:D:12: 8.4	4	Groundstone	Sandstone	-	-	125	225	min 29-max 44	metate frag. Some smoothing on both surfaces. One side pecked.	1
5LR1155		5	Groundstone	-	-	-	-	-		Metate. Not Collected; Located on East Slope	1
5LR1155	CO:D:12: 8.5	6	Groundstone	Sandstone	183.4g	-	-	-		Metate fragment. Smoothing on one side	1
5LR1155	CO:D:12: 8.6	7	Core	Quartzite	16.9g	G1	27.1	35.2	16.6		1
5LR1155	CO:D:12: 8.8	9	Scraper	Quartzite	2.0g	G2	19.4	29.2	3.4		1
5LR1155	CO:D:12: 8.10	11	Scraper	quartzite	-	-	21	43	8		1
5LR1155	CO:D:12: 8.11	12	knife	quartzite	-	-	6-23	33	4	basal portion and one side broken off. Pressure flaked.	1
5LR1155	CO:D:12: 8.22	13	Flake	Quartzite	1.3g	G2	-	-	-		1
5LR1155	CO:D:12: 8.13	14	Biface	Chalcedony	0.7g	G3	11.1	16.8	4.2	Flaked tip	1
5LR1155	CO:D:12: 8.55	17	Mano	Sandstone	-	-	102	81	53		1
5LR1155	CO:D:12: 8.16	18	Scraper	Chert	2.7g	G2	14.1	26.9	5.6	2 margins broken.	1
5LR1155	CO:D:12: 8.21	22	Groundstone	Sandstone	-	-	-	-	-	Metate fragment. Smoothing on one side	1
5LR1155	CO:D:12: 8.24	25	Flake	Quartzite	0.3g	G3	-	-	-		1
5LR1155	CO:D:12: 8.25	26	Flakes	quartzite, chert	1.4g	G3	-	-	-		5

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1155	CO:D:12: 8.26	27	Flake	Quartzite	0.5g	G3	-	-	-		1
5LR1155	CO:D:12: 8.27	28	Flake	Quartzite	0.3g	G3	-	-	-		1
5LR1155	CO:D:12: 8.28	29	Flake	Quartzite	0.2g	G3	-	-	-		1
5LR1155	CO:D:12: 8.29	30	Flake	Quartzite	0.3g	G3	-	-	-		1
5LR1155	CO:D:12: 8.39	30	retouched flake	Quartzite	1.3g	G3	14.4	18.8	4.4		1
5LR1155	CO:D:12: 8.30	31	Flake	Quartzite	0.7G	G3	-	-	-		1
5LR1155	CO:D:12: 8.31	32	Flake	Quartzite	0.5g	G3	-	-	-		1
5LR1155	CO:D:12: 8.32	33	Core	Quartzite	16.0g	G1	27.4	34.2	15.5		1
5LR1155	CO:D:12: 8.37	38	Flake	Chalcedony	0.2g	G3	-	-	-		1
5LR1155	CO:D:12: 8.38	39	Groundstone	sandstone	-	-	95, 70	100, 105	28, 28	metate frags. two pieces that join. Smoothing on one side only.	1
5LR1155		42	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 4	1
5LR1155		43	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 4	1
5LR1155		44	Scraper	schist	-	-	-	-	-	Not Collected; Locality 4	1
5LR1155		45	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 4	1
5LR1155	CO:D:12: 8.41	46	Scraper	Schist	111.6g	G1	41.0	111.6	19.2		1
5LR1155		48	Ground stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 4	1
5LR1155		49	River Cobble	-	-	-	-	-	-	Not Collected; Locality 4. Broken	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1155	CO:D:12: 8.43	50	Flake	Quartzite	0.2g	G3	-	-	-		1
5LR1155	CO:D:12: 8.47	54	Retouched Flake	Quartzite	2.0g	G2	-	-	-		1
5LR1155		55	Groundstone	-	-	-	-	-	-	Not Collected; Locality 5	1
5LR1155		56	Groundstone	-	-	-	-	-	-	Not Collected; Locality 5	1
5LR1155	CO:D:12: 8.48	57	core	quartzite	-	-	46 max	82	35		
5LR1155	CO:D:12: 8.54	58	Utilized Flake	Chalcedony	0.6g	G3	-	-	-		1
5LR1155		59	Groundstone	-	-	-	-	-	-	Not Collected; Locality 5	1
5LR1155		60	Groundstone	-	-	-	-	-	-	metate frag. Not Collected; Locality 4	1
5LR1155	CO:D:12: 8.49	61	core	quartzite	-	-	42	46.5	31		1
5LR1155	CO:D:12: 8.50	62	knife	basalt	-	-	45	196	28	appears to have been made from a mano, broken in two. Poss flesher.	1
5LR1155	CO:D:12: 8.51	63	Biface	shale	8.0g	G1	16.2	47.5	8.1	Midsection	1
5LR1155	CO:D:12: 8.51	63	flake	shale	0.6g	G3	9.5	14.6	4.5		1
5LR1155		65	Groundstone	-	-	-	-	-	-	metate frag. Not Collected; Locality 4	1
5LR1155		67	Groundstone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1
5LR1155		68	Groundstone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1
5LR1155		70	Groundstone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1
5LR1155		71	Groundstone	-	-	-	-	-	-	mano frag. Not Collected; Locality 5	1
5LR1155		72	Groundstone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1155		73	Groundstone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1
5LR1155		74	Groundstone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1
5LR1155		75	Groundstone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1
5LR1155	CO:D:12: 8.56	76	BIface	Chert	6.0g	G2	27.2	23.6	7.5	rough shaping	
5LR1155		77	Groundstone	-	-	-	-	-	-	Not Collected; Locality 5	2
5LR1155		78	Groundstone	-	-	-	-	-	-	Not Collected; Locality 5	1
5LR1155		79	Groundstone	-	-	-	-	-	-	Not Collected; Locality 3	1
5LR1155		81	Groundstone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1
