

University of Nevada, Reno

Pre-Archaic Occupations in the West Arm of the Black Rock Desert

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requirements for the degree of Master of Art in
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by

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Abstract

The relationship between humans and the environments in which they lived is a major topic of interest to archaeologists in the Great Basin. Many early archaeological sites occur on remnant shorelines of ancient lakes and marshes, suggesting a reliance on wetland resources within the region. Archaeological data collected between 2004 and 2006 from surface sites in the Black Rock Desert offer an example of early human occupations surrounding these pluvial lakes as well as the nature of these occupations. This study demonstrates how people concentrated their activities adjacent to large lakes and wetlands following their arrival to the Great Basin. It also compares the spatial and temporal relationships between archaeological sites and lake levels in the West Arm of the Black Rock Desert. The results indicate that the Black Rock Desert is an ideal place to better understand human occupations during the Pleistocene/Holocene transition (11,500 B.P.-7,500 B.P.).

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CHAPTER 1: INTRODUCTION

The goal of this thesis is to describe early archaeological sites in the Black Rock Desert, explain their setting and possible functions, and put them in the context of other sites dating to the early period of initial human occupation of the region. This is accomplished by the discussion and analysis of sites located on Lahontan shorelines within the Black Rock Desert that were surveyed over three field seasons (2004-2006).

The Great Basin of North America is a region of internal drainage, broken into mountain ranges and intervening valleys. These internal drainages filled the basins with water creating vast wetlands characteristic of Great Basin prehistory. The Great Basin's environmental response to global climate changes, specifically during the Pleistocene Holocene transition (PHT) (between 11,500 and 7,500 BP), resulted in environmental conditions with no modern analog (Elston and Zeanah 2002).

Human behavior and response to the different environmental conditions of the PHT in the Great Basin and more specifically in the Lahontan Basin are thought to be very different from the ethnographic record. For example, stemmed point sites often represent this period of occupation in the Lahontan Basin, while a variety of smaller side-notched and corner-notched points as well as grinding stone implements represent the later period. Assuming the Great Basin stemmed point tradition is indicative of PHT occupations and PHT adaptations were tethered to lacustrine settings (as implied by the Western Pluvial Lakes Tradition) then we would expect to find stemmed point sites clustered along the PHT shorelines of Lake Lahontan. Furthermore, if the PHT

adaptations were not restricted to lacustrine settings, then we should find stemmed point sites in a variety of locations around the Lahontan basin and in the current study area.

This thesis is divided into 8 chapters. In this first chapter, I summarize the background to the study. In the next Chapter 2, I present an environmental history of the study area. The following Chapter 3 briefly describes the ethnographic knowledge about human adaptation to the study area in historic times. Chapter 4 presents a summary of the study area's archaeological knowledge. Chapter 5 describes the field and laboratory methods used for this survey project. Chapter 6 discusses the archaeological materials found in my study, which are analyzed and discussed in chapters 7 and 8.

Background

The relationship connecting ancient human cultures and the environment they once lived in has been of major interest to archaeologists in the Great Basin since its early development. The last glacial maximum (LGM) was a time of cold and dry climate that produced maximum glaciers, but in the Great Basin it saw the creation of much wetter surface conditions including rising valley lakes (Madsen 2000).

Between 14,000 BP and 13,000 BP, lakes had achieved their maximum surface area, but in general, they shrank after 12,000 BP. The Younger Dryas (YD) was a sudden global return to a glacial climate between 11,200 and 10,100 BP that briefly refilled many lakes (Madsen 1999, 2000; Elston and Zeanah 2002). This is the time interval when the first well-dated signs of human occupation in the Great Basin are recognized (Elston and Zeanah 2002; Beck and Jones 1997; Grayson 1993).

The Great Basin holds unique information regarding human occupation during the PHT, in both surface and buried sites. While buried sites make up a small portion of the

archaeological record, surface sites often occur at the edges of Pleistocene pluvial lakes, where in certain circumstances caves and rock shelters are not found, especially in places with low gradients and low wave action. These sites, while not directly datable, offer insight regarding colonizing people and how they utilized various resources in specific places and across time.

The archaeological record of the Lahontan Basin of Northwestern Nevada offers an excellent example of the first human occupations surrounding pluvial lakes and the nature of their occupations. More specifically, the Black Rock Desert of the Lahontan Basin is an ideal place to better understand the human occupations during the PHT, through open-air or surface sites along shorelines.

Study Area. The Black Rock Desert is located at the northwestern portion of the Lahontan basin (Figure 1). The Desert contains a large, very flat playa with an average elevation of about 1190 m. This feature represents the lakebed of Lake Lahontan where it now occasionally floods to shallow depths from local precipitation as well as water flowing from the Quinn River and Mud Meadow Creek (MMC). At the north end of this area the valley gradually rises from the playa to an elevation of about 1225 m where MMC becomes confined in a broad canyon likely cut through by Pleistocene lacustrine deposits (Adams et al. 2008).

Unfortunately, there are few well-developed shorelines in the elevation range of 1200 m to 1235 m, even though a continuous lake surface would have occupied these subbasins at an elevation above 1200 m during the PHT. The lack of a well-developed shorelines at the MMC location might be due to a low gradient ($<0.0005\%$) that contributes to low wave energy, which in turn may include low sediment supply (Adams

et al. 2008). Despite the lack of well-defined beach ridges and its overall low gradient, the MMC area is characterized by numerous isolated knobs and linear ridges, which may be fluvial features deposited by MMC in an environment similar to those in the Bonneville basin, described by Oviatt et al. (2003).

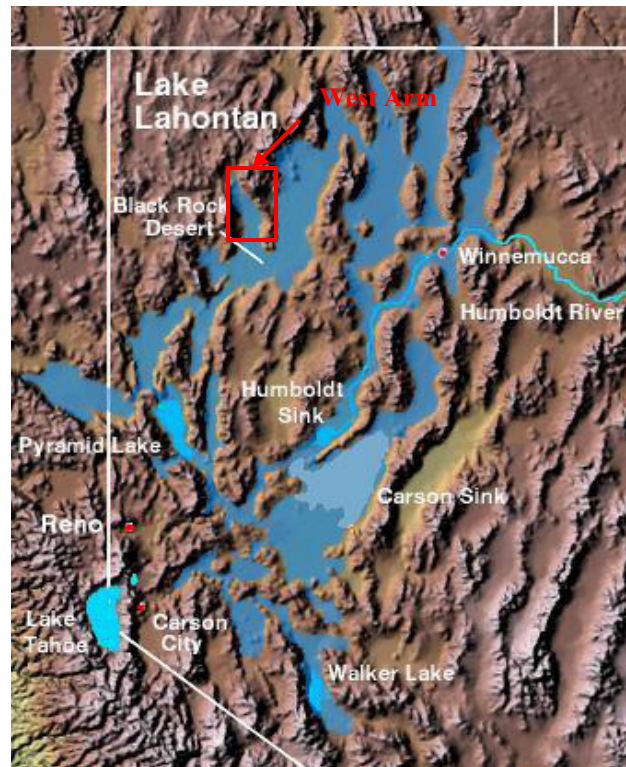


Figure 1. Black Rock Desert within the Lahontan Basin (see list of figures for ULR address)

The MMC sites are located in the West Arm of the Black Rock Desert and offer opportunities to examine Great Basin Stemmed Point traditions within Northwestern Nevada. This area was surveyed during three field seasons and included parcels between elevations of 1200 m to 1230 m, which would have been an approximate location of the shoreline during the YD. Parcels were also surveyed above and below these elevations to allow a better understanding of the timing of different occupations. During three field

seasons (2004-2006) in total 2,515 acres were surveyed, 103 surface sites were recorded, and 76 Isolated Finds were discovered and recorded. Of these findings, 13 parcels are located within the specific project area, 79 sites are used to look at spatial variations, and only 16 of these sites that have Pre-Archaic components are discussed in detail. At these sites, 51 Great Basin stemmed projectile points and four crescents were discovered. Both of these tool types have been found in dated Pre-Archaic assemblages.

This study demonstrates how people concentrated their activities adjacent to large lakes and wetland resources during the time when they first entered the Great Basin. It also offers a comparison between spatial and temporal relationships and the archaeological record in the West Arm of the Black Rock Desert, surrounding Mud Meadow Creek.

CHAPTER 2: ENVIRONMENTAL BACKGROUND

Great Basin

Introduction. The Great Basin has long been a place of interest due to the environmental fluctuations that occurred around the time people first entered the region. It is a region of interdisciplinary studies, where both environmental and archaeological issues have been explored. One of the methods for understanding the distribution of resources within past landscapes is the use of proxy data for the reconstruction of past environments. Changing Great Basin environments have been reconstructed from numerous studies of pollen, sediments, lake levels, and other kinds of data. In this chapter, the environmental setting of the Great Basin is discussed along with the history of interdisciplinary studies in this region.

Environmental Setting. The Great Basin is situated between the Sierra Nevada-Cascade Mountains to the West and the Rocky Mountains to the East. Located to the north and south are the Columbia River and Colorado River drainages. The Great Basin is broken into north-south trending mountain ranges and intervening valleys where the water from the surrounding mountains flows inward. It is a region that can be characterized by great aridity, high topographic relief, and internal drainage (Beck and Jones 1997).

Great Basin environments responded dramatically to global changes, due to these internal drainages, which over millennia has caused rapid fluctuation in wetland areas. With no modern comparison, plant species shifted ranges, location, and abundance. There was also high biodiversity and species turnover (Elston and Zeannah 2002). Researchers have spent many years in the investigation of this region attempting to

discover ways in which humans responded to these fluctuations behaviorally. Although a first step in understanding human behavior in the region is to reconstruct the environment, this has been a difficult task for several reasons. One reason is that there are multiple subbasins within this very large region. The conditions within each subbasin have varied over time, making reconstructions locality-specific and not always comparable to each other.

Environmental Reconstructions. The reconstruction of past environments has been one of the most discussed and researched topics in the Great Basin since the 1930s, when several interdisciplinary teams took interest in the unmistakable cycles of change in the Great Basin Holocene environments. Major finds in North America, such as Clovis and Folsom, and the finds at Gypsum Cave, Nevada, sparked interest in how and when people began to occupy the land. These finds stimulated the joining of disciplines and the need for a historical framework of natural and cultural events during the late Pleistocene and early Holocene. Early on, the Carnegie Institution of Washington, sponsored by Andrew Carnegie, a steel tycoon, was the leading scientific funding agency before NSF supporting this early research (Rhode 1999).

John C. Merriam, a paleontologist, led the research efforts at the Carnegie Institution during this time. Because of his position and his reputation, Merriam was able to support archaeological projects throughout the Great Basin and the Southwest that included a wide variety of researchers and specialists. With Merriam's vision for collaborative work and Luther Cressman's notice of the importance of ecological context for the understanding of cultural patterns, Great Basin research took on an interdisciplinary nature for a better understanding of chronology (Rhode 1999).

Mark Raymond Harrington was part of this movement toward environmental understanding in the 1930s. During his research at Gypsum Cave (1933) in southern Nevada, Harrington observed artifacts and burned wood mixed with hair and dung of the extinct ground sloth and other extinct animals. Harrington thought that these finds were comparable to similar discoveries in the southwest and took careful note of the stratigraphy of the cave. Without the use of radiocarbon dating at this time, there was a strong emphasis on geochronology, which required a careful look at stratigraphic detail.

The work of both Kirk Byran and Ernst Antevs was highly influential in the 1930s and 1940s, although Antevs' work was much more prominent in the Great Basin. Antevs used a three-part environmental Holocene climactic sequence (Anathermal, Altithermal, and Medithermal), which includes a severe drought interval 7,000 to 4,500 years ago, to describe some of the major environmental shifts that took place in prehistory. These ideas were put in print in 1948, and although a work in progress, it served as a critical device for understanding the events following the Wisconsin glacial period and allowed temporal correlation of geological and archaeological deposits throughout western North America (Rhode 1999).

Although there were many aspects of past environments in the Great Basin that shaped human adaptations, one of the most interesting relationships in Great Basin prehistory is the one between the people who first occupied this area and the now extinct lakes and marshes that existed in the Great Basin in the late Pleistocene and early Holocene (Grayson 1993).

The idea that early people occupied the shorelines of these lakes and marshes at their high-stand was expanded upon in the 1970s. A conceptualized model called the

Western Pluvial Lakes Tradition was hypothesized to be a cultural pattern highly dependent upon these wetlands (Bedwell 1973; Willig 1988).

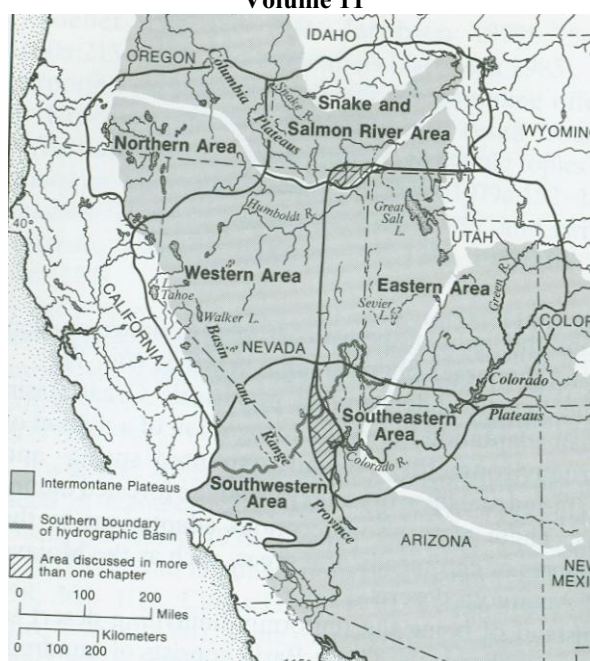
The perception of the Great Basin environmental patterns has undergone many transformations from the time of Ernst Antevs' (1948) publication on Great Basin climatic shifts. Antevs thought that climate change in the Great Basin was composed of gradual climatic shifts spanning centuries or even millennia (Madsen 1999:77). Madsen, on the other hand, interprets these climatic shifts as taking place in a "step-wise fashion rather than a sweeping curvilinear fashion of Antevs" (Madsen 1999:77). Madsen (1999) has also addressed the issue of the culture historical categories assumed to be in Great Basin prehistory, and how this variation within the region must be accounted for. For example, the expansion of pinyon during the Holocene differed in the eastern Basin from in the west, and the reaction of people to this spread was "correspondingly diverse" (Madsen 1999:77).

Western Great Basin

Introduction. Using the western Great Basin as an example, Elston (1982) examined the diversity of the environment and the prehistoric culture change and variation. The western Great Basin is defined in the *Handbook of North American Indians*, Volume 11 (1982) as most of Nevada and parts of California along the Sierra Nevada (Figure 2). It is covered by the drainage systems of Lake Lahontan, and a long arm that extends south, down the Sierra front west of the White and Inyo Mountains to Owen Lake. According to Madsen (1999), this area is diverse ecologically because it contains the Reno and Lahontan floristic sections, parts of the Sierran biotic province, and the northern extension of the Mojave Desert in Owens Valley. Due to the variation

in environments, places where pinyon-juniper woodland grows vary from the low-lying valley bottoms, which are often treeless (Madsen 1999). Therefore, people living closer to the mountain ranges would have been exploiting certain resources such as acorn and pinyon, while those near to lakeshores and rivers would have been utilizing other resources such as fish and waterfowl.

Figure 2. Key to subareas discussed in prehistory chapters in Handbook of North American Indians, Volume 11



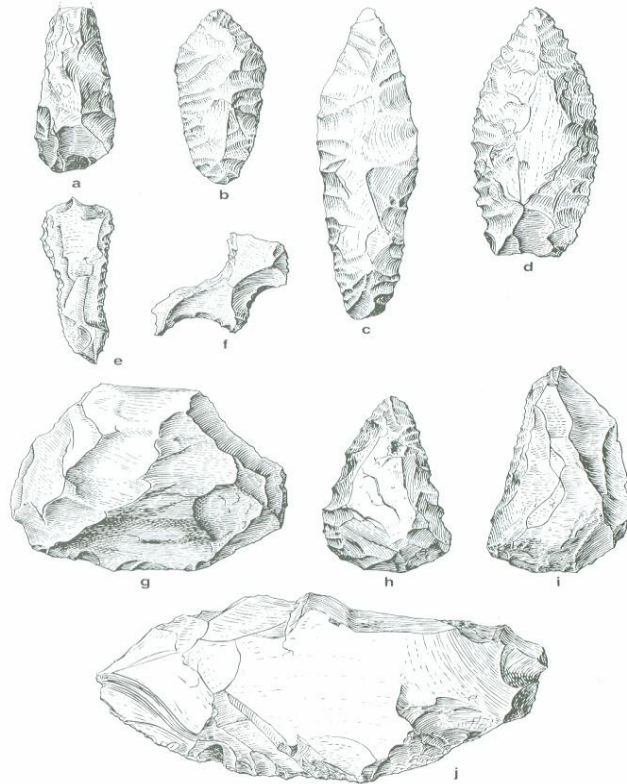
From Jennings 1986; Fenneman 1946; Morrison 1965

Geochronological data have allowed the identification of temporally sensitive artifact types such as styles of basketry, marine shell beads, pottery, and projectile points, which in turn have contributed to the development of a chronological framework for the western Great Basin (Hester 1973; Heizer and Hester 1978a, 1978b; Thomas 1981; J.O. Davis; Elston 1986). Projectile point sequences are probably the most refined of the sequences, possibly because of the stratigraphic sequence of places like Gatecliff Shelter in central Nevada (Thomas 1981; 1983a; Elston 1986).

The prehistory of the western Great Basin has been split into four regional phases, Pre-Archaic, Early Archaic, Middle Archaic, and Late Archaic, spanning over 11,000 years of occupation. The Pre-Archaic is defined by surface sites with distinctive technology similar in some ways to that of the Paleoindians of the Great Plains. The tools include: bifacial knives, stemmed and concave base projectile points with edge grinding, crescents, graters, punches, and choppers (Figure 3). Many of these tools may be worn and resharpened, and seed grinding implements are rare to nonexistent (Elston 1986).

The Early Archaic begins late in the west compared to the north and east (7,000-4,000 BP) and Early Archaic sites are scarce, which could be related to drop in occupation of this area. This is a time of a warming and drying climatic trend. Projectile points such as Pinto, Gypsum, and Humboldt appear in the archaeological record and were used for the tips of atlatl darts. The tools during this time become less specialized and smaller. Seed grinding implements also appear in the archaeological record, implying an intensified use of seeds. Sites appear more often on valley floors as opposed to remnant shorelines, and caves and rockshelters are used for the storage of goods (Elston 1986).

Figure 3. Pre-Archaic tools, from Sadmat site (Elston 1986b)



a. Leaf-shaped projectile point, b. Lake Mojave type point, c. Large stemmed lanceolate point, d. Large, basally thinned, lanceolate point, e. Unifacially flaked blade, f. Unifacially reduced flake, g. Unifacially flaked core, h-i. Scrapers, j. Knife chopper

The Middle Archaic dates from approximately 4,000 to 2,500 BP. The climate was cool and moist, and is often called neoglacial or neopluvial (Davis 1982; Weide 1982; Elston 1986). There are no large technological shifts between the Early and Middle Archaic, but there is a change in settlement and subsistence patterns. People tended to exploit certain ecozones, and rabbit bones and grinding stone implements are often seen in the Middle Archaic record. Trade materials such as marine shell and

obsidian become important and the diagnostic points for this period include Elko series points and Martis points.

The Late Archaic begins at about 2,500 BP and continues until right after Euroamerican contact. The climate was warm and dry, which may be the reason for the cultural changes. Some of the artifacts associated with this time include brownware pottery, and projectile points include Rose Spring and Eastgate series as well as the Desert series points. The atlatl was replaced by the bow and arrow, plant-processing tools became more elaborate and abundant, and increased ecozones and resources were exploited (Elston 1986).