5LR1155	CO:D:12: 8.58	82	utilized Flake	Quartz	1.2g	G3	-	-	-		1
5LR1155		83	Ground Stone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1
5LR1155		84	Ground Stone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1
5LR1155		85	Ground Stone	-	-	-	-	-	-	metate frag. Not Collected; Locality 5	1
5LR1155	CO:D:12: 8.7	86	retouched flake	Quartzite	9.2g	G1	20.9	33.5	9.8		1
5LR1155	CO:D:12: 8.59	86	Scraper	Chert	1.0g	G2	13.7	23.7	4.1		1
5LR1155		87	Ground Stone	-	-	-	-	-	-	Metate Concentration. Not Collected; Locality 5	Un know n
5LR1155	CO:D:12: 8.60	88	Flakes	Various Materials	1.3g	G3x4 G4x7	-	-	-	Flake concentration	12
5LR1155		89	Groundstone	-	-	-	-	-	-	whole metate. Not Collected; Locality 5	1
5LR1155		90	Groundstone	-	-	-	-	-	-	Not Collected; Locality 5	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1155	CO:D:12: 8.62	92	Flakes	Various Materials	-	-	-	-	-	Locality 5; missing from collection. General surface flakes	21
5LR1155	CO:D:12: 8.63	93	Biface	Quartzite	2.3g	G2	16.7	17.5	5.3	Piece of a biface. One margin intact.	1
5LR1155		100	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 5	1
5LR1155		101	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 5	1
5LR1155		102	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 5	1
5LR1155		103	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 5	1
5LR1155		104	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 5	1
5LR1155		105	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 5	1
5LR1155		106	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 5	1
5LR1155		107	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 5	1
5LR1155		108	Ground Stone	-	-	-	-	-	-	Metate frag. Not Collected; Locality 5	1
5LR1155	CO:D:12: 8.64	109	Flakes	Quartzite	4.7g	G2x1 , G3x1 , G4x1	-	-	-	General surface flakes	3
5LR1155	CO:D:12: 8.18	20-A	Groundstone	Sandstone	-	-	-	-	-	Metate fragment. Found in association with .19, smoothing confined to one face.	1
5LR1155	CO:D:12: 8.19	20-B	Groundstone	Sandstone	-	-	85	180	45	found in association with .18, smoothing confined to one face. Metate frag	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1156		2	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		3	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		4	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		5	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156	CO:D:12: 9.6	6	Flakes	Quartzite, Chert	12.9g	G2x2 G3x4	-	-	-		6
5LR1156		6	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		7	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		8	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		9	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		10	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		11	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		12	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		13	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		14	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		15	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		16	Ground Stone	-	-	-	-	-		Not Collected. Metate	1
5LR1156		17	Ground Stone	-	-	-	-	-	-	Not Collected. Mano	1
5LR1156		18	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		19	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		20	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		21	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		22	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		23	Ground Stone	-	-	-	-	-		Not Collected. Metate frag	1
5LR1156		24	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1156		25	Ground Stone	-	-	-	-	-	-	Not Collected. Ground cobble	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1156	CO:D:12: 9.2	26	retouched flake	chert	-	-	33.3	29.5	12.5		1
5LR1156	CO:D:12: 9.4	28	core	basalt	-	-	43.8	72.5	41		1
5LR1156		29	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1157	CO:D:12: 10.1	1	Flake	Quartz	0.2g	G3	-	-	-	Red-brown quartz	1
5LR1157	CO:D:12: 10.2	2	Flake	Chalcedony	1.3g	G2	-	-	-		1
5LR1157	CO:D:12: 10.3	3	Flake	Chert/Jasper	0.2g	G3	-	-	-		1
5LR1157	CO:D:12: 10.4	5	Flake	Chert	0.4g	G3	-	-	-		1
5LR1157	CO:D:12: 10.5	6	Flake	Chert	0.4g	G3	-	-	-	Purple chert	1
5LR1157		7	Bone	n/a	-	-	-	-	-	Changed to FS AN 7	2
5LR1157	CO:D:12: 10.6	8	Flake	Chert	1.3g	G2	-	-	-		1
5LR1157	CO:D:12: 10.7	9	Flake	Chalcedony	0.6g	G2	-	-	-		1