The Pleistocene/Holocene Transition

Introduction. The Pleistocene/Holocene transition (PHT) was between ca. 11,500 and 7,500 B.P., including the closing phase of the last glaciation and a period of high precipitation that continued throughout the first two millennia of the Holocene (Jones and Beck 1999). It is a time when humans are thought to have first occupied the Great Basin. This is a time of remarkable changes such as elevational and latitudinal migrations of plants and animals, the disappearance of lakes and river systems, and extinction of large mammals. Great Basin researchers often confront questions regarding human mobility and subsistence strategies of this time and how these are reflected within the archaeological record.

Human Interaction. The archaeological record of the western Great Basin during this time is quite different from the record of the Plains and the southwestern United States; consequently, researchers have spent many years attempting to model the way in

which the first occupants subsisted. As mentioned above, one of the more popular explanations is referred to as the Western Pluvial Lakes Tradition (Bedwell 1970:23).

Considering the environmental variations within the Archaic period, it is difficult to grasp what resources these highly mobile foraging groups, during the PHT, would have considered most valuable. While the Archaic toolkit consists of items such as seed processing tools, projectile points, baskets, nets, and other textiles, digging sticks, snares, and flaked stone tools, the Pre-Archaic toolkit reflects almost no seed processing activities and contains a different stone tool kit. The settlement pattern of Archaic people also implies features of subsistence. During the Archaic there was an intensification and exploitation of diverse resources based on environmental conditions, and these are not seen during the pre-Archaic (Madsen 1987:187).

The Pleistocene/Holocene transition (PHT) is considered a unique time in Great Basin prehistory, not only because human beings first appeared then, but also because great environmental fluctuations took place. According to Jones and Beck (1999), the "Paleoarchaic" record in the Great Basin is unique among coeval records elsewhere in North America. For example, in the Plains and the American Southwest, there is a relation between the now extinct megafauna and the Paleoindians that hunted them. However, in the Great Basin, there is only a suggestive correlation between human hunting and the die-outs. In addition, a large fraction of the chronology from this period is based on open air landforms that have seen little if any sediment accumulation, meaning artifacts have been exposed on ground surfaces for over 10,000 years (Jones and Beck 1999:84).

One thing agreed upon is that there is strong evidence of marked shifts in hydrologic budgets and changes in the distribution of biota during the PHT (Grayson 1993). Two main assumptions underlie this statement: (1) during the PHT, precipitation was higher than during any subsequent period. There was more vigorous stream and spring flow, more numerous and extensive wetlands, and maintenance of shallow lakes in some valleys is recorded during this period; and (2) the more extensively distributed wetland biota and steppe-like habitat were more prevalent than today, which would have contributed to higher than modern large animal biomass, although conditions diminished over the span of this interval. The result of climatic changes is thought to be a reduction of wetland and steppe biota and their replacement by xerophytic vegetation (Jones and Beck 1999:86).

Jones and Beck (1999) note that many past researchers noticed something unique about the PHT people, but Campbell et al. (1937) especially recognized that human populations at this time had a special affinity for well-watered settings. In addition, most of the sites found during this period are located on Pleistocene beaches and along outflow channels. As mentioned, Bedwell (1973) proposed that Pre-Archaic populations of the western Great Basin followed an economic adaptation geared to exploitation of lakes and marshes, which he termed the "Western Pluvial Lakes Tradition" (Jones and Beck 1999:89). Beck and Jones recognize the problem in this model, stating that we can only infer these people depended highly on wetland resources, because organic remains are not preserved in surface sites with lithic artifacts. Grayson (1993) noted that fluted points are most often found as isolates and, with very little exception, are distributed in lowland settings where they rest on landforms associated with now extinct lakes or marshes.

Grayson believes that there is really no evidence for what these people were really doing, but they were doing a lot of it near shallow water (Jones and Beck 1999:89).

Chronology of Pleistocene Lake Transitions

Introduction. The last glacial maximum (LGM) was followed by a period of warmer and wetter climate (Madson 2000; Thomson et al. 1993). Between 14,000 BP and 13,000 BP, lakes had achieved their maxima, until 12,000 BP when they began to retreat. An abrupt global return to a glacial-like climate, called the Younger Dryas, occurred between 10,900 BP and 10,100 BP (Madsen 1999, 2000). It is during this time that there is the first evidence for human occupation (Beck and Jones 1997).

Great Basin Pluvial Lake Fluctuations. Knowledge about lake level fluctuations during the Pleistocene has allowed researchers to infer the intensity at which these wetland resources may have been used. The Late Quaternary was a time when nearly 100 basins in the Great Basin contained lakes. Of these lakes four paleolake systems have been intensively studied (Lake Lahontan, Lake Bonneville, Lake Russell, and Lake Searles) (Benson et al. 1990). By using techniques such as radiocarbon-age estimates of soils, rock varnish, packrat-middens macrofossils, lake sediment, tufa, oolites, mollusks, and wood in deltaic and lagoonal environments, researchers have been able to come up with chronologies which demonstrate the fluctuations in lake levels during varied climactic phases within the Great Basin (Benson et al. 1990). Starting their reconstructions around 35,000 years ago, Benson et al. (1990) were able to demonstrate some of the similarities and differences among the four major lake systems.

Lake Bonneville and Lake Lahontan were at low levels around 35,000 years ago. Lake Russell and Lake Searles were at moderate levels at around the same time. Around

two thousand years later (33,000 B.P.) levels of both lakes had fallen. Around 15,500 B.P., a decrease occurred in water levels of the Lake Lahontan and Lake Bonneville basins (also possibly the Mono basin). Another decrease occurred between about 15,250 and 14,500 B.P.. From 15,000 to 12,500 B.P., the Searles Lake record shows a decrease as well, and before 13,500 B.P., highstands occurred in all four basins. Recessions that occur from the last highstand may have transpired nearly synchronously between 14,000 and 13,500 B.P. in all four basins. Between 12,500 and 11,500 B.P., the Lake Bonneville Lake Lahontan basins either stabilized or water rose to moderate levels. Between 12,500 and 11,500 years B.P., the Searles Lake levels rose and possibly rose again at about 10,500 B.P. At about 10,000 years ago, lakes in the Bonneville, Lahontan, and Mono basins remained at low levels. However, a 55-meter deep lake may have remained in the Searles Lake basin for a large part of the Holocene (Benson et al. 1990:277-278).

Based on lake levels from about 35,000 to 10,000 B.P., it is evident that there were many changes prehistoric humans would have needed to respond to in the Great Basin. For example, while much is understood concerning Lake Lahontan water levels, understanding the fluctuation in the western subbasins can be complicated due to the effects of the spill across sills that separate the Pyramid Lake subbasin from adjoining subbasins. By looking at patterns in lake levels, Benson et al. (1999) were able to make some generalizations concerning the timing of certain events, which allows for a reconstruction of prehistoric responses to environmental changes. Using these environmental data and the assumption that the first occupations of the Great Basin occurred somewhere around 13,000 calendar years ago, correlations can be made and models can be applied to the archaeological evidence, to examine subsistence strategies

and mobility patterns of people inhabiting the environs of the basin lakes and water systems.

Sometime around 14,000 B.P., it is safe to say that all four lakes may have had "nearly synchronous recession" (Benson et al. 1990:282). Following this recession the lakes seemed to stabilize at around 11,500 to 10,000 B.P. These events are often attributed to the Younger Dryas and its enormous global effects. Variation in lake size is often discussed in terms of variation in lake surface areas. In order to compare lake levels a normalization of surface area is needed. This can be accomplished by dividing the palaeosurface area of a lake by its mean-historical, reconstructed surface area. By comparing surface areas of the lakes it can be determined that Lake Bonneville and Lake Lahontan increased in size by a factor of about ten, whereas Lake Russell and Lake Searles increased by a factor of about four to six. These numbers may mean a movement of populations closer to lake shores, or a different set of varied responses to the environmental fluctuations. Whatever the human response was, environmental changes would have motivated human behavioral changes (Benson et al. 1990).

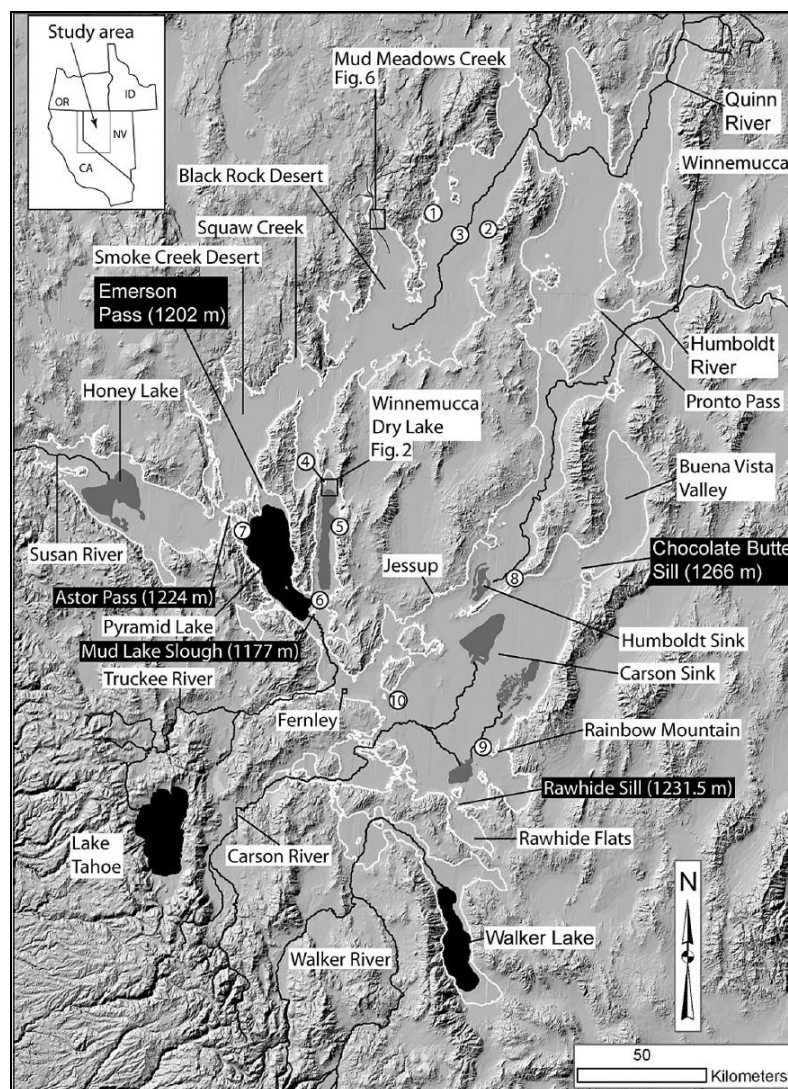
While the shorelines in the Bonneville Basin are well understood during the late Pleistocene and early Holocene, the Lahontan Basin lake-level fluctuations are not. Using the archaeological record paired with the paleoenvironmental record, researchers are beginning to have a better understanding of the relationship between Pre-Archaic people in the Lahontan Basin and their environment.

Lahontan Shorelines. The Seho Lake cycle began around 35,000 B.P. years ago in the Lahontan Basin. There were a series of major lake-level fluctuations during this cycle and eventually culminated at around 13,000 B.P. (Adams and Wesnousky 1998;

Benson et al. 1995; Morrison 1991). The highstand of the shoreline varies between about 1340 m near the center of the basin to about 1318 m at the northern edge. These elevations vary due to isostatic rebound and northward tilting (Adams et al. 1999). By 12,000 B.P. the lake dropped by more than 100 m, which separated the basin into numerous smaller subbasins (Thompson et al. 1986). This recession is not well known, although studies at the Carson Sink by Curry (1988; 1990) and Benson et al. (1992) concluded that the lake level was around 1205 m between about 11,300 and 10,400 B.P. Adams and Wesnousky (1998) also reported stratigraphic and geomorphic evidence for lake-level rise after the Lahontan highstand that reached an elevation of about 1235 m. Caskey et al. (2004) also dated a beach ridge at 1228 m to be between 8,060 and 9950 B.P. (Adams et al. 2008).

Western Subbasins. Pyramid Lake, Winnemucca Dry Lake (WDL), Honey Lake, Smoke Creek Desert, and the Black Rock Desert are all western subbasins of the Lahontan Basin and are all separated by sills. The Lahontan Basin is presently fed by the Truckee River. It is also possible that the Humboldt River drained into the basin through Pronto Pass around 15,000 B.P. (Davis 1982; Davis 1990; Benson and Peterman 1996; Adams et al. 2008). Volumes of downstream basins and the elevation of the surrounding sills (Mud Lake Slough (1177 m), Emerson Pass (1207 m), and Astor Pass (1224 m) gave control over past lake levels (Figure 4). This is because the lake surface would maintain a specific elevation until the basins at lower elevations would fill and the integrated lake would continue to rise (Adams et al. 2008).

Figure 4. Locations of rivers, creeks, passes, sinks, and sills



From Adams et al. (2008)

The low gradient within the West Arm of the Black Rock Desert has made finding a datable shoreline difficult. Using the estimated shorelines of nearby western subbasins has allowed for a usable comparison for estimating shorelines in the West Arm. These subbasins include Winnemucca Dry Lake (WDL), Pyramid Lake, and Carson Sink (Adams et al. 2008).

Within the Lahontan Basin WDL and Pyramid Lake are a couple of places where there is a sequence of well-defined beach ridges from the playa (~1152 m) to the highstand (1338 m). Using the dating from geologic features such as Mazama tephra, pack rat middens, and archaeological data (Appendix A), it is possible to reconstruct a timeline of the Lahontan prehistoric and historic shorelines (Adams et al. 2008).

The low beach ridges of WDL range from 1177 m to 1202 m, based on distinctive photo and field characteristics, which distinguish them from higher shorelines. These characteristics include the appearance of granite sand being reworked into dunes by the prevailing winds (Adams et al. 2008). There was also a historic highstand of 1175 m reported (Adams et al. 2008; Harding 1965; Russell 1885). Between 2,600 and 3,600 B.P. the shoreline was 1185 m up to about 1195. This elevation was estimated with multiple radiocarbon dates from shoreline materials (Appendix A) (Adams et al. 2008). This shoreline is also correlated with those from the south end of Pyramid Lake (Briggs et al. 2005).

One of the largest ridges at WDL rests at 1202 m. It probably formed during the spill over through Emerson Pass sill and its large size is most likely related to "long stands and repeated spills over Emerson Pass and Smoke Creek Desert" (Adams et al. 2008; 15). The Mazama and Tsoyawata tephra beds located near the Coleman archaeological locality, date to 7,590-7,790 and 7,730-7,950 B.P and determine the age of this shoreline (Adams et al. 2008). A shoreline has been mapped at the south end of Pyramid Lake, which is referred to as the Nixon terrace. This shoreline descends from about 1220 m down to 1200 m (Bell et al. 2005). The terrace is truncated at the 1200 m shoreline and Mazama tephra is found at several locations. There have been several

radiocarbon dates recovered from this terrace and the age range is 7,000-8,000 B.P. (Adams et al. 2008). There is also an upper age limit of 10,820 B.P. at the Nixon terrace that rests at 1212 m. An articulated mollusk shell in "relatively flat-lying beach gravels that in turn are overlain by the landward dipping backsets of the surface beach ridge" (Briggs et al. 2005; Adams et al. 2008:16) determined this age.

Based on geological and archaeological evidence and pack rat middens, Adams et al. (2008) created a sequence for post-highstand lake level fluctuations in the western subbasins. The Lahontan highstand was determined by the age of a camel bone (13,070 B.P.) located in a lagoon behind a highstand beach ridge in the Jessup embayment (Adams and Wesnousky 1998). The regression is then constrained by the elevations of pack rat middens located on the east shore of WDL (Thompson et al. 1986; Adams et al. 2008). These middens determine that lake levels in the western subbasins have not gone over 1231 m since the oldest of these was formed (13,950 cal B.P.). The lake levels then retreated to 1202 m from 13,000 and 14,000 cal B.P. and then increased again to 1230 m. They withdrew again between 11,000 to 10,000 cal B.P. from 1230 m to 1153. This date is constrained by archaeological materials recovered at Wizards Beach on the northwestern shore of Pyramid Lake (Tuohy and Dansie 1997). The lake levels then rose again between 10,160 and 9,560 B.P. through an elevation of 1168 m and may have spilled over through Emerson Pass into the Smoke Creek Desert. This level is controlled by the age and elevation of deltaic deposits (Born 1972), the Nixon terrace (1200 m elevation) (Bell et al. 2005), and the presence of Mazama and Tsoyawata tephras behind the 1202 m beach ridge at the north end of WDL (Adams et al. 2008).

CHAPTER 3: ETHNOGRAPHIC BACKGROUND

Introduction. In the next two chapters, I describe how pre-colonial people adapted to environments in the Great Basin in general and my study area in particular. I then describe archaeological knowledge of the prehistoric peoples, subsistence, and organization.

History of Ethnography in the Great Basin. The relationship between the ethnographic and archaeological record in the Great Basin is one of complication. Although the ethnographic record is a main foundation for reconstructing the prehistory of this region, researchers have also been cautious about the degree to which this knowledge should be applied to the past (Elston and Zeanah 2002). Although Native informant knowledge as well as ethnographic data are invaluable, the effects of culture change must be considered when interpreting the past. Ethnographers began to focus on Great Basin Natives in the 1930s, when the people had already undergone significant changes in social organization, economy, and subsistence (Kelly 1997a). Native populations had been severely affected by European diseases, the introduction of horses, and invasive economic endeavors such as fur trading, farming, cattle ranching, mining, and California-bound immigration (Kelly 1999:111). Although taking into consideration only a few of these complications, the ethnographic record still remains an important component of Great Basin research.

The Spanish in the 1700s recorded the earliest descriptions of Great Basin Indians. After the conclusion of the war with Mexico and transfer of jurisdiction on the central and southern Great Basin from Mexico to the United States, observations were

made by visiting naturalists, migrant wagon train passengers, topographical surveyors, railroad surveyors, and government sponsored expeditions by the Bureau of Indian Affairs and other agencies (C. Fowler 1971; Beck 1999). Kroeber, Sapir, and Lowie were the first researchers to conduct ethnographic studies in the Great Basin with groups such as the Washo, the Northern Shoshone, the Northern Paiute, and the Southern Paiute (Baumhoff 1958; Beck 1999). In 1927 Julian Steward, a student of Kroeber, began his ethnographic work with the Owens Valley Paiute, and during the 1930s major ethnographic studies took place when the University of California conducted its Cultural Element Surveys in the western United States. By the mid 1930s researchers such as Isabel Kelly, Willard Park, Omer Stewart, Beatrice Blyth, Marvin Opler, and Jack Harris were all recording information concerning the Natives of the Great Basin (C. Fowler 1977:18).

The idea that Native people were rapidly disappearing was the major motivation behind the ethnographers' work at this time. Often termed "salvage ethnography", the research is fundamental to the entire body of ethnographic data (Beck 1999). The threat of cultural disappearance encouraged ethnographers to focus on life before contact, often leading to a deliberate ignoring of contemporary life (Beck 1999:15). Regardless of this issue, ethnographic studies offer essential information concerning material culture and basic cultural practices among Natives of the Great Basin (Beck 1999).

The Ethnography of Northwestern Nevada. Julian Steward, who is probably the best known Great Basin ethnographer, did not include Northwestern Nevada in his classic 1938 study of aboriginal sociopolitical groups (Steward 1938; Elston and Davis 1979). However, the work of Omer Stewart (1938) is a major contribution to the understanding

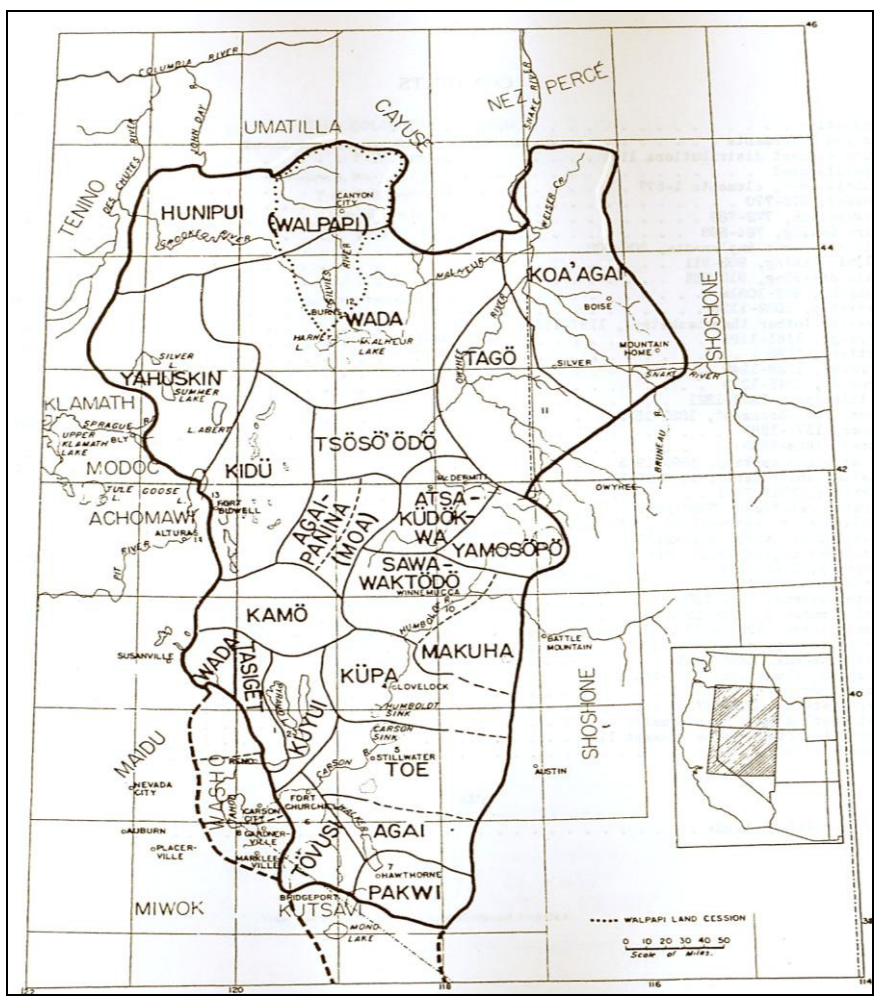
of the Pre-Euroamerican era Northern Paiute people. Stewart's 1938 publication on Northern Paiute bands is the first attempt at establishing coherent names and boundaries for this tribe. He discussed the Northern Paiute as a tribe rather than a nation based on the works of Powell (1873-1891), Kroeber (1907-1959), and Steward (1927-1977) who originally referred to the subdivisions of this group as bands (Stewart 1939:127). While the tribe as a whole is termed the Northern Paiute, each band acts independently of the other, but remains linguistically and culturally Paiute (Stewart 1939:129).

According to Stewart, the habitat of the Northern Paiute is uniformly desert, which has been modified by streams from the Sierra Nevada, Cascade, Teton, and Blue Mountains. Their territory is like an inverted "isosceles triangle", claimed Stewart, with its most southern tip located at Owens Lake, California and its base (275 miles long) located 600 miles north near the Blue Mountains in Oregon. Almost all of the Northern Paiute territory lies within the Basin-Range physiographic province, except a small fraction on the arid plateau to the north (Figure 5) (Stewart 1941: 361).

The band of Paiutes known to occupy my study area in the Black Rock Desert of Nevada are known as the *Agaipaninadokada* or the *Moado Kado*. The *Agaipaninadokada* ("fish lake eaters") or *Moado Kado* ("wild onion eaters") had a territory that begins in the Summit Lake area and continues into the Black Rock Desert (Stewart 1939; Layton 1978). These bands would occupy Summit Lake during the winter and disperse further to the south in the summer, with a range of approximately 4,506 km² (2,800 mi²). There is some confusion about whether two separate bands were in this area and it is possible that these were two different bands that wintered in different places (Stewart 1939; Layton 1978; Elston and Davis 1979:27). Despite the confusion, the

majority of Stewart's informants believed that there were two different names for the same band. Based on informant testimony, Stewart attributes most of the territory in the High Rock Country to the *Agaipaninadokada*, also known as the *Moado Kado*. Although he did not interview anyone from this band specifically, the information gathered was from neighboring bands that remembered direct accounts of these people (Stewart 1939; Layton 1978).

Figure 5. Northern Paiute Bands.



From Stewart 1939, 1941

Stewart (1939) writes that the *Agaipaninadokada* 4,506 km² (2,800 mi²) began at the Nevada-Oregon state line, and extended easterly approximately 64.37 km (40 miles) to Disaster Peak Mountain, then southwesterly about 80 miles to the center of the Black Rock Desert south of the Black Rock Range. The Black Rock Desert was a well-defined eastern boundary for the Surprise Valley Paiute, whereas the western boundary was not so clear. Surrounding the *Agaipaninadokada* were the *Kidiitokado* to the west, the *Tsösö'ödö* to the north, and the *Atsaküdkwa* and *Sawawktödö* to the south (Stewart 1939:135). According to informants, although North Paiute bands had a productive core area, the large deserts that surrounded the core area were not exclusively claimed (Stewart 1939: 135). Areas that would have been claimed included well-watered localities such as Summit Lake, Soldier Meadow, the High Rock Lake Basin, and the stream courses and tributaries to these localities (Stewart 1941).

In 1941, Stewart described the band that lived in the Quinn River Valley as the *Atsa'küdkwa-tuviwara* ("red-butte dwellers"). This band, along with other bands of the Northern Paiutes, inhabited parts of Nevada, California, and Oregon. This territory totaled over 70,000 km² (27,000 mi²) (Stewart 1939: 135). Stewart's (1941) account discusses the various subsistence strategies employed, such as hunting large game, which was done on an individual basis, and communal hunts, which often involved smaller game such as jackrabbits.

Other Northern Paiute bands include the *Yamosöpö tuviwarai* ("half-moon valley dwellers"), the *Makuhadokado* (unknown meaning), the *Sawa ' waktödö-tuviwarai* ("sagebrush mountain dwellers"), the *Kamodokado* ("jackrabbit eaters"), *Tasiget-*

tuviwarai ("between dwellers"), *Kuyuidokado* ("Kuyui black sucker eaters"), the *Küpa-dökadö* ("ground squirrel eaters"), and the *Toe-dökadö* ("tule eaters").

The *Yamosöpö tuviwarai* territory included Paradise Valley, Nevada, the Little Humboldt drainage between the Santa Rosa Mountain Range, and the land stretching from the Oregon-Nevada border south through the Osgood Mountains. The *Makuhadokado* territory bordered the Western Shoshone and included the Humboldt, Buena Vista, Pleasant, and Buffalo valleys, and the Sonoma and East ranges. The *Sawa' waktödö-tuviwarai* occupied the Winnemucca area, and their territory ranged from the Osgood Mountains and the Sonoma Mountains on the east to the Jackson Mountains on the west. The territory also included the Slumberg Hills and the Santa Rosa Mountains, which formed the boundary on the north, and Table Mountain on the south. The *Kamodokado* centered around the town of Gerlach, and their territories included the Smoke Creek and Granite Creek deserts. The *Tasiget-tuviwarai* lived in the Winnemucca Valley, and the *Kuyuidokado* centered on Pyramid Lake extending from Gerlach south to Fernley. The *Küpa-dökadö* lived in the area around Humboldt Lake where they bordered the Shoshone on the east and covered the Pahsupp, Kamma, and Majuba mountains to the Humboldt River and Sink. The *Toe-dökadö* territory included Job's Peak (Stewart 1941:135; Smith et. al. 1983:8).

Northern Paiute Subsistence and Settlement. The Northern Paiute family was considered an independent economic unit, providing subsistence through hunting and gathering activities. According to Stewart (1939), subsistence consisted primarily of plant food, and families often harvested these plants alone or possibly with one or two related families. Hunting returns often complemented plant foods and the hunts took

place during winter when certain plant resources were scarce. The Northern Paiute were known to have practiced seasonal rounds described in detail by Stewart (1939).

In early spring, as soon as the snow melted, people would join for root gatherings where they would consume buried foods from the previous year and dig roots that could be found. In early Spring, various greens and bulbous roots were gathered for the coming winter, and chokecherries were dried and then ground to be molded into cakes for the winter. Late summer activities included the gathering of crickets as well as insect larvae. Also wild seeds and berries were gathered and then ground into flour. In the fall, families would often gather for communal hunting, which often included rabbit drives, as well as the hunting of waterfowls such as mudhens, ducks, geese, and swans. Cottontail rabbits as well as other small animals were taken in snares, deer were driven into pitfalls and shot with arrows, and antelope were stalked, driven over cliffs, or herded into corrals and shot with arrows as well (Stewart 1938: 27)

The traditional dwellings consisted of conical winter houses that were constructed with willow and covered with grass or tule (Stewart 1941). Other kinds of shelters included windbreaks and sunshades and were used during the warmer months. To insure survival, groups of families usually set up dwellings near each other but remained dispersed from other groups. Although the family unit was considered the most important political unit, local groups often employed headmen (*poinabi*) to act as camp advisors (Stewart 1939).

CHAPTER 4: ARCHAEOLOGICAL AND THEORETICAL BACKGROUND

Introduction. Early studies in Great Basin archaeology were overshadowed by interest elsewhere, such as the pueblos of the Southwest, the earthen mounds in the eastern United States, and temple mounds in Central America (Beck 1999:17). The Great Basin was thought to be marginally interesting and peripheral to more attractive places such as the Southwest where extinct megafauna had been found associated with fluted projectile points, or California where cultural diversity is more visible (Fowler, D. and Jennings 1982). Despite the belief that the Great Basin was merely peripheral to the Southwest, some researchers worked hard to demonstrate the unique culture history of this region. Some of the earliest efforts were those of L.L. Loud, Mark Harrington, Luther Cressman, and Jesse Jennings, who wanted to establish a uniform chronology for the Great Basin.

The History of Great Basin Archaeology. Archaeological research in the Great Basin began in 1912 when L.L. Loud, a guard at the University of California's Museum of Anthropology, salvaged artifacts from guano miners at Lovelock Cave, Nevada (Fowler 1986:15). In 1924, Mark R. Harrington of the Heye Foundation and L.L. Loud conducted further excavation at Lovelock Cave, recovering the famous duck decoys made of tule stalks. Harrington continued his work with the excavations at the Virgin branch Anasazi complex of Lost City in southern Nevada, Mesa House, and Paiute Cave. In 1933, Harrington began a series of excavations at Gypsum Cave, Nevada, where he reported great antiquity for the "Gypsum culture" (Loud and Harrington 1929; Harrington, Hayden, and Schellbach 1930; Fowler 1986).

In 1932, Luther Cressman initiated a program of archaeological research in the Northern Great Basin (Grayson 1993). Cressman's work began with a survey of rock art and archaeology of the Guano Valley, Nevada. From 1935 through 1938, Cressman excavated a series of caves and rockshelters in the Catlow, Fort Rock, and Summer Lake basins. In 1938, Cressman discovered artifacts beneath a layer of volcanic ash. Concerned with stratigraphy, Cressman knew that cultural materials beneath the ash were older than the event during which the ash was deposited (Cressman 1942; Hurst-Thomas 1981). The relationship between the ash and cultural remains raised two questions: Where did these ashes come from and when were they deposited? As it turns out, Mount Mazama erupted several times between 6,700 and 7,000 years ago, which was clear proof of the Great Basin's long and unique culture history (Grayson 1993). Despite Cressman's evidence, his field methods were criticized and thought to be sloppy (Beck 1999; Krieger 1944a). Ethnographic researchers such as Kroeber and Steward were convinced that Great Basin cultures reflected the migration of people or traits into the region from the Southwest (Beck 1999; Steward 1940; Kroeber 1939).

Jesse Jennings, one of the most influential Great Basin archaeologists because of his careful excavation methods, helped solidify the long period of human occupation in the Great Basin with his work at Danger Cave. The combination of Cressman's date from Fort Rock Cave and Jennings's date from Danger Cave established a 10,000-year time span of human occupation in the Great Basin, setting it apart from the sequence in the Southwest (Beck 1999; Jennings 1957).

Despite the importance of Danger Cave, much of Jennings's reconstruction of Great Basin prehistory was heavily based on the ethnographies of Julian Steward.

Steward's concept of the Desert Culture was founded on a long regional culture history, which had undergone little transformation from the Pre-Archaic up to culture contact (Steward 1940). Jennings's ideas were criticized because he had not considered such factors as culture change since European contact, or climate change and local variation. Many archaeologists found it difficult to believe that the Desert Culture would be unchanged throughout a large area over a long period, and eventually Jennings himself abandoned this concept. The Desert Culture was later redefined as the Desert (or Western) Archaic (Fowler, D., and Jennings 1982; Jennings 1964, 1968, 1974).

Archaeology of the Black Rock Desert High Rock Canyon Region. Possibly the first intensive look at the Black Rock region in the Lahontan Basin was in 1968 when C. William Clewlow and Richard Cowan located several surface sites and made small surface collections. Some sites such as 26Hu17 and Hu310 contained large numbers of artifacts that were associated with the Western Pluvial Lakes Tradition (Elston and Davis 1979; Bedwell 1973; Hester 1973). According to Elston and Davis (1979), the artifacts associated with this tradition were points resembling Clovis and Borax Lake Fluted points, Black Rock Concave Base points, and crescent-shaped Great Basin transverse points. Other tools found at the sites included points resembling the Lind Coulee type from Washington (Parman Series), Northern Side-notched, Pinto, Humboldt, Elko Series, Rose Spring, and Eastgate points (Elston and Davis 1979).

After Clewlow's work in the Black Rock, both Barrel Springs and Trego Hot Springs were excavated. In 1972, Richard Cowen excavated Barrel Springs, a base camp as well as rhyolite quarry and workshop. The main component of the site dated to the Middle Archaic and there was an earlier component indicated by a Concave base point.

As part of the Bell Telephone coaxial cable construction project, James Toney (1972) excavated Trego Hot Springs, located at the southern margin of the Black Rock Desert. Although the site was never fully analyzed, unit 2 contained house floors, living surfaces, and the projectile point types included mostly Elko's. According to Elston and Davis (1972), this site contained dunes with high potential to preserve archaeological assemblages, particularly those close to other resources such as springs or streams.

Thomas Layton's work is important for the Black Rock High Rock Canyon area. He began working there in 1964 with the excavation of Smoky Creek Cave, which became his 1965 MA thesis at the University of California, Davis. In 1967, Layton located and tested several sites such as Silent Snake Springs, Little Smoky Shelter, and Hanging Rock Shelter, and he revisited and sampled Smoky Creek Cave. In 1968, intensive excavation took place at Hanging Rock Shelter and Silent Snake Springs, Last Supper Cave was mapped and tested, and surface collections were made along ancient Lake Parman (northwest of Summit Lake). Layton's last session of fieldwork in this area included working with J.O. Davis at Last Supper Cave (Elston and Davis 1972).

Layton's work from Last Supper Cave, Lake Parman, Hanging Rockshelter, Silent Snake Spring, and Calico inspired him to create a cultural chronology for the Black Rock Desert. This chronology is divided into seven phases (Layton 1970; Layton and Davis n.d.), which include:

Unnamed Early Phase: (>10,000 BP) This phase is marked by Clovis points, which are found at lower elevations adjacent to Pluvial Lake shores.

Parman Phase: (10,000-8,000 BP) The Parman phase is characterized by occupations around the margins of extinct pluvial lakes and caves in the canyons of the High Rock Country. Diagnostic artifacts include Parman and Cougar Mountain type points of the Great Basin Stemmed Series (Tuohy and Layton 1979) and Black Rock Concave Base projectile points (Clewlow 1968). The Parman phase was a period during which human populations in this area were relatively high and thought to have been supported by the abundant resources of extensive Anathermal lake and marsh environments.

Calico Phase: (8,000-7,000) The Calico Phase was defined by the Calico site, where Humboldt projectile projects dominated the assemblage. This phase is thought to be characterized by upland occupations and a decrease in lakes and marshes and population.

Silent Snake Phase: (6,000-3,500 BP) The Silent Snake Phase marks a reoccupation of the High Rock Country after a period of abandonment following the Altithermal maximum. The diagnostic artifacts include the Northern Side-notched projectile points, and manos and milling stones appear. 95% of faunal remains from the type site, Silent Snake Springs, were artiodactyls, and 85% of those were mountain sheep, indicating the importance of big-game hunting in this time.

Smoky Creek Phase: (3,500-1,500 BP) The Smoky Creek Phase marks the most intensive prehistoric occupation of the High Rock Country and Black Rock Desert. The diagnostic artifacts are Elko projectile points, and there is evidence for an increased interest in lagomorphs and decreased interest in larger ungulates including mountain sheep.

Hanging Rock Phase: (700 BP-Contact, ca. AD 1843) In this phase there is another occupation hiatus caused by a dry climate interval. The phase marks the arrival of the protohistoric Northern Paiute people into High Rock Country. Temporally diagnostic projectile points include Desert Side-notched.

Last Supper Phase: (AD 1843-AD 1920) This phase marks the decline of traditional life-ways in the High Rock Country. The Native Americans were increasingly drawn into confrontation and competition with Euro-American settlers. Diagnostic artifacts from this phase are a mixture of aboriginal and early historic artifacts, and faunal remains often include bones of horses and cows.

Radiocarbon Dates in the Black Rock High Rock Canyon Region

Introduction. The abundance of surface sites along remnant shorelines within the Lahontan basin gives few opportunities for absolute dating in this region. Therefore, while there is a consensus about the kinds of places Pre-Archaic people inhabited, the timing of their occupations remains in question. Creating a sequence of dates using "reasonably well-dated" archaeological remains of rockshelters and caves, researchers are able to understand the time at which this region was first occupied.

There is very little evidence of humans in the Lahontan basin prior to 10,800 B.P. The Fishbone Cave assemblage consists of two horse mandibles that have been AMS dated to ~11,350 and 11,200 B.P. Dansie and Jerrems (2005) claim that both mandibles have "strong evidence" of cultural modification. Not all taphonomists who have

examined the horse mandibles agree that they were positively worked by humans and a review of the original excavation revealed that Boecker and Orr's (1958) excavation field notes and various publications were not in agreement when describing provenience and association of the recovered materials. It is not impossible that this region was occupied before the Younger Dryas, but the evidence as it stands is not enough to prove it.

The next oldest site located in the Lahontan region is Handprint Cave in the Black Rock Desert. The age of this site is estimated to be 10,740 B.P., based on a date on a piece of charcoal recovered from underneath a Great Basin Stemmed point (Byran 1988:55). Unfortunately, the context of the charcoal is also not clear and the shallow, unsealed stratigraphic context suggests the charcoal and point may not be related. Found on an eroded surface near Pyramid Lake's historic lowstand (1,158 m) were two osseous points that have been directly dated to ~10,360 and 10,340 B.P. (Dansie and Jerrems 2005). One of the artifacts is interpreted as made from mammoth ivory, although it may be deer antler (G. Haynes 2008 personal communication), and the other from mammoth rib bone, but this identification is also unproven. The problem with these artifacts is that the age of the artifact dates the death of the animals, not necessarily the date of human use and deposition (Dansie and Jerrems 2005:68).

The evidence that humans occupied the Lahontan basin at the onset of the Holocene (10,000-9,100 B.P.) is plentiful. The Wizards Beach site located in the Pyramid Lake basin produced skeletal remains along with items such as sagebrush cordage, which were directly dated to ~9,600-9,100 B.P. (Tuohy 1988; Tuohy and Dansie 1997). Sites such as Shriners Site A, Chimney Cave, and Crypt Cave located on the Winnemucca Dry Lake basin produced human made textiles that have also been directly

dated to ~9,600-9,100 B.P. (Hattori 1982; Fowler et al. 2000). Located in the Carson Desert basin, Spirit Cave produced some of the more important finds in this region. The Spirit Cave mummy and Spirit Cave Cremation No. 2 and Spirit Cave Burial #1 directly dated to between ~9,500-9,000 B.P. (Tuohy and Danise 1997; Fowler et al. 2000). Another important find in this region was the Wallman bison, which was located eroding from lake deposits in the east arm of the Black Rock Desert. All of these finds suggest that this was a time of frequent human occupation in the Lahontan basin (Adams et al. 2008).