5LR1157	CO:D:12: 10.8	10	ground stone	sandstone	-	-	88.5	102	15	metate frag	1
5LR1157	CO:D:12: 10.12	11	core	agate	-	-	32.3	43	29.5		1
5LR1157	CO:D:12: 10.9	12	ground stone	sandstone	-	-	89.5	92	35.8	metate frag	1
5LR1157	CO:D:12: 10.10	13	ground stone	sandstone	-	-	30	48	18	metate frag	1
5LR1157	CO:D:12: 10.11	13	ground stone	sandstone	-	-	45	49	22.3	metate frag	1
5LR1157	CO:D:12: 10.15	14	ceramic	n/a	-	-	26.8	26	7.5	cord-marked	1
5LR1157		15	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1157		16	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1
5LR1157		17	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1
5LR1157		18	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1
5LR1157		19	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1
5LR1157		20	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1
5LR1157		21	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1
5LR1157		22	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1
5LR1157		23	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1
5LR1157		24	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1
5LR1157		25	Ground Stone	-	-	-	-	-	-	Northern Shelter. Not collected or missing	1
5LR1157	CO:D:12: 10.13	26	ground stone	sandstone	-	-	42	67.1	43	metate frag	1
5LR1157	CO:D:12: 10.14	27	Scraper	Quartzite	147.3g	G1	68.8	108.4	17.1		1
5LR1157	CO:D:12: 10.14	27	scraper	quartzite	-	-	69.2	109	17.8		1
5LR1158		1	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		2	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		3	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		4	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		5	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		6	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		7	Groundstone	-	-	-	-	-	-	Not Collected	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1158		8	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		9	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		10	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		11	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		12	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		13	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		14	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		15	Core	Shist	-	-	-	-	-	Not Collected	1
5LR1158		16	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1158		17	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		1	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		2	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		3	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		4	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		5	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		6	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		7	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		8	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		9	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		10	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		11	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		12	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		13	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		15	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		16	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		17	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		18	Groundstone	-	-	-	-	-	-	Not Collected	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1159		19	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		20	Groundstone	-	-	-	-	-	-	Not Collected. metate	1
5LR1159		21	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		22	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		23	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		24	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		25	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		26	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		27	Shist Material	schist	-	-	-	-	-	Not Collected	N/A
5LR1159		28	Groundstone	-	-	-	-	-	-	Not Collected. Metate	1
5LR1159		29	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		30	Groundstone	-	-	-	-	-	-	Not Collected. Mano frag	1
5LR1159		31	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1159		32	Groundstone	-	-	-	-	-	-	Not Collected	2