Although there appears to be a period of occupation directly following the Younger Dryas, where occupants seemed to focus primarily on wetland resources, the human use of this area seems to discontinue around ~9,000 B.P., where there is very little evidence of people. Occupations do not seem to intensify until after 7,800 yr B.P. when humans occupied caves and rockshelters as opposed to open-air sites. Some of these sites include Elephant Mountain Cave, Lake Winnemucca Cave, Guano Cave, Hidden Cave, Leonard Rockshelter, and Cowbone Cave (Heizer 1951; Orr 1956, 1974; Rozaire 1974; Hester 1972; Heizer and Hester 1978b; Thomas 1985; Hattori 1982; Connolly and Barker 2004; Dansie and Jerrems 2005). The technologies changed from those of the Pre-Archaic period, which indicates a shift in adaptive strategies and possibly the presence of a new population of the Lahontan basin (Connolly and Barker 2004).

Human Remains from the Pleistocene-Holocene Transitional Period

Introduction. Some of the most convincing forms of archaeological evidence for the peopling of the Great Basin are the human remains that have been discovered throughout the region. In fact, the Great Basin has one of the oldest and most dateable

sets of remains in North America, which have been used for reconstructing ancient human lifeways throughout this region as well as the new World in general.

Spirit Cave man is the oldest set of remains of a human found in Nevada and the oldest known mummy in North America at $9,415 \pm 25$ B.P. (Dansie 1997:5). Spirit Cave was discovered and excavated by Sydney and Georgia Wheeler in 1940, but was not dated until 1994. The Wheelers were working for the Nevada State Parks Commission doing salvage archaeology when they came upon a small shelter that contained two burials stacked on top of one another. Both burials were wrapped in split-tule and cordage matting, and above the burials were two bags that contained smaller bags and inside each was a human cremation (Dansie 1997:7). The second burial found (*Burial no. 2.*) the famous *Spirit Cave Mummy*, contained the remains of a 35-55 year old male, who was wrapped in "two large pieces of diamond-plaiting matting, and was covered with a large open-twined tule mat"(Dansie 1997:17). He had hide moccasins on his feet and was also wrapped in a rabbit-skin blanket. Other than these items there were no other diagnostic artifacts found with the mummy (Dansie 1997:18).

This burial has offered many new insights into the people of this time. The matting found wrapped around the man was made of tule, which shows that people 9,000 years ago had knowledge of wetland materials and weaving techniques, which was knowledge thought to be utilized by people who occupied this region much later. In addition, despite the great antiquity of Spirit Cave man, the remains are extremely well preserved. There was desiccated human excrement identified with certainty. This is often referred to as coprolites or paleofeces and can be unequivocally associated with the human remains of the mummy (Napton 1997:97).

Human coprolites offer a great deal of knowledge about the subsistence patterns of people during the Late Pleistocene-early Holocene in the Great Basin. In 1912, L.L. Loud found examples of desiccated coprolites during his excavations at Lovelock Cave and he observed that people had a diet of seeds, hulls, and tough plant fibers. In the 1960s at the University of California, Berkeley, investigations of coprolites revealed that L.L. Loud was correct in that the human dietary regime included fiber, seeds, fish, feathers, and wild fowl. While doing basic visual analysis of the coprolites is important, L.Kyle Napton (1997) argued that other investigations can prove much more useful. Considering the length of time it takes to study things such as DNA in fecal matter, his approach is to be very conservative until more research can be done. Visual (external) examination revealed that portions of the Spirit Cave coprolite samples are composed of dense kinds of fish bones. One of the species is probably Lahonton chub (*Sipateles bicolor*) and there are also seed fragments that appear to be bulrush (*Scirpus cf. acutus*) (Napton 1997:98). This kind of diet is consistent with the environmental context of the cave and other cave sites, because most of these early cave sites are located near the shorelines of ancient lakes (Napton 1997:100).

In 1989, the Buhl burial was discovered by the Buhl Highway District personnel, in a highway gravel quarry located in Twin Falls County, south-central Idaho. Unfortunately, the bones were displaced before the archaeologists arrived, and only a few ribs, the cranium, and the mandible were still in place. The samples were sent to University of California, Riverside, for dating and then returned to Idaho State when there was delay in the analysis. In 1991, the samples were dated with multiple AMS

measurements to an age of $10,675 \pm 95$ B.P., one of the oldest dates of skeletal remains found near the Bonneville Basin.

Morphological and anthropometric assessments of the skull and postcranial elements revealed the remains were of a 17-21 year old woman, with craniofacial attributes similar to other North American Indian and East Asian populations. The general health of the Buhl woman was determined from the dentition, which exhibited linear enamel hypoplasias (LEH) on the right mandibular canine. According to Green et al. (1998), enamel hypoplasias are defects in the enamel believed to be caused by metabolic stresses linked to disease or nutritional deficiencies. In addition, radiographic analysis showed the presence of 15 radiopaque transverse lines in the distal segment of the right femur, which are referred to as Harris lines. These lines are hypothesized to result from growth arrest episodes followed by subsequent startup of bone production (Martin et al. 1985).

Isotopic analysis of bone found that the percent value for carbon reflected a dietary dependence on continental terrestrial or aquatic resources with marine supplementation. The supplementation is probably from anadromous fish from the nearby Snake River. The best explanation for the carbon isotopic measure in the Buhl woman is that there was a substantial reliance on meat and fish resources, most likely "animals at the end of a long food chain" (Green et al. 1998:448). The supplementation of terrestrial resources by anadromous fish could explain the high nitrogen value more positive than expected from a solely terrestrial or freshwater resource base (Green et al. 1998:449).

The associated artifacts found with the Buhl skeleton are a badger baculum, one pressure flaked stemmed biface, a portion of a bone needle, and two fragments of an incised bone awl or pin. The artifacts associated with the burial illustrate one of the major issues in interpretation of subsistence strategies during the Pleistocene-Holocene transition. They do not seem to represent a wetland adaptation, yet the analysis of coprolites, the AMS dating, and the isotopic analysis support an interpretation of wetland adaptation during the late Pleistocene and early Holocene. These analytical methods have filled many gaps in the prehistoric studies of the Great Basin. Without them, the story was exclusively in the stone tools, which can often be misleading.

Models of Adaptation

Introduction. One of the overarching themes of Great Basin archaeology during the PHT is the relationship between the first occupants of this region and the role that wetlands played in their lifeways and subsistence strategies. This idea is based on the fact that sites dating from this time are situated on Pleistocene lake strand-lines or wave-cut benches, wetland margins, and pluvial lake outflow channels (Beck and Jones 1997; Beck et al. 2002; Bedwell 1973; Campbell et al. 1937; Clewlow 1968; Jones and Beck 1999; Layton 1979; Oviatt et al. 2003; Smith 2006; Willig and Aikens 1988; Wriston 2003). These sites are representative of a clear connection between Pre-Archaic peoples in the Great Basin and their use of wetland resources during this period.

Archaeological Evidence. Due to these findings, two models have been presented. The first model is that Pre-Archaic people were highly mobile people that often traveled long distances in pursuit of food and other resources. They also had a very narrow based subsistence economy (Basgall 1988). This model is maintained by the

lithic assemblages of the Pre-Archaic, which consist of small numbers of formal artifact classes (Beck and Jones 1990b, 1997; Jones and Beck 1999). Lithic sourcing is used as a means to illustrate Pre-Archaic populations traveled great distances to procure critical resources (Amick 1995, 1997; Basgall 1988, 1997; Beck et al. 2002; Elston and Zeanah 2002; Graf 2001, 2002; Jones et al. 2003; Smith 2006). The Pre-Archaic adaptation of this region seems consistent with that of other regions of North America including the Great Plains and Southwest (Amick 1997; Beck and Jones 1997; Beck et al. 2002; Elston 1986; Elston and Zeanah 2002; Jennings 1986). Because of these findings, it is realistic to conclude that Pre-Archaic populations were residentially mobile foragers that roamed the region in search of highly ranked big game and other, lower-ranked foods.

On the other hand, the few studies done of human coprolites and other archaeological residues suggest that Pre-Archaic people used plants, small mammals, birds, fish, and shellfish. They also utilized large ungulates such as antelope, mountain sheep, elk, and bison (Beck and Jones 1997; Dansie 1987; Delacorte 1999; Eiselt 1997; Elston and Zeanah 2002; Napton 1997; Pinson 1999). The subsistence remains from Pre-Archaic sites, which include large and small mammals, birds, waterfowl, fish, mollusks, roots, seeds, and berries, indicate that early-period people had diverse diets as did the ethnographically recorded peoples described in chapter 3 (Beck and Jones 1997; Bryan 1979; ; Dansie 1987, Eiselt 1997; Goebel et al. 2003; Grayson 1988, 1993; Greenspan 1990, 1994; Layton and Davis n.d.; Oetting 1994; Pinson 1999; Wriston 2003). The contrast between these remains and the apparent reliance on large-mammal-hunting suggested by the lithic record creates problems for archaeological interpretations in the Great Basin.

It is generally agreed that during the Pleistocene/Holocene transition (PHT) people in the Great Basin behaved differently than during the Archaic (Beck and Jones 1997; Jones and Beck 1999; Elston and Zeannah 2002). The early people often used similar kinds of material culture such as cordage, baskets, mats, bags, fishnets, atlatls and darts, woven fur robes, fiber sandals, skin moccasins, milling stones, and flaked stone tools, but there is a distinctive difference in the flaked stone tool technology (Beck and Jones 1997; Elston and Zeannah 2002). There was a trend for people to situate themselves in places where resources were most reliable or plentifully available. Therefore, when there was a shift in the availability or distribution of these resources there was usually a change in places occupied. In addition, a change in the kinds of resources being pursued can be seen in stone tool technology. These changes are particularly evident in the Great Basin during the PHT, because of numerous shifts in the environment, which in turn changed the availability of certain resources.

PHT Lithic Assemblages. For the most part, the lithic assemblages of the PHT in the Great Basin are similar to those of the Southwest and Plains. For example, fluted points are similar to those of the Southwest and the Great Plains, but it has been difficult to prove that they are of similar age. Therefore calling the Great Basin fluted points "Clovis" may be insupportable considering the variability in form (Grayson 1997), although it is commonly done.

In the 1930s, a detailed archaeological survey was conducted on the shores of Pleistocene Lake Mojave in southeastern California (Campbell, Crozer and Campbell 1937). This survey was done with the intent to find sites of great antiquity. The Campbells and their colleagues located a series of sites with large core and flake tools,

distinctive projectile points, and a series of objects they called "crescent stones". The projectile point were placed in two groups called Lake Mojave and Silver Lake points, which had distinct stems that were sometimes rounded. The Lake Mojave points also had stems that were distinctively longer than those on the Silver Lake points (Grayson 1997).

There are over a dozen other types of large stemmed points, which include: Cougar Mountain, Haskett, Lind Coulee, Mount Moriah, Parman, and Windust, as well as seven named varieties within some of these groups. The characteristics of these points include thick stems, a contracting base that is rounded to square, and often a distinct shoulder that separates the stem from the blade. They are similar to fluted points in that they have edges dulled by grinding. Regardless of the distinctive qualities, stemmed points are often grouped together and referred to as "Great Basin Stemmed" projectile point series (Grayson 1997).

New Archaeology in the Great Basin

Introduction. The early archaeological studies in the Great Basin often focused on rockshelters and caves in order to establish a firm chronology. Open-air sites were often ignored, since it was thought they could offer little knowledge concerning chronology, and, more specifically, evidence for the lifeways of early people in the Great Basin. By the 1960s, the focus of research changed directions and ideas concerning subsistence and settlement patterns became part of the theoretical framework of the time. This period in American archaeology has been referred to as the "explanatory period" (Willey and Sabloff 1980; 181-185). This refers to a time when trends in research were influenced strongly by Binford and associates, beginning with the article "Archaeology as Anthropology" (Binford 1962).

Reese River Valley Project. In the Great Basin, researchers such as David Hurst Thomas used this new approach in places such as the Reese River Valley Project (1971b, 1972a, 1972b, 1973, 1974). Thomas thought the Great Basin was an ideal place for "new archaeology" to be applied because the region had a long association with the paradigm of cultural ecology. Thomas' research is significant since it focuses less on chronology and more on the testing of hypotheses, sampling of archaeological data, and the study of regions rather than specific sites (Beck 1999). Thomas refined his approach and used it in the Monitor Valley, Gatecliff Rockshelter, and Alta Toquima, and also established a Great Basin projectile point chronology, which is still used today (Thomas 1981). This kind of research not only allowed for hypothesis-based archaeological studies, but it also permitted archaeologists to sample open-air sites for analysis and date them using projectile point chronologies.

The Study of Paleoindian Stone Tools. According to Kelly and Todd (1988), hunter-gatherer responses to long-term fluctuations in regional resource structure require mechanisms to cope with periodic subsistence stress. Normally the way in which groups would cope with these changes would be to move to adjacent occupied areas, or "move in with relatives" (Kelly and Todd 1988:231). Post-Pleistocene environmental changes and the low initial population of the New World did not allow for those mechanisms. According to Kelly and Todd (1988), Paleoindians sometimes behaved like tropical foragers and also like arctic collectors. Paleoindians used high quality lithic raw materials from large quarry sources, relied on a bifacial technology, made limited use of caves and rockshelters, and did little processing of food products for storage (Kelly and Todd 1988:231). These patterns are seen in Paleoindian sites all over the New World,

but there is some variation regionally regarding the tools people were producing and what they say about subsistence. Models of past lifeways are linked to explanations of the past, but a model for Paleoindian society must account for not only the similarities, but also the differences between the people that dispersed through the New World.

The Great Basin is a unique area that humans occupied for millennia and is a good example of why differences must be taken into account when reconstructing past lifeways and subsistence patterns. When examining the toolkit of the first people to enter the Great Basin, archaeologists have come up with chronologies based on tool types. While the fluted points are often diagnostic of the first people into the New World, other point styles that also may be representative of this time and place. For example, Alan Bryan (1988) has proposed that the Stemmed Point Tradition is at least as old as the Fluted Point Tradition in the Great Basin, although most researchers would not agree. The archaeological evidence from Smith Creek Cave has been interpreted to mean people made stemmed points throughout the time of the Clovis and Folsom occupation of the Great Basin (Bryan 1988:53).

Stemmed point sites in the Great Basin have provided a diverse set of associated artifacts, including the very distinctive crescents. The function of these artifacts remains unknown, but some researchers believe they were hafted at the midsection. Researchers have interpreted them as being used for cutting and scraping tools, as sickle blades, as drill bits, and even as blades mounted on throwing sticks (Grayson 1993:240-241). Most of the interpretations are based on the idea that early inhabitants were hunters. This sort of artifact class brings to the forefront an important question: how can we get at other

forms of subsistence through examination of stone tools, when the stone tools may have had multiple uses or do not clearly reveal those uses?

Determining if stone tools were used for things other than big game hunting is difficult, but by looking at the kinds of tools used and the tool stone selection some light may be shed on the mobility of early settlers (Jones et al. 2003; Beck and Jones 1990b). For example, in the article *The Three Sides of a Biface* (1988), Robert Kelly examined the use of bifaces and how they reflect human mobility and organization. He discussed the use of bifaces as cores as well as tools, where the thinning flakes removed from them are useful for certain tasks. He also saw bifaces as *long-use-life* tools, meaning in circumstances where raw material is insufficient, bifaces could be used to make flakes for various tasks over long periods of time. These function-specific tools which are part of a reliable tool kit, suggest the generalized use of certain tools in the Great Basin would be encouraged during times of abrupt climatic changes (Kelly 1988:731).

The Pleistocene Holocene Transition in the West Arm of the BRD

Introduction. It is evident that the relationship between humans and the environment they lived in during the Pleistocene Holocene transition (PHT) greatly influences archaeological studies in the Great Basin. As has been discussed the PHT marks a time of dramatic environmental shifts, but also the first human occupation into this region. While Great Basin archaeology has always been rooted in its ethnographic history, there is now a consensus that the environment during the PHT was vastly different from the one described in the ethnographic accounts. The reconstruction of human behavior during this period and the environment they utilized has been a vehicle for debate within the archaeological community. Regardless of this debate, researchers

agree that a multidisciplinary approach is an essential approach in the interpretation of these colonizing people and the land they occupied.

Environmental Issues. The environment during the PHT was vastly different from the environment around 7,500 B.P. (middle Holocene), which is why this period is thoroughly examined by researchers. The end of the early Holocene marks a major transition in many low level valleys. Although most of these transitions took place at different times, lakes and marshes slowly disappeared, groups of large mammals became extinct and so did a distinct group of artifacts that make up the Stemmed point tradition.

Researchers agree that ethnographic knowledge cannot be directly applied (Elston and Zeanah) to PHT archaeology, with the result that some major issues remain a concern. While the occurrence of most environmental shifts are agreed upon, when these shifts took place and to what extent were the environment and its people affected by them still remains in question. Reconstructing this period requires several lines of evidence, which can often be accepted by one researcher and possibly not the next. The largest issues in the debate are when this region was first occupied, and what are the similarities and differences between these occupants and other Paleoindian counterparts.

Archaeological Issues and the Occupation of the West Arm. The PHT record in the Great Basin consists mostly of surface sites that cannot be directly dated. The locations of these sites most often are on the remnant shores of ancient lakes. If the stemmed point tradition and the Clovis tradition are somehow synchronous, then it is unclear if these are left by the same people using different technologies. If they are not synchronous, then maybe the people were ancestors or descendant peoples with different

technologies, or maybe they were different people using different technologies at the same times and places.

When thinking about the Pre-Archaic sites located in my study area, (the west arm of the Black Rock Desert), some of these ideas can be examined and certain conclusions can be drawn. Unfortunately there is no way to know, without a large sample of human remains, if the people that occupied this area are the same people that used Clovis technologies in other regions. Since this is an argument which cannot be resolved, it seems futile to argue about what these people should be titled, and focus on what similarities and differences there are regionally and within the same region.

One of the major similarities between the Pre-Archaic sites in the west arm and other parts of the Great Basin is that almost all sites are located on the surface. They also include a technology similar to what is found in sites located in different parts of the region. These sites are also similar to other Great Basin Pre-Archaic sites in that they occur on remnant shorelines of Pleistocene lakes.

Examination of Lahontan Environmental History. According to Thompson et al. (1986), by 12,000 B.P. Lake Lahontan dropped by more than 100 meters and the basins were separated into many smaller subbasins. This drop could have been the environmental response to a small drought, discussed by Beck and Jones (1997). The drought was supposedly short lived, and precipitation increased by 11,300 and 10,400 B.P. (Adams and Wesnousky 1998). Both stratigraphic and geomorphic evidence for this lake level rise are reported and the elevation of Lake Lahontan is thought to be around 1235 m at this time. A beach ridge that rests at 1228 m has also been reported to date between

8,060 and 9,950 B.P. This would have been the time when people are expected to have already been present in this region.

As has been discussed in previous chapters, the low gradient of the west arm has left little to no evidence of ancient shorelines in this area. This makes it difficult for directly dating the shorelines in this basin. By using dated shorelines from other subbasins, such as WDL and Pyramid Lake, researchers have been able to estimate lake levels in the west arm. These data paired with the archaeological record can aid in our understanding of when humans first occupied the west arm and what space they utilized in conjunction with the Lahontan shoreline.

By using known and datable shorelines from WDL and Pyramid Lake, we can estimate the shoreline in the west arm was located at 1230 m around 11,000 B.P. and around 10,820 B.P. the shoreline was situated at 1212 m. Radiocarbon dates from Mazama tephra at Pyramid Lake indicate that shorelines would have descended between 8,000 and 7,000 B.P. from 1220 to 1200 m. Assuming this evidence is accurate, I think the assumption can be made that sites with Pre-Archaic components will be concentrated between 1230 and 1200 m, while later sites will probably not cluster near these elevations, but rather vary in locality.

What does this tell us about the people that once occupied the shorelines of Lake Lahontan? I think it is safe to say that these people did indeed occupy areas located closest to the Lahontan shorelines, but does this determine the kinds of resources they would have utilized? Using skeletal remains paired with location one would think that the Pre-Archaic people would have been tethered to lacustrine settings, but adding the

lithic record to the data causes some confusion. There are several schools of thought regarding the PHT dichotomy of site location and the lithic record associated with it.

One of the leading ideas is put forward by Beck and Jones (1997), which suggests fluted-point-makers were likely hunters of large terrestrial herbivores. Willig (1989, 1991) suggests that humans that first occupied the Great Basin were probably free-ranging foragers with an opportunistic diet that focused on large mammals. Haynes (2002) suggests that because of site locations, which tend to be located near pluvial lake basins, Clovis-era foragers sought abundant and diverse resources. These resources would include small and large game, birds, fish, and plant foods (Haynes 2002). While some argue for an early appearance of stemmed points (Bryan 1980), most Great Basin researchers (Mead, Thomson, and Van Devender 1982; Willig and Aikens 1988; Beck and Jones 1997) support a later use of stemmed points. These ideas are based on radiocarbon dates that place stemmed points at a date of about 10,350 (Haynes 2002; 67). Haynes (2002) also suggests that maybe there was a late or "post-Clovis backwash migration that brought fluted points into an undesirable region where surface water and marshes were abundant, but herbivore forage quality was limited" (Haynes 2002: 68). All of these positions maintain importance among current research of the Great Basin during the PHT.

Paleoindian, Paleoarchaic, or Pre-Archaic

The noticeable difference in site assemblages and faunal remains between the Great Basin and other regions has created some debate regarding the terminology for the time of first occupation within this region. Clovis technology has typically been associated with the hunting of big game; however, the lack of PHT megafauna hunting

and butchering sites and evidence that these animals survived in the Great Basin after 11,300 B.P. (Grayson 1993) make this model questionable for use in this region (Elston and Zeanah 2002). The analysis of subsistence evidence such as coprolites (Eiselt 1997; Napton 1997), as well as faunal assemblages (Beck and Jones 1997; Delacortte 1999; Pinson 1999), demonstrates a diet that includes fish, seeds, and other small animals (Elston and Zeanah 2002) after the time of Clovis, during the stemmed-point period in the Paleoindian era.

Although the technology of the PHT foragers resembles those of the Great Plains and Southwest Paleoindians, with an array of large projectile points and formal flaked tools, some researchers (Beck and Jones 1997; Jones and Beck 1999; Pinson 1999) feel that the PHT foragers show similarities to later broad-spectrum hunting and gathering. Therefore, according to them, the stemmed point foragers should be referred to by the terms Paleoarchaic or Initial Archaic (Elston and Zeanah 2002). However, Elston and Zeanah as well as others (Basgall 1988; Elston 1982, 1986a, Jennings 1986) feel that the term Paleoarchaic is not effective for describing the PHT foragers. They prefer to use the term Pre-Archaic instead to describe the unique features of PHT archaeology.

Although it would be just as appropriate to use the term Paleoindian for the PHT within my study area, the term Pre-Archaic will be used. While I believe there is no denying the fact that all Paleoindians in the New World utilized various resources other than big game, practicing a broad spectrum diet, the term Pre-Archaic seems to be a safe way of describing the small differences observed within the Great Basin archaeological record.

CHAPTER 5: METHODS AND DATA COLLECTION

This project area is located in the West Arm of the Black Rock Desert, at the northwestern corner of the Lahontan Basin between the Calico and the Black Rock mountain ranges. Survey was conducted throughout the West Arm including the valley floor on both the east side and the west side of Mud Meadow Creek at various elevations. Survey also took place at the southern end of the Black Rock Range surrounding two small playas. Survey parcels were located based on appearance of raised landforms, elevation, and location to Mud Meadow Creek.

Survey Methodology. Fieldwork was conducted by a crew of three to seven individuals spaced at 25-m intervals. Survey transects were traversed in an east-west fashion unless topography or vegetation made this task difficult. In this case north-south transects were accomplished. Orientation was maintained with a Garmin GPS, compass, as well as topographic maps to locate beginning and ending points of each transect. All prehistoric and ethnohistoric archaeological sites were recorded based on the Bureau of Land Management guidelines.

Archaeological Site Criteria. During survey an archaeological site was defined by one of the following criteria: (a) two or more pieces of debitage, (b) one or more features, (c) two or more Historic artifact such as cans, pieces of glass, ceramic, metal.

West Arm Site Types. The main goal of this thesis is to examine site distribution within the West Arm of the Black Rock Desert in relation to elevation. This is to observe if Pre-Archaic sites tend to occur around the shoreline of Lake Lahontan during the Pleistocene Holocene transition (PHT). The PHT was a time when environments were

unlike any during Ethnohistoric times. Based on archaeological evidence the subsistence strategies were different as well. For example, early assemblages consist of large projectile points and formed flake tools, while middle to late Holocene assemblages contain smaller points, smaller amounts of formal flaked tools, and an abundance of ground stone (Elston and Zeanah 2002). This suggests that early foragers emphasized hunting more than the later inhabitants of this region did.

The sites in the West Arm have been split into Pre-Archaic, Middle or Late Archaic (later Archaic), Historic, and those that are not diagnostic.

Pre-Archaic Site: A Pre-Archaic site contains two or more tools diagnostic to this period. Many of the Pre-Archaic sites in this area also contain later diagnostics; therefore, any site containing later Archaic tools as well as at least two Pre-Archaic tools (e.g., Great Basin stemmed points, Concave base points, and/or Crescents) are considered to have a Pre-Archaic component. These sites also have a large number of formal flaked tools such as bifaces.

Later Archaic Sites: Later Archaic sites contain tools diagnostic to this period, such as smaller projectile points (e.g. side-notched and corner-notched points as well as groundstone).

Historic Sites: Historic Sites contain two or more artifacts associated with the Historic period and/or a feature associated with ranching, mining, or military activities.

Non-diagnostic Sites: These sites usually contain artifacts that can not be associated with a specific period. More specifically these sites often consist of debitage, with no formal flaked stone tools.

A majority of the Pre-Archaic sites found in my research area contain later Archaic flaked stone tools as well as small amounts of Pre-Archaic tools. Sites that are considered Historic often also include Archaic components.

Isolated Find: An isolated find is any artifact including Pre-Archaic, Archaic, Historic, or non-diagnostic, which are found isolated from other artifacts by at least ten meters.

Collections

During the 2005 field season, artifacts and features encountered during the survey were analyzed in the field with exception of artifacts associated with the Pre-Archaic (e.g. stemmed points, Crescents, and concave based points), which were collected.

During the 2006 field season all tools were collected from all Pre-Archaic sites as well as a small sample of debitage (> 20 pieces), which was collected from within a one m² area within any dense concentration at the site. Several of the Pre-Archaic sites from the 2005 field season were revisited and all formal flaked stone tools were collected along with a small sample of debitage. The Pre-Archaic tools were collected for XRF analysis as well as lithic analysis such as weight and measurement, which was completed at the University of Nevada Reno Prehistoric Laboratory.

All site assemblages are archived in the Anthropology Museum at the University of Nevada, Reno.

Artifact Analysis

There was a change in my research strategy from the 2005 to the 2006 field season. My research question included: where are Pre-Archaic sites located, rather than what were the makings of Pre-Archaic assemblages; therefore limited analysis were done

during the first field season. Debitage was observed and dominant flaking stages were noted, but minimum time was spent ondebitage analysis. Collection of only Pre-Archaic tools (e.g. Stemmed Projectile Points and Crescents), took place in the 2005 field season. During the 2006 field season, entire assemblages and small samples ofdebitage were collected at sites with Pre-Archaic components. Most Pre-Archaic sites from the 2005 field season were revisited, lithic assemblages were collected, and analysis took place at the UNR Prehistoric Laboratory. All projectile points collected were then categorized according to Thomas (1981). Length, width, thickness, and weight were also recorded.

Lithic Raw Material. Lithic raw material was identified with visual identification into three categories. These include CCS or cryptocrystalline silicate (which includes chert, chalcedony, flint, and jasper), obsidian, and fine-grained volcanic rock (FGVR) (which includes basalt, andesite, rhyolite, and dacite). Additionally, a sample of artifacts manufactured on obsidian was further characterized using X-ray fluorescence (XRF) analysis, a geochemical technique.

Debitage Analysis. Debitage is described by Andrefsky (1998) as detached pieces of lithic material that were produced and discarded during the lithic reduction process. This description includes cortical spalls, flakes, retouched chips, split cobbles, and pieces of angular shatter. Lithicdebitage was classified using a standard typology developed by the Sundance Archaeological Research Fund of UNR for early period assemblages (Smith 2005a; Smith et al. 2004a). These typologies include; Surface platform preparation, number of dorsal flake scars, amount of dorsal cortex, size value, and weight. Using these attributes each piece ofdebitage was placed into typological

categories. For most sites, this was done in the field with a sample of approximately 100 pieces of debitage. Lab analysis included the (>20) flakes collected in the field.

Using the previous attributes, each piece of debitage was placed into a specific category. The typological categories include unidentified cortical spall, primary cortical spall, secondary cortical spall, flake, flake fragment, biface thinning flake, retouched chip, retouched chip fragment, overpass flake, angular shatter, and split cobble

Tool Analysis

Lithics from the West Arm sites were analyzed using criteria based on the previous work of researchers in the Great Basin and the Sundance Archaeological Research Fund of UNR created specifically for Pre-Archaic artifacts (Smith 2005a; Smith et al. 2004). Bifaces are defined as any tool or tool fragment that exhibits flaking on both sides (Andrefsky 1998; Kelly 2001; Odell 2004) and are divided into two classes according to the "presence/absence of a hafting element (e.g., stems, shoulders, notches, ground edges)" (Smith 2005; 50). Unifaces are defined as "any tool or tool fragment that exhibits flaking on a single face" (Smith 2005; 50) and are divided into several classes based on morphological variables. The tool classes include; Hafted Biface, Unhafted Biface, Side Scraper, End Scraper, Graver, Notch, Backed Knife, Retouched Flake, and Combination Tool.

Hafted Biface types that are Pre-Archaic have been previously defined (Smith 2005; Beck and Jones 1997; Butler 1961, 1965; Clewlow 1968; Layton 1970, 1972, 1979; Leonardy and Rice 1970; Tadlock 1966). They include Black Rock Concave Base Projectile Point, Parman Stemmed Projectile Point, Cougar Mountain Stemmed Projectile

Point, Windust Stemmed Projectile Point, Haskett Stemmed Projectile Point, Cascade Projectile Point, and Crescent.

All later Archaic projectile points are defined by Thomas (1981). They include: Large Side-Notched Projectile Point, Humboldt Concave Base Projectile Point, Gatecliff Split Stem Projectile Point, Elko Corner-Notched Projectile Point, Elko Eared Projectile Point, Rosegate Corner-Notched Projectile Point, and Desert Side-Notched Projectile Point. Pieces of projectile points that can not be recognized due to size, re-working, or wear are defined as: Undiagnostic Projectile Point Fragment, Undiagnostic Notched Projectile Point Fragment, Undiagnostic Corner-Notched Projectile Point Fragment, and Undiagnostic Stemmed Projectile Point Fragment. Bifaces with no hafting element include: Early-Stage Biface, Mid-Stage Biface, Late-Stage Biface, and Finished Biface.

All groundstone was analyzed in the field. Groundstone was typed according to inferred use (e.g., pestle, handstone, millingstone). Each groundstone specimen was measured for length, width, and thickness, and material type, if known, was noted. Pestles were described and the number of used surfaces was often noted. Some groundstone was photographed.

All of the Historic artifacts and features were analyzed in the field. For cans a base diameter and height was taken in inches. Manufacturing techniques (e.g., side seams) were noted on specimens that were intact. Other Historic artifacts and features were described and illustrated or photographed.

Obsidian Sourcing

The post-field analysis of artifacts was aimed at finding the distance of raw material sources from the archaeological sites and the direction from which these raw

materials came from. All obsidian artifacts (n=50) associated with the Pre-Archaic were submitted to Craig Skinner at Northwest Obsidian Research Laboratories for XRF analysis (see Appendix B). Results from this analysis are discussed further in Chapter 7.

**CHAPTER 6:
MATERIALS
PRE-ARCHAIC SITES IN THE WEST ARM OF THE BLACK ROCK DESERT,
NEVADA**

Introduction. The next two chapters describe the materials discovered during my fieldwork, and places them in the context of knowledge about the study area and Great Basin in general.

The main goal of this fieldwork required the collection of two types of information. The archaeological sites along with their geographic location is the first data set to be examined. The second set includes the lithic assemblages from all Pre-Archaic sites and more specifically the tools that are diagnostic to this period in the Lahontan Basin.

Site Locations and Elevations. Materials for the spatial analysis consist of 101 (of 103) archaeological sites that were recorded during the 2004-2006 field seasons (Table 1). The sites are located in a variety of places throughout the West Arm of the BRD and the surrounding mountains, at various different elevations.

The West Arm research executed during the 2004 field season began with survey in Box Canyon, which is located in the northwest corner of the West Arm. There are 13 sites (BC 1-12 and RS 1) located in this survey area, which are all located within survey Parcel 1 (2003). Two of the 13 sites in this survey parcel are diagnostic to the Late Archaic with the remainder of sites being non-diagnostic lithic scatters. The sites are located between 1390 m and 1435 m in elevation (Smith et al. 2004).

The second group of sites occur on the valley floor of the West Arm. There were a total of four parcels surveyed (Parcels 2-5) and 18 sites located and recorded (Mud 1-6

and 8-19). Six of the sites located during this survey have Pre-Archaic components, while five sites contain artifacts associated with the Archaic period and the remaining seven sites are non-diagnostic lithic scatters. The elevation of these sites is between 1211 m and 1231 m.

During the 2005 field season survey was conducted along the east and west side of Mud Meadow Creek (MMC), which rests on the valley floor of the West Arm. Knowing that Pre-Archaic sites had been located in the MMC area between 1210 and 1230 m in 2004, survey was conducted in the same area to see if more Pre-Archaic sites could be located. There were four parcels (Parcels 1-4, 2005) surveyed and 21 sites recorded (BRD 1-21). Five have Pre-Archaic components. All of these sites are located between 1216 m and 1230 m. Of the remaining sites, 11 are non-diagnostic, one is Historic, and four are associated with the later Archaic. During this field season, survey was also conducted at the southern end of the BRD, near Trego Hot Springs, as part of a salvage archaeological project (Parcel 4, 2005). This survey took place because artifacts had been recovered from the dunes, one being a small stemmed point. These two sites are mentioned throughout this paper, used in some tables as data collected, but not used in the spatial analysis. Of the Trego sites (Trego-1, 2), one is associated with the Pre-Archaic and the other has a Later Archaic component.

During the 2006 field season our goal was to survey in close proximity to some of the previously recorded Pre-Archaic sites and survey above and below these sites to determine if Pre-Archaic people focused their activities on a specific elevation or landforms or if they had no preference and occupied various different areas within the West Arm. We also wanted to find sites located on raised landforms at various

elevations, similar to those found in the Old River Bed of the Bonneville Basin discussed in Oviatt et al. (2003).

Surveys began with the exploration of the areas surrounding two small playas located at the southern end of the Black Rock Mountain range on the east side of the West Arm. We also surveyed the southern tip of the Black Rock Mountains where the 'Black Rock' is located after which the desert is named. A BLM employee discovered a Haskett projectile point during a visit to this location; therefore, there was high potential for sites with Pre-Archaic components. There were four parcels surveyed in this area (Parcel 5, 6, 13, 15) and nine sites located and recorded (BRP 2-6 and Playette 1-4), eight of which are non-diagnostic lithic scatters and one has an Archaic component. There were no sites in this area with Pre-Archaic components. The elevations of these sites are between 1275 m and 1310 m.

The next parcel surveyed (Parcel 7) is located between the Mud sites recorded in 2004 and the BRD sites surveyed during the 2005 field season. This location was revisited again to locate Pre-Archaic sites, which are clustered in this general area. There were nine sites recorded (Flowing Springs 1-9) within this parcel. Four of the nine sites contained Pre-Archaic tools in the assemblages, one site had a Late Archaic component, and the remaining four are non-diagnostic lithic scatters. The Flowing Springs sites are located between 1211 m and 1224 m.

Survey Parcel 8 includes the Willow Creek sites (WC 1-7), which are located southeast of Box Canyon on the west and east side of MMC. WC-3 has one Black Rock Concave point base. Three of the sites date to the Archaic period and three are non-

diagnostic lithic scatters. All of the Willow Creek sites are located at elevations between 1249 m 1267 m. WC-3 is located on large raised landform on the east side on MMC.

The Wheeler Springs parcel (Parcel 9) is located northeast of Box Canyon, east of Wheeler Spring, and east of MMC. There were three sites recorded in this parcel, two of which contain projectile points associated with the Archaic. These sites are located at elevations between 1277 m and 1302 m.

The Jackass Flat sites are located to the west of MMC and within close proximity to a hot spring. Two parcels were surveyed (Parcel 10 and 11) and nine sites were recorded (JAF 1-9) to the east and west of the hot spring. One site dates to the Pre-Archaic and one dates to the Archaic. The remainder of the sites are non-diagnostic lithic scatters. The Pre-Archaic site (JAF-4) is located to the west of two small playas. The sites rest at an elevation of between 1208 m and 1214 m.

Survey Parcel 12, which is located on a raised landform to the east of Box Canyon, contained two sites, both non-diagnostic lithic scatters. These sites are at an elevation of between 1274 m and 1281 m.

Survey Parcel 13 is located north of Double Hot Springs and to the east of MMC. Eleven sites (DH 1-11) were recorded during this survey. There were no sites associated with the Pre-Archaic, but one Crescent was located within this parcel, an artifact often diagnostic to this period. Eight of the 11 archaeological sites are non-diagnostic lithic scatters, while three have Middle and Late Archaic components. These sites are located between 1196 m and 1212 m in elevation.

Lithics in this study were gathered from chipped stone assemblages from 17 sites, located during pedestrian surveys in the West Arm of the Black Rock Desert in

northwestern, Nevada. These surveys resulted in the discovery and recording of 103 archaeological sites (Table 1) and 76 isolated finds, of which only a few will be discussed in detail. The 17 sites used in this study, referred to as the Mud Meadow Creek sites (MMC sites), contained small numbers of Great Basin Stemmed projectile points, Black Rock Concave Base projectile points, crescents, and other lithic artifacts diagnostic of Pre-Archaic occupations in the Great Basin. Trego-1 contained one single stemmed point, but will not be discussed in this study due to its distant location from the MMC sites. There are no dates obtained for these sites, but based on other sites in this area that have been radiocarbon dated, the sites probably date to ca. 11,500 to ca. 7,500 B.P. (Bedwell 1973; ; Gruhn and Bryan 1988; Hanes 1988; Layton 1970, 1979; Layton and Davis n.d.).

The materials from these sites were analyzed to answer questions regarding the Pre-Archaic occupation of this region and more specifically of the West Arm of the Black Rock Desert. Several concepts were utilized in order to get at questions regarding settlement systems and hunter-gatherer mobility during the Pre-Archaic. The location of these Pre-Archaic sites in comparison to the Younger Dryas shorelines in the Lahontan Basin can answer questions about what places people preferred to occupy during this time. While my analysis of the lithic assemblages has not revealed what non-lithic resources were being utilized, they can give insight into technological organization and how it relates to hunter-gatherer mobility. In addition, the use of X-ray fluorescence (XRF) analysis makes it possible to look at the distance which people were traveling to acquire specific raw materials.

Pre-Archaic Site Descriptions

Geographic Setting. All of the sites defined in this study as Pre-Archaic are lithic scatters situated in the valley floor of the West Arm of the Black Rock Desert. The West Arm is located between the Calico mountain range to the west and the Black Rock mountain range to the east. These sites are near Mud Meadow Creek, which is a south-trending drainage and the nearest permanent water source. These sites are between 1189 m (3990 feet) and 1232 m (4040 feet) in elevation.