5LR1159	CO:D:12: 12.2	33	Scraper	Quartzite	28.7g	G1	34.9	52.1	15.1	in 1988, reidentified as expended core	1
5LR1159		34	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1160		1	Groundstone	Ground Stone	-	-	-	-	-	Not Collected	1
5LR1160	CO:D:12: 13.1	2	Flakes	Quartzite, Chert	22.0g	G1x1 G2x2 G3x6	-	-	-	General surface flakes	9
5LR1160		3	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1160		4	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1160		5	Groundstone	-	-	-	-	-	-	Not Collected. Mano	1
5LR1160		6	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1160		7	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1160		8	Groundstone			-	-	-	-	Not Collected. Metate	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1160		9	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1160		10	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1160		11	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1160		12	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1160		13	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1160	CO:D:12: 13.3	14	Biface	Chalcedony	0.7g	G3	10.2	16.4	3.6	Piece of a biface	1
5LR1160	CO:D:12: 13.2	15	Biface	Chert	0.5g	G3	11.8	15.9	2.7	Piece of a biface	1
5LR1160		16	Groundstone	-	-	-	-	-	-	Not Collected. Mano frag	1
5LR1160	CO:D:12: 13.4	17	Historic, Miscellaneous	n/a	-	-	-	-	-	Historic dump collection. Not Collected or missing. 1 Ball Canning Jar Lid, Broken Bottles, 1 Tobacco Tin, 2 Condensed Milk Cans, 1 Unidentifiable Can, 1 Rectangular Paint Thinneror Similar Can	8
5LR1161		1	Groundstone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1161		2	Groundstone	-	-	-	-	-	-	Not Collected. Metate	1
5LR1161		3	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1161		4	Groundstone	-	-	-	-	-	-	Not Collected. Mano frag	1
5LR1161		5	Groundstone	-	-	-	-	-	-	Not Collected. Mano frag	1
5LR1161	CO:D:12: 15.3	6	Flake	Quartzite	0.7g	G3	-	-	-	General surface flake	1
5LR1161		6	Groundstone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1161		7	Groundstone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1161		8	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1161		9	Groundstone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1161		10	Groundstone	-	-	-	-	-	-	Not Collected. Metate frag	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1161		11	Groundstone	-	-	-	-	-	-	Not Collected	1
5LR1161		12	Groundstone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1161		14	Groundstone	-	-	-	-	-	-	Not Collected. Metate	1
5LR1161	CO:D:12: 14.1	15	Cobble	Basalt	-	-	-	-	-	smooth cobble manuport used as FCR	1
5LR1161		16	Ground Stone	-	-	-	-	-	-	Not Collected. Mano frag	1
5LR1161	CO:D:12: 14.2	17	Flakes	Chalcedony Chert, Quartzite	39.0g	G2x7 G3x8	-	-	-	General surface flakes	15
5LR1161		18	Ground Stone	-	-	-	-	-	-	Not Collected. Mano frag	1
5LR1161	CO:D:12: 14.3	19	Biface	-	-	-	-	-	-		1
5LR1161		20	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1161		21	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1161	CO:D:12: 14.4	22	Scraper	Quartzite	10.5g	G2	25.4	29.8	12.3		1
5LR1161		23	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1161		24	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1161		25	Ground Stone	-	-	-	-	-	-	Not Collected. Mano frag	1
5LR1161		26	Ground Stone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1162		2	Groundstone	-	-	-	-	-	-	Not Collected. Mano frag	1
5LR1162	CO:D:12: 15.2	3	Biface	Quartzite	2.9g	G2	21.9	18.9	5.4	Smaller piece of midsection, fits with associated one	1
5LR1162	CO:D:12: 15.2	4	Biface	Quartzite	4.8g	G2	25.4	25.2	6.4	larger piece of midsection, fits with associated one	1
5LR1162		5	Groundstone	-	-	-	-	-	-	Not Collected. Metate frag	1
5LR1162	CO:D12:1 5.3	6	Flake	Quartzite	-	-	-	-	-	General flake 'collection' (only 1 piece)	1
5LR1168	88-IF1	n/a	ground stone	-	-	-	30	45	-	metate frag. Unifacially ground, most of grinding surface obliterated.	1

Site No	Temp No	FS	CMPA Artifact Class	Material Type	Weight (gm)	Size Grade	Max Width (Tools) (mm)	Max Length (Tools) (mm)	Greatest Length (GT) (mm)	Description	Count
5LR1169	88-IF2	n/a	ground stone	-	-	-	190	200	-	metate frag. Generalized rectangle, ground on one side.	1
5LR1170	88-IF3	n/a	glass	-	-	-	75	94	-	historic glass frag. Thick glass bottle base, word "bold" imprinted	1