These sites are within the Upper Sonoran vegetation zone, where the vegetation consists of mainly *Sarcobatus vermiculatus* (greasewood), *Atriplex confertifolia* (shadscale), and *Achnatherum hymenoides* (Indian ricegrass). Also seen is some *Distichlis spicata* (salt grass), *Bromus tectorum* (cheat grass), *Artemisia spinescens* (budsage), and *Grayia spinosa* (hopsage). Riparian plants occur at sites close to Mud Meadow Creek.

The sediments near Mud Meadow Creek are characterized by soil lacking an A horizon and having a weakly developed Bk horizon. Occasionally clusters of sand dunes and desert pavement are found. In addition, raised areas covered with gravels were observed in the study area. The margins of the valley floor are typically made up of heavily weathered alluvial fans, dissected by numerous drainages. Mud Meadow Creek itself consists of numerous meandering channels. Most of these channels (both current and remnant) are deeply incised (up to ca.1 m) into the valley floor.

Further descriptions of these sites and IF (Isolated Finds) will be presented in the following chapters. Locations of the Mud Meadow Creek sites in conjunction with the Younger Dryas shoreline will be discussed, and the XRF data will be described.

Table 1. List of Archaeological Sites from the 2004, 2005, 2006 field seasons.

Field Season	Site Name	Elevation	Pre-Archaic	Archaic	Historic	Non-diagnostic
2004	Box-1	1435 m		DSN		
	Box-2	1435 m				LS
	Box-3	1432 m				ND PPT
	Box-4	1432 m				LS
	Box-5	1435 m		RS		
	Box-6	1435 m				ND PPT
	Box-7	1435 m				LS
	Box-8	1438 m				LS
	Box-9	1405 m				LS
	Box-10	1402 m				LS
	Box-11	1281 m				LS
	Box-12	1274 m				LS
	RS-1	1437 m				LS
	Mud-1	1225 m	GBSP			
	Mud-2	1225 m				LS
	Mud-3	1223 m				ND PPT
	Mud-4	1223 m		EE PPT		ND PPT
	Mud-5	1223 m				ND PPT
	Mud-6	1225 m	GBSP			
	Mud-8	1228 m	GBSP			
	Mud-9	1226 m				LS
	Mud-10	1225 m		EE/RS PPT		
	Mud-11	1228 m	GBSP			
	Mud-12	1213 m				ND PPT
	Mud-13	1213 m	Crescent			
	Mud-14	1211 m				LS
	Mud-15	1211 m		ECN PPT		
	Mud-16	1213 m	GBSP/Crescent			
	Mud-17	1228 m				LS
	Mud-18	1228 m		GCSS/RS PPT		
	Mud-19	1231 m		EE PPT		
2005	BRD-1	1225 m				LS
	BRD-2	1227 m				LS
	BRD-3	1228 m			Historic	
	BRD-4	1228 m				LS
	BRD-5	1230 m				LS
	BRD-6	1227 m		DSN PPT		
	BRD-7	1227 m				ND PPT
	BRD-8	1230 m				LS
	BRD-9	1224 m				LS
	BRD-10	1222 m				LS
	BRD-11	1216 m	Crescent			
	BRD-12	1216 m				LS
	BRD-13	1222 m				ND PPT

	BRD-14	1219 m				ND PPT
	BRD-15	1215 m	GBSP			
	BRD-16	1216 m	GBSP			
	BRD-17	1219 m		Humboldt		
	BRD-18	1219 m		Humboldt/RS PPT		
	BRD-19	1223 m		Humboldt/EE PPT		
	BRD-20	1229 m	Windust/GBSP			
	BRD-21	1229 m	GBSP			
	Trego-1	1219 m	GBSP			
	Trego-2	1219 m		EE/RS PPT		
2006	BRP-2	1298 m				LS
	BRP-3	1309 m				LS
	BRP-4	1293 m				LS
	BRP-5	1310 m		GCSS PPT		
	BRP-6	1275 m				LS
	Playette-1	1310 m				LS
	Playette-2	1310 m				LS
	Playette-3	1310 m				LS
	Playette-4	1310 m				LS
	FS-1	1219 m	GBSP			
	FS-2	1214 m	GBSP			
	FS-3	1214 m				LS
	FS-4	1222 m				LS
	FS-5	1224 m				LS
	FS-6	1213 m	GPSP			
	FS-7	1224 m				LS
	FS-8	1222 m	GBSP			
	FS-9	1224 m				LS
	WC-1	1267 m		DSN PPT		
	WC-2	1257 m				LS
	WC-3	1264 m	BRCB			
	WC-4	1265 m				LS
	WC-5	1249 m				LS
	WC-6	1259 m		Humboldt/RS PPT		
	WC-7	1258 m		Humboldt/EE PPT		
	WS-1	1277 m		EG/RS PPT		
	WS-2	1277 m				ND PPT
	WS-3	1302 m		LSN PPT		
	JAF-1	1210 m		RS PPT		
	JAF-2	1210 m				LS
	JAF-3	1208 m				LS
	JAF-4	1209 m	GBSP			
	JAF-5	1210 m		RS PPT		
	JAF-6	1211 m				ND PPT
	JAF-7	1211 m				LS
	JAF-8	1214 m				LS
	JAF-9	1211 m				LS

	BC-1	1281 m				LS
	BC-2	1274 m				LS
	DH-1	1212 m				LS
	DH-2	1205 m				LS
	DH-3	1196 m				ND PPT
	DH-4	1196 m				LS
	DH-5	1196 m		Humboldt		
	DH-6	1203 m				LS
	DH-7	1203 m				LS
	DH-8	1212 m				ND PPT
	DH-9	1200 m		Humboldt		
	DH-10	1196 m		RS PPT		
	DH-11	1202 m				LS

BRCB (Black Rock Concave Base), DSN (Desert Side-notched), ECN (Elko Corner-notched), EE (Elko-eared), EG (East Gate), GBSP (Great Basin Stemmed Point), GCSS (Gatecliff Split-stem), LSN (Large side-notched), LS (Lithic Scatter), PPT (Projectile Point), RS (Rose Spring). * Trego-1 is not used in this analysis due to its location

CHAPTER 7: RESULTS

Introduction. This chapter focuses on the results from archaeological survey and analysis conducted over three field seasons (2004-2006) in the West Arm of the Black Rock Desert, Nevada. Several sites that were located and recorded are not used in this particular study. Sixteen sites can be deemed valuable to answer certain research questions. All of the archaeological sites that pertain to this research (Table 2) either contained tools diagnostic to the Pre-Archaic such as stemmed projectile points or crescents, or include information pertinent to human behavior during this time.

Table 2. Pre-Archaic sites from the West Arm of the Black Rock Desert, Nevada (Study Area).

Field Season	Site Name	Elevation	Pre-Archaic Tool Type
2004	Mud-1	1225 m	GBSP
	Mud-6	1225 m	GBSP
	Mud-8	1228 m	GBSP
	Mud-11	1228 m	GBSP
	Mud-13	1213 m	Crescent
	Mud-16	1213 m	GBSP/Crescent
2005	BRD-11	1216 m	Crescent
	BRD-15	1215 m	GBSP
	BRD-16	1216 m	GBSP
	BRD-20	1229 m	Windust/GBSP
	BRD-21	1229 m	GBSP
2006	FS-1	1219 m	GBSP
	FS-2	1214 m	GBSP
	FS-6	1213 m	GPSP
	FS-8	1222 m	GBSP
	WC-3	1264 m	BRCB
	JAF-4	1209 m	GBSP

GBSP (Great Basin Stemmed Point), BRCB (Black Rock Concave Base), m (meters)

Most of the Later Archaic sites that were located and recorded remain intact for future research. While lithic assemblages were collected at most Pre-Archaic sites, some

were not collected based on changes in research strategies over the three field seasons. There are a few sites (Mud-1, Mud-11, Mud-13, BRD-11, BRD-15 and BRD-16) that do not contain as much information, specifically tool measurements, to discuss with the same detail as others (Mud-6, Mud-8, and Mud-16, BRD-20, BRD-21, FS-1, FS-2, FS-3, FS-6, FS-8, JAF-4, and Trego-1). It should also be noted that FS-3 (Flowing Springs-3) is not technically a Pre-Archaic site. Its location relative to other Pre-Archaic sites as well as the presence of an obsidian split cobble made this a good site to collect obsidian for XRF sourcing.

The following section will discuss the Pre-Archaic sites located and recorded during the 2004 field season. As mentioned above, collection of tools as well as a detailed debitage count did not take place at all of these sites. Therefore, the information obtained is limited in some cases, but encompasses details pertinent to my study.

Mud Meadow Creek Sites, 2004 Field Season

Mud-1 (CrNV-21-7771). Mud-1 is a small and sparse (maximum density 5 lithics/m²) prehistoric lithic scatter that is within survey Parcel 2 (2004 survey). This site is situated among low-lying transverse dunes to the west of Mud Meadow Creek. The site is at an elevation of 1225 m (4020 feet) and the site area is about 4,358 m². The site has a slope and aspect of 0°.

Mud-1 can be considered a Pre-Archaic site, based on the presence of one Great Basin Stemmed projectile point fragment. The other tools observed at this site include five bifaces and one retouched flake. There were approximately 25-100 pieces of lithic debitage observed. There were no cores seen. The dominant raw material is CCS, which is a local raw material that has been observed throughout the study area. All of the lithic

tools were manufactured on this material, but the debitage is equal amounts of CCS and obsidian.

Mud-6 (CrNV-21-7776). Mud-6 is a large, but sparse (maximum density 3/m²) prehistoric lithic scatter in survey Parcel 3 (2004 survey). The site is south of Wheeler Reservoir and immediately east of Mud Meadow Creek. The site rests at an elevation of 1225 m (4020 feet) and has a slope of 0°. The site area was not recorded.

Two tools suggest Mud-6 is a Pre-Archaic site: two Great Basin Stemmed projectile point fragments. Other tools observed and recorded include: four Humboldt projectile points, two Elko-eared projectile points, three non-diagnostic projectile point fragments, and one corner-notched projectile point. The bifaces observed include one late-stage biface, four mid-stage bifaces, and one early-stage biface. Also recorded was one mano, one retouched flake, and three cores. There were approximately 100-500 pieces of lithic debitage.

Obsidian and CCS are the dominant materials at Mud-6, with very little FGVR (Fine-Grained Volcanic Rock). A majority of the lithic tools other than debitage were manufactured on obsidian (n=17), with some CCS (n=5), and one tool of FGVR. The debitage is both obsidian and CCS that is tan, red, and white.

Mud-8 (CrNV-21-7777). Mud-8 is a small and sparse (maximum density 5/m²) prehistoric lithic scatter located atop a slight rise to the east of Mud Meadow Creek. This site is in Parcel 3 and rests at an elevation of 1228 m (4030 feet). It rests on rounded gravels, which could represent the remnants of Lahontan beach deposits. The area of the site is 27,563 m² and the site has a slope of 0°.

This site can be dated to the Pre-Archaic based on lithic cross-dating. The diagnostic tools that represent the Pre-Archaic are two Great Basin Stemmed projectile points and one possible projectile point fragment. One Northern Side-notched projectile point represents the Early Archaic and there are also three non-diagnostic projectile point fragments. Other tools include two early-stage bifaces and two retouched flakes. There were 25-100 pieces of debitage.

Obsidian and CCS are the dominant raw material types present in the debitage at Mud-8. The tools other than lithic debitage are primarily manufactured on obsidian (n=9), with very little CCS (n=1).

Mud-11 (CrNV-21-7780). Mud-11 is a sparse (maximum density 5/m²) prehistoric lithic scatter that is not within a survey parcel, but rather on a notable land formation. This site is atop a slight rise west of Mud Meadow Creek. The site rests on rounded gravels, which may represent Lahontan beach deposits (Smith et al. 2005). The site is located at an elevation of 1228 m (4030 feet) and the site area is about 41,024 m². The site has a slope of 0°.

Mud-11 can be considered a Pre-Archaic site based on the presence of six Great Basin Stemmed projectile points. The other tools observed at this site include: one Humboldt projectile point, two non-diagnostic obsidian projectile points, one retouched flake, two scrapers, and three cores. The bifaces recorded include one early-stage biface, six mid-stage bifaces, three late-stage bifaces, and two finished bifaces. There were approximately 100-500 pieces of lithic debitage observed. The dominant raw materials at Mud-11 are obsidian and CCS; although a majority of the lithic tools were manufactured

on obsidian (n=21), and much fewer were made on CCS (n=3) and FGVR (n=3). The lithic debitage was a mixture of obsidian and CCS.

Mud-13 (CrNV-21-7782). Mud-13 is a sparse (maximum density 1/m²) prehistoric lithic scatter in survey Parcel 4 (2004 field season). The site rests on the valley floor and is bisected by Mud Meadow Creek. It rests at an elevation of 1213 m (3980 feet) and is 12,571 m² in area with a slope of 0°. There is also a dense (maximum density 10/m²) and spatially discrete lithic reduction area (Concentration-1) located at the southeastern edge of the site on the west side of Mud Meadow Creek. Most of the lithic debitage is in this area.

Mud-13 is considered a Pre-Archaic site based on the presence of one crescent. Other than the crescent, the only other lithic tool observed was one early-stage biface. There were approximately 25-100 pieces of debitage observed. There were no cores observed at this site. There seems to be an equal amount of obsidian and CCS among the debitage. The lithic tools other than debitage were both manufactured on CCS.

Mud-16 (CrNV-21-7785). Mud-16 is a large, but sparse (maximum density 5/m²) lithic scatter on the valley floor of the West Arm to the Black Rock Desert. The site is in Parcel 4 (2004 field season) and rests at an elevation of 1213 m (3980 feet). The site is approximately 43,671 m² in area and has a slope of 0°. Mud-16 is situated just east of Mud Meadow Creek.

Mud-16 can be considered a Pre-Archaic site based on two Great Basin Stemmed projectile points and one crescent. Early to Middle Archaic tools include one Humboldt projectile point. There is one Rose Spring projectile point representing the Late Archaic period. Bifaces include three late stage bifaces, one mid-stage biface, and one early stage

biface. Other tools include three scrapers and one retouched flake. There were three cores recorded as well.

Similar to many other sites, both obsidian and CCS dominate the assemblage. Most of the lithic tools other than the debitage are obsidian (n=9), with some CCS (n=7), as well as FGVR (n=1). The CCS at this site is tan in color, which has been seen in this region before as an abundant local material. There were approximately 200 pieces of lithic debitage observed.

Pre-Archaic sites from the 2005-2006 Field Seasons

The following sites were located and recorded during the summer field seasons of 2005-2006. All of the sites are within the Mud Meadow Creek research area and contain one or more tools that date to the Pre-Archaic.

BRD-11 (CrNV-22-8111). BRD-11 is a large and dense (maximum density 50/m²) prehistoric lithic scatter in survey Parcel 3 (2005 field season). The site rests between two tributaries of Mud Meadow Creek, which looks to be a flood plain of the creek. BRD-11 rests at an elevation of 1220 m (4005 feet) and is 41,783 m² in area with a 0° slope.

BRD-11 is considered a Pre-Archaic site based on the presence of one crescent. There were no other Pre-Archaic tools observed at this site. Other lithic tools other than debitage included: two Humboldt projectile points, one Elko projectile point fragment, one Elko-eared point fragment, one non-diagnostic projectile point base and four non-diagnostic projectile point fragments. The bifaces and biface fragments include one finished biface fragment, one finished biface midsection, five late-stage biface fragments, one mid-stage biface, one mid-stage biface fragment, five early-stage bifaces, and three

early-stage biface fragments. There were also six cores observed and two retouched/utilized flakes. There were approximately 500 pieces of debitage at this site.

Both obsidian and CCS dominate the debitage at BRD-11, with the presence of some FGVR. On the other hand, obsidian seems to be the dominant material among tools other than debitage (n=18), with CCS also present (n=15), and some FGVR (n=3).

BRD-15 (CrNV-22-8115). BRD-15 is a small but dense lithic scatter (maximum density 30/m²). The site is within survey Parcel 3 (2005 field season) and is approximately 6,597 m² in area. BRD-15 rests at an elevation of 1215 m (3,986 feet) and has a slope of 1°.

There were 57 lithic artifacts observed at this site, not including debitage. BRD-15 is a Pre-Archaic site based on the presence of one Great Basin stemmed point. Some of the other projectile points include one Northern Side-notched, one Rose Spring, and one Humboldt.

Other tools include one side-scraper, three finished bifaces, eighteen late-stage bifaces, one late-stage biface fragment, eight mid-stage bifaces, two mid-stage biface fragments, six early-stage bifaces, three retouched flakes, and one polished stone. The grinding stone implements include one mano fragment and six metates. There were between 100 and 500 pieces of debitage observed. CCS is the dominant lithic raw material at BRD-15 with 70% of the debitage and a large number of the tools (n=25) being CCS. Approximately 30% of the debitage is obsidian with a good amount of the tools manufactured on obsidian as well (n=22). There are a few tools manufactured on FGVR (n=3), one on rhyolite, and six tools are manufactured on unknown materials.

BRD-16 (CrNV-22-8116). BRD-16 is a large but sparse lithic scatter (maximum density 6/m²). This site is within survey Parcel 3 (2005 field season) and is approximately 50,265 m² in area. BRD-16 rests at an elevation of 1216 m (3990 feet) and has a slope of 0°.

There were 53 lithic artifacts observed, not including debitage. BRD-16 is considered a Pre-Archaic site based on the presence of one Great Basin stemmed point. Some of the other projectile points include: one Gatecliff split stemmed, two Northern Side-notched, one Humboldt, and two Rose Spring. Other tools include one non-diagnostic projectile point, one preform, one side-scraper, one end-scraper, one knife, one graver, one biface, eight late-stage bifaces, six mid-stage bifaces, five early-stage bifaces, seven retouched flakes, one tested cobble, four manos, three metates, and two metate fragments. There were also two cores and one core fragment observed. There were between 100 and 500 pieces of lithic debitage observed.

BRD-20 (CrNV-22-8120). BRD-20 is a large and dense prehistoric lithic scatter (maximum density 50/m²). BRD-20 is similar to Mud-8 and Mud-11 in that it rests atop a slightly raised area, which has the presence of rounded gravels, possibly relating to a Lahontan beach feature. The site is within survey Parcel 3 (2005 field season) and is approximately 15,708 m² in area. BRD-20 rests at an elevation of 1229 m (4,033 feet) and has a 1° slope.

There were 111 lithic artifacts observed at this site, not including debitage. BRD-20 is a Pre-Archaic site based on the presence of a Black Rock Concave Base projectile point, two Windust projectile points, and eight stemmed point bases. Some of the other projectile points include six Humboldt projectile points, six Humboldt projectile point

bases, one Humboldt point fragment, three Elko-eared points, one Elko-eared fragment, and eleven non-diagnostic projectile points.

Other tools include six scrapers and one graver. Bifaces observed include the following: nine biface fragments, 12 early-stage bifaces, two early-stage biface fragments, seven mid-stage bifaces, eight mid-stage biface fragments, four late-stage bifaces, and eight mid-stage biface fragments. There were also 11 utilized flakes, and one manuport. There were over 500 pieces of debitage observed. Six cores were observed as well.

Obsidian is the dominant raw material present at BRD-20. The large majority of debitage as well as lithic tools (n=92) were manufactured on obsidian. There was a small amount of CCS (n=11), and very little FGVR (n=7) and quartzite (n=1).

BRD-21 (CrNV-22-8121). BRD-21 is a large and dense (maximum density 35/m²) prehistoric lithic scatter on a raised land feature between two tributaries of Mud Meadow Creek. Similar to BRD-20, BRD-21 has rounded gravels that could be Lahontan beach features. This site is within survey Parcel 3 (2005 field season) and is 47,124 m² in area. The site sits at an elevation of 1229 m (4,033 feet) and has a slope of 1°.

A total of 61 lithic artifacts were recorded at this site, which include a variety of projectile points, bifaces, some grinding stones, and cores. The Pre-Archaic projectile points include: one Great Basin Stemmed point, three Great Basin Stemmed point bases, one Great Basin Stemmed point fragment, and two possible stemmed point fragments. Other projectile points observed were one Gatecliff Split-stem point, two Humboldt points, one Humboldt point base, one Northern Side-notched point, two non-diagnostic

notched point fragments, and three non-diagnostic projectile point fragments. Some of the other tools include four graters, three side scrapers, and one knife.

A good sample of bifaces includes: three finished bifaces, one finished biface fragment, two late-stage bifaces and two late-stage biface fragments, nine mid-stage bifaces, three early-stage bifaces and one early-stage biface fragment. Also present were eight retouched/utilized flakes, and four possible grinding stone implements, which include two possible mano fragments and two possible metate fragments. Over 500 pieces of debitage were present. There were just two cores recorded.

The debitage seems to be mostly manufactured on CCS, with some obsidian and FGVR. A majority of the tools recorded are manufactured on obsidian (n=33) and CCS (n=19), and some FGVR (n=8).

Flowing Spring-1 (CrNV-22-8189). FS-1 is a large, but sparse (maximum density 10/m²) prehistoric lithic scatter located to the west of Mud Meadow Creek, in the West Arm of the Black Rock Desert. This site rests on both low silty sediments and some raised areas that have the appearance of rounded gravels. The site is in survey Parcel 7 (2006 field season), and rests at an elevation of 1219 m (4,000 feet) with a slope of 1.2°. The site area was not recorded.

Thirty-seven lithic tools were observed at this site, which include a variety of projectile points, bifaces, scrapers, and cores. The site is considered Pre-Archaic based on the presence of 11 stemmed projectile points. These projectile points include: five GBSP bases, four stemmed point fragments, and one Parman point. Other points include: two Humboldt points, three Elko Eared points, one Elko corner-notched point, and five non-diagnostic projectile point fragments. The bifaces include one early-stage biface,

one mid-stage biface, two late-stage bifaces, one finished biface, and two biface fragments. Other tools recorded consist of one side-scraper, one notched flake, six retouched/utilized flakes, and one core.

Over 500 pieces of debitage were observed at this site, manufactured on both CCS and obsidian. A majority of the tools other than debitage were made of obsidian (n=26), with the remainder made on CCS (n=10). Tertiary flakes were the most common flake type at this site.

Flowing Springs-2 (CrNV-22-8190). Flowing Springs-2 (FS-2) is a large (157, 080 m²) (maximum density 25/m²) prehistoric lithic scatter to the east of Mud Meadow Creek within survey Parcel 7 (2006 field season). The elevation at this site is 1214 m (3,983 feet) and it has a slope of 2.9°. Similar to Flowing Springs-1, this site is mostly salt-crusted silt with some raised areas covered in rounded gravels.

Thirty-two lithic tools were recorded, which include projectile points, bifaces, scrapers, and utilized flakes. FS-2 is considered a Pre-Archaic site based on the appearance of two Great Basin stemmed points and one crescent. Other projectile points include one Humboldt point, one Large Side-notched point, and four non-diagnostic projectile point fragments. The bifaces include three finished bifaces, 13 biface fragments, one mid-stage biface, and one early-stage biface fragment. Other tools consist of one scraper, one graver, and four retouched utilized flakes.

There were over 500 flakes at FS-2, most of which are tertiary flakes. The dominant raw material types are both obsidian and CCS. Twenty-two of the lithic tools other than debitage were obsidian, while the remaining were CCS (n=10).

Flowing Springs-3 (CrNV-22-8191). Flowing Springs-3 (FS-3) is a small (1,884 m²) and sparse (maximum density 3/sq. m) prehistoric lithic scatter located southwest of FS-2 and southeast of FS-1. The site rests at an elevation of 1215 m (3,987 feet) and has a slope 0°. FS-3 is located within survey Parcel 7.

There were only two tools observed at FS-3 and, unlike the other sites used in this research, it is not a Pre-Archaic site. Although FS-3 is lacking diagnostic Pre-Archaic artifacts, a split cobble observed at this site made of visually similar material to some diagnostic tools found at other Pre-Archaic sites in the vicinity. Therefore, this tool was collected for sourcing purposes. There were 10-25 pieces of lithic debitage observed and one scraper. Obsidian makes up 75% of the lithic debitage, with the other 25% being CCS.

Flowing Springs-6 (CrNV-22-8194). Flowing Springs-6 (FS-6) is a large (50,579 m²) but sparse (maximum density 7/m²) lithic scatter to the west of Mud Meadow Creek. The site rests at an elevation of 1225 m (4,020 feet) and has a slope of 0°. FS-6 is within survey Parcel 7 (2006 field season).

This site is considered Pre-Archaic based on the one Great Basin stemmed point found. Other tools include two Humboldt projectile points, two Humboldt point bases, and one non-diagnostic projectile point mid-sections. Approximately 300 pieces of lithic debitage were seen at FS-6, manufactured mostly on obsidian with some CCS. All of the tools, not including the debitage, are obsidian (n=6).

FS-8 (CRNV-22-8196). FS-8 is a small (3,769 m²) lithic scatter (10 per/m²). The site is located between dune formations and playa within the West Arm of the Black

Rock Desert. The site is within survey Parcel 7 (2006 field season) and rests at an elevation of 1222 m (4,011 feet). The slope of the site is 0°.

FS-8 is considered a Pre-Archaic site based on the presence of one Great Basin stemmed point. Seventeen lithic artifacts were observed at FS-8, which include: one Great Basin stemmed point, one large side-notched projectile point, two end-scrapers, one non-diagnostic projectile point fragment, two mid-stage bifaces, two late-stage bifaces, six biface fragments, and two retouched flakes. There were approximately 35-40 pieces of lithic debitage observed; 60% of the collected sample is manufactured on obsidian, 30% on CCS, and 10% on FGVR. A majority of the lithic tools other than debitage are manufactured on obsidian (n=10), while five are CCS, and two are made with FGVR.

WC-3 (CrNV-22-8199). WC-3 is a large (58,905 m²) (25 per m²) lithic scatter on the east side of Mud Meadow Creek, atop a raised landform which stretches approximately 500 m in length. This site is within survey Parcel 8 (2006 Field Season) and rests at an elevation of 1264 m (4,146 feet). The slope of the site is 3°.

This site is considered a Pre-Archaic site based on one Black Rock Concave Based (BRCB) point. There were 63 lithic artifacts observed at this site other than debitage. The projectile points include: one BRCB, one Gatecliff contracting-stem, three large side-notched, four non-diagnostic (ND) points, and five ND projectile point fragments. Other tools include: two side-scrapers, 18 biface fragments, one early-stage biface, one early-stage biface fragment, two mid-stage bifaces, six mid-stage biface fragments, four late-stage bifaces, five complete metates, one broken metate, one metate fragment, one mano, one preform, two cores, one core fragment, and three utilized flakes.

One piece of tooth enamel was also found. Over 500 pieces of lithic debitage were observed, with obsidian the dominant raw material.

The dominant raw material used for lithic tools other than debitage was obsidian (N=50), with some FGVR (n= 8), and CCS (n=4). Tertiary flakes dominate the lithic debitage.

It is more likely that this site is not Pre-Archaic, but possibly contains a Pre-Archaic tool that had been moved or reused during the mid to late Archaic. The large amount of debitage supports this, but the site is discussed here based on the appearance of the BRCB projectile point.

JAF-4 (CrNV-22-8210). JAF-4 is a small (3,142 m²) prehistoric lithic scatter with no more than two flaked stone tools per/m². The site is partially on a dune west of two small playas within the West Arm of the Black Rock Desert. JAF-4 is within survey Parcel 10 (2006 field season) and rests at an elevation of 1209 m (3,967 feet). The slope of this site is 0°.

JAF-4 is considered a Pre-Archaic site based on one possible stemmed point. Only four lithic artifacts were observed at JAF-4, plus debitage. The tools include one biface fragment with a burin break, one Pinto point, one Pinto point fragment, and one possible Great Basin stemmed point fragment. Approximately 50 pieces of lithic debitage were also observed, most manufactured on obsidian and some CCS and FGVR. Most of the lithic tools other than debitage were obsidian (n=3) and one was on CCS. Secondary flakes dominate the debitage, with primary flakes also present.

Table 3. Lithic Tools from Pre-Archaic sites recorded during the 2004-2006 field seasons.

		SITE NAME																		
TOOL TYPE		Mud-1	Mud-6	Mud-8	Mud-11	Mud-13	Mud-16	BRD-11	BRD-15	BRD-16	BRD-20	BRD-21	FS-1	FS-2	FS-6	FS-8	WC-3	JAF-4	Total	
	BRCB										1							1		2
	Parman												1							1
	Windust										2									2
	GBSP	1	2	3	6		2		1	1	9	7	9	2	1	1			1	46
	Humboldt		4		1		1	2	1	1	13	3	2	1	4			1		34
	GCSS									1		1						1		3
	Pinto																		2	2
	NSN								1	3		1		1				3		9
	LSN																1	1		2
	EE/ECN		2					2			4		5							13
	RS/EG						1		1	2										4
	DSN																			
	PPT Frag		4	4	2			5	2	1	12	5	6	9	1	2	7			60
	Bifaces	5	6	2	12	1	5	18	38	22	46	22	7	12		9	32	1		238
	Crescent					1	1	1						1						4
	Drill																			
	G. Stone		1						8	8	1	4						8		30
	Core/TC		3		3		3	6		4	6	4	1					3		33
	R. Flake	1	1	2	1		1	2	3	7	10	8	4	4		2	3			49
SPR/GVR				2		2		1	3	7	6	2	2		2	1			28	
Total	7	23	11	27	2	16	36	56	53	111	61	37	32	6	17	62	4		561	

BRCB (Black Rock Concave Base), DSN (Desert Side-notched), ECN (Elko Corner-notched), EE (Elko Eared), G (Ground), GBSP (Great Basin Stemmed Point), GCSS (Gatecliff Split-stemmed), EG (East Gate), GVR (Graver), LSN (Large Side-notched), NSN (Northern Side-notched), PPT (Projectile Point), R (Retouched), SPR (Scraper), SN (Side-notched)

Isolated Finds

A total of 10 Isolated Finds (IF) were discovered in the 2004 summer field season; 18 IF were recorded in the 2005 summer field season, and 48 in 2006. Two of

the 48 (IF 19 and IF 20) from 2006 were added to my collection, but had been discovered and collected by Bureau of Land Management employees earlier that year. There were 76 IF discovered and recorded during the 2004, 2005, and 2006 field seasons (Table 4). Of the 77, there were two diagnostic lithic tools found within the Mud Meadow Creek study area. The first one is IF 6 (2004 field season) and the second is IF 4 (2006 field season). IF 6 (2004) is one possible Great Basin Stemmed point manufactured on obsidian and IF 4 (2006) is a white CCS Crescent.

Table 4. Isolated Finds from 2004, 2005, and 2006

Field Season	Isolated Finds Number	Material	Description
2004	IF-1	FGVR	ES BIF FRAG
	IF-2	OBS	BTF
	IF-3	OBS	BTF
	IF-4		Rock Stack
	IF-5	OBS	BTF
	IF-6	OBS	Poss GBSP *
	IF-7	OBS	FLK
	IF-8	CCS	FLK
	IF-9	CCS	BTF
	IF-10	CCS	BTF
2005	IF-1	CCS	FLK
	IF-2		Animal Trap
	IF-3	CCS	Scraper FRAG
	IF-4		Rock/wire fencing
	IF-5	CCS	ND PPT FRAG
	IF-6	OBS	FLK
	IF-7	CCS	FLK
	IF-8	CCS	PPT FRAG
	IF-9	OBS	CN PPT
	IF-10	CCS	FLK
	IF-11	OBS	FLK FRAG
	IF-12	CCS	FLK
	IF-13	OBS	CN PPT
	IF-14	CCS	BTF
	IF-15	CCS	MS BIF
IF-16	CCS	MS BIF	
IF-17	CCS	FLK	
2006	IF-1	OBS	FLK
	IF-2	OBS	Hasket PPT
	IF-3	OBS	LSN PPT

	IF-4	CCS	Crescent *
	IF-5		20mm M21A1 shell ca
	IF-6		20mm M21A1 shell ca
	IF-7		20mm M21A1 shell ca
	IF-8		20mm M21A1 shell ca
	IF-9	FGVR	RTCH FLK
	IF-10		Hinge/Military
	IF-11	CCS	Core
	IF-12	CCS	Blade Flake
	IF-13	OBS	Blade Flake
	IF-14	OBS	BTF
	IF-15	CCS	FLK
	IF-16	CCS	FLK FRAG
	IF-17	OBS	Preform (poss. Elko)
	IF-18	CCS	Flake
	IF-19	OBS	FLK FRAG
	IF-20	CCS	RS PPT
	IF-21	OBS	Cortical Spal
	IF-22	CCS	Flake
	IF-23	OBS	BTF
	IF-24	OBS	RS PPT
	IF-25	OBS	Biface Fragment
	IF-26	CCS	Retouched Flake
	IF-27	CCS	Chunk
	IF-28	CCS	Chunk
	IF-29	OBS	Biface Mid-section
	IF-30	CCS	Retouched Flake
	IF-31	FGVR	LS Biface
	IF-32		50cal shell casing
	IF-33		20mm M21A1 shell ca
	IF-34	CCS	FLK
	IF-35	CCS	LS BIF
	IF-36	CCS	FLK
	IF-37	CCS	Overshot Flake
	IF-38	CCS	ES Biface
	IF-39	CCS	Transverse Scraper
	IF-40	CCS	BTF
	IF-41	OBS	BTF
	IF-42	OBS	FLK
	IF-43	OBS	BTF
	IF-44	CCS	FLK
	IF-45	OBS	BTF
	IF-46		Historic hinge (military)
	IF-47		Shell Casing M21A1
	IF-48		Shell Casing M21A1
	IF-49		Shell Casing M21A1

BIF (Biface), BTF (Bifacial thinning flake), CCS (Cryptocrystalline silicate), CN (Corner-notched), ES (Early-stage), FLK (Flake), FRAG (Fragment), GBSP (Great Basin stemmed point), LS (Late-stage), LSN (Large Side-notched), MS (Mid-stage), ND (Non-diagnostic), Poss (possible), PPT (Projectile point)

Site Elevations and Locations

Although pedestrian surveys were conducted throughout the West Arm of the Black Rock Desert, all of the Pre-Archaic sites (excluding Trego-1) occur in the Mud Meadow Creek area. These sites were identified by the appearance of diagnostic projectile points. Of the 79 sites in the Mud Meadow Creek (MMC) area, 35 contained diagnostic lithic tools and 44 were non-diagnostic lithic scatters. Five isolated diagnostic lithic artifacts were also found.

Sixteen of the sites in the study area contained diagnostically Pre-Archaic tools. These not only contained Pre-Archaic tools, but also later Archaic projectile points. This may seem problematic, but there are two possible reasons for the mixture. First, it may be possible that later groups collected Pre-Archaic artifacts, reusing them and then redepositing them at these sites with other lithic debris, possibly indicating that these sites do not actually date to the Pleistocene/Holocene transition (PHT), but are in fact later Archaic. A second possible explanation would be that these sites or landforms were actually revisited by later groups in the area long after a Pre-Archaic occupation. Many of these sites are located on elevated landforms overlooking MMC, which would have been ideal locations for scanning the surrounding area. Perhaps despite the environmental changes occurring during the PHT, these locations would have continued to be good overlooks throughout the Archaic period. In addition, their proximity to the creek would have made them even more useful (Adams et al. 2008).

Thirty-three of the 35 (94.3%) archaeological sites containing diagnostic artifacts also contained later Archaic points. Sites containing later Archaic points (e.g. Large Side-notched or Northern Side-notched, Humboldt, Gatecliff, Elko, Rose Spring, East

Gate, and Cottonwood types) are ubiquitous throughout the MMC study area (Adams et al. 2008). It could be concluded that, like Pre-Archaic groups, later Archaic groups also frequently returned to the West Arm of the Black Rock Desert (Adams et al. 2008).

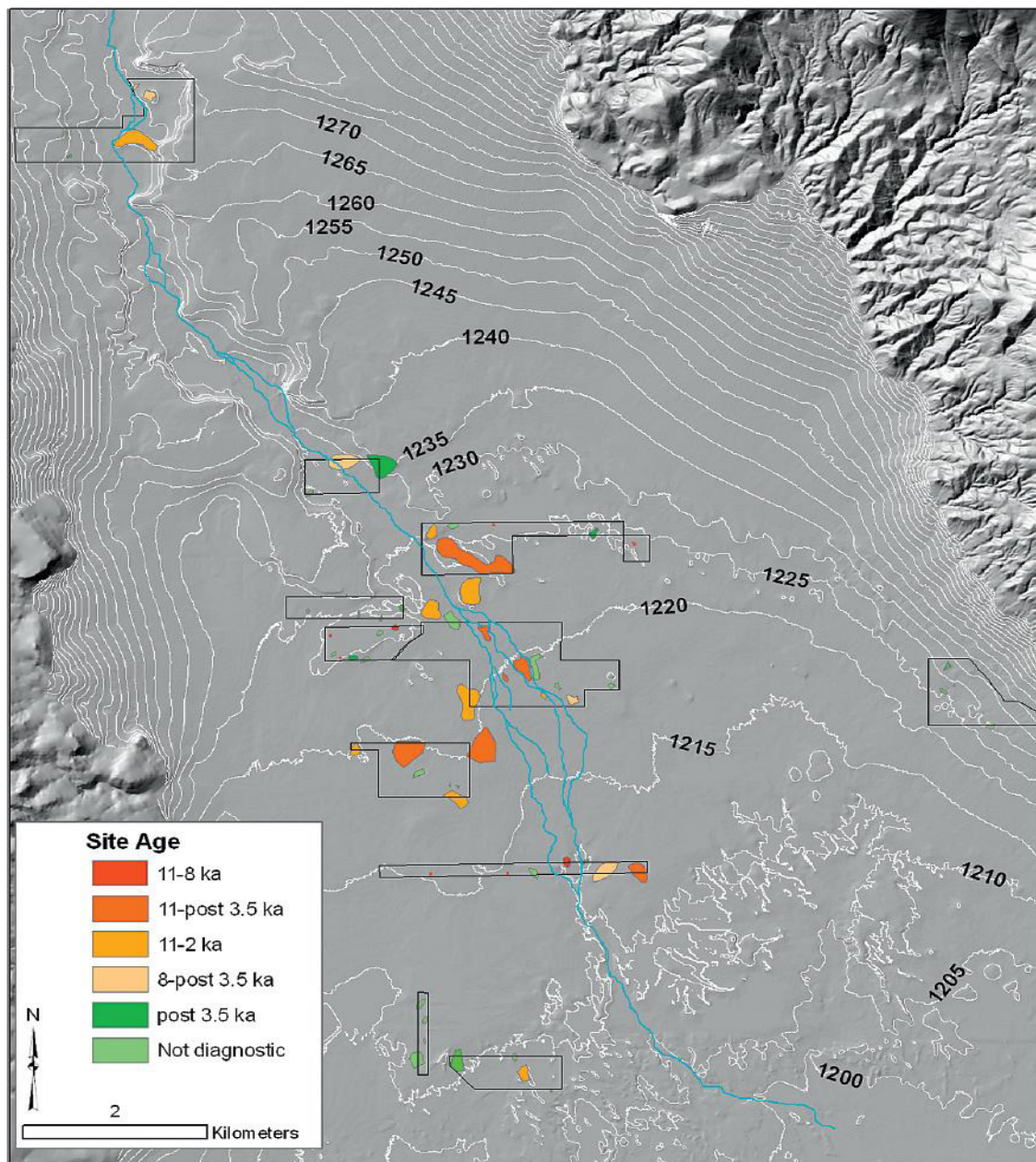
To demonstrate that Lahontan Lake level fluctuations determined Pre-Archaic land use patterns, it is important to show some sort of pattern of where these sites are specifically located. They should be found between an elevation of 1200 and 1230 m, which is the predicted location of the Lake shore 11,000-8,000 B.P. If sites do occur in high frequency around this elevation, as opposed to being scattered somewhat uniformly across the landscape, it can be surmised there was a preference for these settings.

In order to show this patterning, all sites containing diagnostic tools from both the Pre-Archaic as well as later Archaic are organized into groups showing the range of occupation. As this figure shows, a majority of Paleoindian sites (93.8%); (15 of 16 sites) are located between 1200 and 1230 m in elevation and two of the three isolated diagnostic Pre-Archaic artifacts are also in this range. These data suggest that groups occupying the West Arm of the Black Rock Desert were preferentially attracted to areas within this elevation range.

One Pre-Archaic site, CrNV-22-8199, is located outside of the range of the shoreline during this period. This site contained a single concave-based point and six later Archaic points. It is located at 1255 m, and approximately 6 km north of the 1230 m contour. This may represent later Archaic groups collecting and redepositing this tool, but also it is likely that later groups revisited this landform after the initial Pre-Archaic occupation. One Pre-Archaic isolated artifact (IF 4, 2006), a Crescent, was also located outside of the 1200-1230 m elevation range. The Crescent, found at an elevation of 1195

m, is also located along one of the current channels of MMC, which may indicate the artifact had been moved from its original location through natural or cultural processes and redeposited where it was discovered.

Figure 6. Map of the west arm of the Black Rock Desert showing the distribution of archaeological sites.



From Adams et al. 2008

XRF Analysis

Although this study focuses on Pre-Archaic sites that occur in relation to the elevation of the Lake Lahontan shorelines during the PHT, the distance raw material

travels can indicate the level of mobility of Pre-Archaic people occupying the area. Therefore, the following discussion centers on the mobility behavior of Pre-Archaic people in this region and in general. Also, because high quality lithic raw materials (i.e., CCS and obsidian) are found in the uplands and alluvial deposits surrounding the West Arm of the Black Rock Desert (Camp in press; Moyer 1999; Smith and Goebel 2003; Young 2002), it is useful to see to what extent these lithic sources were being utilized during the Pre-Archaic.

A total of 52 obsidian artifacts were submitted to Northwest Research Obsidian Studies Laboratory for XRF analysis. A majority of the lithics submitted for analysis were from the Pre-Archaic sites within the MMC study area, although two diagnostic Pre-Archaic artifacts (Specimens number [SN] 20 and 39) found outside the study area were submitted for analysis with the idea that the information could be used in future research. SN 20 is a stemmed point from Trego-1 (CrNV-22-8122), a Pre-Archaic site located at the southern end of the Black Rock Desert near Trego Hot Springs. SN 39, an isolated Haskett point (IF 2, 2006), diagnostic to the Pre-Archaic, was found on at the southern tip of the Black Rock Mountain range, which would have been a peninsula during the PHT.

Of the 52 obsidian artifacts, all but SN 33 and SN 37 are lithic artifacts diagnostic to the Pre-Archaic. SN 33 is a split cobble (found at FS-3 or CrNV-22-8191) manufactured on a material that was visually diagnostic to Pre-Archaic tools from other sites, and SN 37 is a core found at CrNV-22-8199 (WC-3), which is a Pre-Archaic site located outside of the estimated Younger Dryas shoreline. In total 48 of the 52 obsidian lithic artifacts are diagnostic Pre-Archaic projectile points.

From the 52 obsidian artifacts samples sent for analysis, 11 different geochemical sources were identified (Table 5). Trace element data for each artifact submitted for XRF analysis are presented in Appendix B.

Table 5. XRF data for 52 Pre-Archaic lithic artifacts

SITE NAME	SITE NUMBER	FS NUMBER	TOOL TYPE	SN	GEOCHEMICAL SOURCE
BRD-15	CrNV-22-8115	8	GBSP MS	1	Coyote Spring
BRD-20	CrNV-22-8120	8	GBSP Base	2	BS/PP/FM/Whitehorse
	CrNV-22-8120	12	GBSP MS	3	BS/PP/FM
	CrNV-22-8120	13	GBSP Base	4	Massacre Lake/Guano Valley
	CrNV-22-8120	17	BRCB	5	BS/PP/FM
	CrNV-22-8120	26	GBSP Base	6	BS/PP/FM/Whitehorse
	CrNV-22-8120	27	GBSP Base	7	Massacre Lake/Guano Valley
	CrNV-22-8120	37	GBSP	8	BS/PP/FM
	CrNV-22-8120	41	GBSP Base	9	BS/PP/FM/Whitehorse
	CrNV-22-8120	93	GBSP Base	10	BS/PP/FM
	CrNV-22-8120	95	GBSP Base	11	BS/PP/FM/Whitehorse
	CrNV-22-8120	106	GBSP Base	12	BS/PP/FM
BRD-21	CrNV-22-8121	4	GBSP Base	13	Badger Creek
	CrNV-22-8121	11	GBSP Base	14	Coyote Spring
	CrNV-22-8121	13	GBSP Base	15	Massacre Lake/Guano Valley
	CrNV-22-8121	14	GBSP Base	16	Massacre Lake/Guano Valley
	CrNV-22-8121	23	GBSP MS	17	BS/PP/FM/Whitehorse
	CrNV-22-8121	24	BRCB/Windust	18	Massacre Lake/Guano Valley
	CrNV-22-8121	34	GBSP Base	19	Beatys Butte
Trego-1	CrNV-22-8122	1	GBSP	20	BS/PP/FM
FS-1	CrNV-22-8189	1	GBSP Base	21	BS/PP/FM
	CrNV-22-8189	2	Parman	22	Double H/Whitehorse
	CrNV-22-8189	3	GBSP MS	23	Coyote Spring
	CrNV-22-8189	4	GBSP Base	24	BS/PP/FM
	CrNV-22-8189	5	GBSP Base	25	Buck Mountain
	CrNV-22-8189	6	GBSP MS	26	BS/PP/FM
	CrNV-22-8189	7	GBSP Base	27	Massacre Lake/Guano Valley
	CrNV-22-8189	9	GBSP MS	28	Buffalo Hills
	CrNV-22-8189	13	GBSP Base	29	Massacre Lake/Guano Valley
	CrNV-22-8189	27	GBSP Base	30	BS/PP/FM
FS-2	CrNV-22-8190	25	GBSP Base	31	Massacre Lake/Guano Valley
	CrNV-22-8190	28	GBSP Base	32	Coyote Spring
FS-3	CrNV-22-8191	1	Split Cobble	33	Coyote Spring
FS-6	CrNV-22-8194	4	GBSP Base	34	Mt. Majuba
FS-7	CrNV-22-8196	1	GBSP MS	35	BS/PP/FM
WC-3	CrNV-22-8199	48	BRCB	36	Massacre Lake/Guano Valley
	CrNV-22-8199	63	Core	37	Massacre Lake/Guano Valley
JAF-4	CrNV-22-8210	1	GBSP FRAG	38	BS/PP/FM

	Isolated Find	19	Haskett	39	Cowhead Lake
Mud-6	CrNV-21-7776	2	GBSP Base	40	Massacre Lake/Guano Valley
	CrNV-21-7776	3	GBSP Base	41	BS/PP/FM
Mud-8	CrNV-21-7777	1	GBSP Base	42	BS/PP/FM
	CrNV-21-7777	2	GBSP MS	43	Massacre Lake/Guano Valley
	CrNV-21-7777	3	GBSP FRAG	44	Massacre Lake/Guano Valley
Mud-11	CrNV-21-7780	5	GBSP Base	45	Coyote Spring
	CrNV-21-7780	9	GBSP Base	46	BS/PP/FM
	CrNV-21-7780	11	GBSP MS	47	BS/PP/FM/Whitehorse
	CrNV-21-7780	18	GBSP Base	48	BS/PP/FM
	CrNV-21-7780	19	GBSP Base	49	BS/PP/FM
	CrNV-21-7780	20	GBSP MS	50	Buffalo Hills
	CrNV-21-7784	1	GBSP MS	51	Buck Mountain
	CrNV-21-7784	2	GBSP Base	52	Massacre Lake/Guano Valley

BRCB (Black Rock Concave Base), BS/PP/FM (Bordell Spring/Pinto Peak/Fox Mountain), FRAG (Fragmant), FS (Field Specimen), GBSP (Great Basin Stemmed Point), MS (Mid-stage), SN (Specimen number)

CHAPTER 8; DISCUSSION

Introduction. Clear evidence exists that Lahontan Basin people were present during the PHT, when lake levels were dramatically fluctuating. How humans responded to these fluctuations remains a major question in Great Basin research. The study of surface archaeological sites along these shorelines can help address questions regarding the control that lake fluctuations had on the "spatial and temporal" distributions of archaeological sites in this area (Adams et al. 2008: 27).

Occupations in the West Arm. To begin, 16 of the archaeological sites within the West Arm of the Black Rock Desert contained artifacts dating to the Pre-Archaic. Two IF were also dated to this period. Sixteen sites contained multiple stemmed points, concave-based points, and/or crescents. Of these sixteen, all but one (CrNV-22-8199 or WC-3) occur between 1200 and 1230 m. The sites being concentrated at these elevations suggests that people may have focused their activities along what were once the shorelines of Lake Lahontan. The sites also reveal a rich record of human occupation within the West Arm of the Black Rock Desert.

A variety of diagnostic artifacts from the Pre-Archaic to the later Archaic period is present at these sites, which means that people were occupying this area at least intermittently for over 11,000 years. This might suggest that resources other than wetlands were plentiful throughout the Archaic. Many of these surface sites contain later projectile points as well as grinding stone implements; groups were hunting as well as processing plant foods throughout the west arm.

While all of these ideas are possible, the existence of Pre-Archaic sites between 1200 m and 1230 m may mean two things regarding the relationship between humans and

the changing hydrographic conditions (Adams et al. 2008). First, Pre-Archaic groups that visited the West Arm of the Black Rock Desert focused on the area between 1200 m and 1230 m during the Younger Dryas. This is where Mud Meadow Creek flowed into Lake Lahontan, creating a rich deltaic environment at this time, perhaps indicating people were focused on lacustrine and marsh resources. This idea can be supported with other research done throughout the Great Basin and current models of Pre-Archaic adaptation to this region (Beck and Jones 1997; Grayson 1993; Oviatt et al. 2003). This can also be supported by the study of human remains, human coprolites, and early-period subsistence residues (Adams et al. 2008; Bedwell 1973; Eiselt 1997; Greenspan 1990, 1994).

In addition, later Archaic diagnostic tools are found at these sites as well as sites at higher and lower elevations, indicating that later groups occupied the West Arm long after Lake Lahontan had receded. Later sites are also found above and below these elevations, demonstrating that later groups were not as focused on one particular area, as earlier groups had been (Adams et al. 2008).

Lithic Technology and Mobility

Introduction. The analysis of surface sites such as the ones located in the West Arm of the Black Rock Desert can be difficult because there are problems with dating control. In fact, Jones and Beck (1999) suggest that most archaeologists describe these locales as containing evidence of human use for most of the Holocene. These sites do not usually contain spatially discrete temporal components with signature projectile points. These sites often occur in close proximity to some kind of water source, making it difficult to distinguish Pre-Archaic from Archaic site functions (Jones and Beck 1999).

Pre-Archaic Lithic Assemblages and Toolstone Selection. Many of the sites that researchers label Pre-Archaic contain small numbers of Great Basin Stemmed series projectile points (GBSS) in comparison with sometimes more numerous later Archaic tools, which can also prove problematic when interpreting the activities and functionality of these sites. One of the ways researchers have been able to tease out some of the differences between Pre-Archaic and later Archaic groups is through the selection of toolstone for specific tool classes. For example, Elston (1994a) remarks that in eastern margins of the Shoshone Range in north-central Nevada, assemblages share a set of common features typical of the Western Stemmed Tradition (WST). These features include: low tool diversity, toolkits including stemmed points, production bifaces, scrapers and graters, and a strong association between types of tools and toolstone. Another feature in this area is that assemblages display a greater use of FGVR for the manufacturing of projectile points. While this is not the case in the West Arm, Amick (1993, 1995) notes that obsidian rather than FGVR was preferentially selected in the northern Great Basin.

Although chert or CCS was rarely used for the production of projectile points in early assemblages, it remains an important material in that it is used for tools such as end scrapers, awls and boring tools, crescents, and multi-purpose retouched tools. This difference in toolstone selection allows researchers to look for answers in the relationship between mobility and procurement as well as tool function and mechanical suitability (Jones and Beck 1999). Some researchers have suggested (Elston 1994, Basgall 1993b) Pre-Archaic lithic assemblages contain a few "highly maintainable tools of general

morphology" (Jones and Beck 1999: 90), related to the highly mobile lifeways of colonizing groups.

Toolstone Selection in the West Arm of the Black Rock Desert

Introduction. To demonstrate the selective nature of toolstone in the West Arm of the Black Rock Desert, I first define Pre-Archaic sites and then examine toolstone selectivity. Almost all of these sites contain later Archaic projectile points, presenting a problem for an accurate analysis of toolstone selection. Therefore, criteria must be in place to determine what sites can be considered mostly Pre-Archaic. The criteria include a combination of three basic components, which is the occurrence of at least one diagnostically Pre-Archaic tool (e.g. GBSS points, Black Rock Concave points, or Crescents); the location of the site is between 1200 and 1230 m; and a significant number of bifaces occur within the assemblage.

The lithic assemblages are used here to demonstrate artifact types and lithic raw material type. The tools in these assemblages are split into four categories, including projectile points, bifaces, other bifacially and unifacially modified tools, and cores. Debitage is not used in this comparison. A similar comparison was used by Jones and Beck (1999) based on the compiled data from Nelson Basin in the Mojave Desert (Basgall 1993a) and Butte Valley in eastern Nevada (Beck and Jones 1990b).

Mud-1(CrNV-21-7771). Mud-1 is considered a Pre-Archaic site based on the presence of one GBSP and the absence of any later Archaic diagnostic tools. The site is also at an elevation of 1225 m and contains a high number of bifaces in comparison to other tools (Table 6).

Table 6. Mud-1 raw material per tool-class

Mud-1 (CrNV-21-7771)	TOOL TYPE							
	PROJECTILE POINTS		BIFACES		UF/BF/FS TOOLS		CORES	
RAW MATERIAL	N	%	N	%	N	%	N	%
OBS	0	0	0	0	0	0	0	0
CCS	1	100	5	100	1	100	0	0
FGVR	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0
TOTAL	1	100	5	100	1	100	0	0

BF (Bifacial), CCS (Cryptocrystalline silicate), FGVR (Fine-grained volcanic rock), FS (flaked stone), OBS (obsidian), UF (unifacial)

Mud-6 (CrNV-21-7776). Mud-6 is considered a Pre-Archaic site based on the presence of two GBSP. The site is also at an elevation of 1225 m and contains a high number of bifaces in comparison to other tools. This site does contain four Humboldt points, but the lack of other later Archaic points suggests this site has a predominantly Pre-Archaic component (Table 7).

Table 7. Mud-6 raw material per tool-class

Mud-6 (CrNV-21-7777)	TOOL TYPE							
	PROJECTILE POINTS		BIFACES		UF/BF/FS TOOLS		CORES	
RAW MATERIAL	N	%	N	%	N	%	N	%
OBS	2	100	3	50	1	100	2	66.6
CCS	0	0	3	50	0	0	1	33.3
FGVR	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0
TOTAL	2	100	6	100	1	0	3	100

BF (Bifacial), CCS (Cryptocrystalline silicate), FGVR (Fine-grained volcanic rock), FS (flaked stone), OBS (obsidian), UF (unifacial)

Mud-8 (CrNV-21-7777). Mud-8 is considered a Pre-Archaic site based on the presence of three GBSP. The site is also at an elevation of 1228 m and contains a high number of bifaces in comparison to other tools. This site does contain diagnostic points

from the later Archaic, but the assemblage appears to have a major Pre-Archaic component (Table 8).

Table 8. Mud-8 raw material per tool-class

<i>Mud-8 (CrNV-21-7777)</i>	TOOL TYPE							
	<i>PROJECTILE POINTS</i>		BIFACES		UF/BF/FS TOOLS		CORES	
RAW MATERIAL	N	%	N	%	N	%	N	%
OBS	3	100	1	50	2	100	0	0
CCS	0	0	1	50	0	0	0	0
FGVR	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0
TOTAL	3	100	2	100	2	100	0	0

BF (Bifacial), CCS (Cryptocrystalline silicate), FGVR (Fine-grained volcanic rock), FS (flaked stone), OBS (obsidian), UF (unifacial)

Mud-11 (CrNV-21-7780). Mud-11 is considered a Pre-Archaic site based on the presence of six GBSP. The site is also at an elevation of 1228 m and contains a high number of bifaces in comparison to other tools. This site does contain diagnostic points from the later Archaic, but the small number of these points suggests this site has a predominantly Pre-Archaic component (Table 9).

Table 9. Mud-11 raw material per tool-class

<i>Mud-11 (CrNV-21-7780)</i>	TOOL TYPE							
	<i>PROJECTILE POINTS</i>		BIFACES		UF/BF/FS TOOLS		CORES	
RAW MATERIAL	N	%	N	%	N	%	N	%
OBS	6	100	8	66.6	3	100	1	33.3
CCS	0	0	2	16.6	0	0	1	33.3
FGVR	0	0	2	16.6	0	0	1	33.3
OTHER	0	0	0	0	0	0	0	0
TOTAL	6	100	12	100	3	100	3	100

BF (Bifacial), CCS (Cryptocrystalline silicate), FGVR (Fine-grained volcanic rock), FS (flaked stone), OBS (obsidian), UF (unifacial)

Mud-16 (CrNV-21-7785). Mud-16 is considered a Pre-Archaic site based on the presence of two GBSP and one Crescent. The site is also at an elevation of 1213 m and

contains a high number of bifaces in comparison to other tools. This site does contain diagnostic points from the later Archaic, but the small number of these points suggests this site has a predominantly Pre-Archaic component (Table 10).

Table 10. Mud-16 raw material per tool-class

<i>Mud-16 (CrNV-21-7785)</i>	<i>TOOL TYPE</i>							
	<i>PROJECTILE POINTS</i>		<i>BIFACES</i>		<i>UF/BF/FS TOOLS</i>		<i>CORES</i>	
<i>RAW MATERIAL</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
<i>OBS</i>	2	100	3	60	1	20	2	66.6
<i>CCS</i>	0	0	2	40	3	60	1	33.3
<i>FGVR</i>	0	0	0	0	1	20	0	0
<i>OTHER</i>	0	0	0	0	0	0	0	0
<i>TOTAL</i>	2	100	5	100	5	100	3	100

BF (Bifacial), CCS (Cryptocrystalline silicate), FGVR (Fine-grained volcanic rock), FS (flaked stone), OBS (obsidian), UF (unifacial)

BRD-20 (CrNV-22-8120). Mud-20 is considered a Pre-Archaic site based on the presence of one Black Rock Concave Base point, two Windust points and eight GBSP bases. The site is also at an elevation of 1229 m and contains a high number of bifaces in comparison to other tools. This site does contain diagnostic points from the later Archaic, but the small number of these points suggests this site has a predominantly Pre-Archaic component (Table 11).

Table 11. BRD-20 raw material per tool-class

<i>BRD-20 (CrNV-22-8120)</i>	<i>TOOL TYPE</i>							
	<i>PROJECTILE POINTS</i>		<i>BIFACES</i>		<i>UF/BF/FS TOOLS</i>		<i>CORES</i>	
<i>RAW MATERIAL</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
<i>OBS</i>	11	100	41	89.13	8	42.10	0	0
<i>CCS</i>	0	0	4	8.69	7	36.84	5	0
<i>FGVR</i>	0	0	1	2.1	2	10.52	0	0
<i>OTHER</i>	0	0	0	0	2	10.52	0	0
<i>TOTAL</i>	11	100	46	100	19	100	5	100

BF (Bifacial), CCS (Cryptocrystalline silicate), FGVR (Fine-grained volcanic rock), FS (flaked stone), OBS (obsidian), UF (unifacial)

BRD-21 (CrNV-22-8121). BRD-21 is considered a Pre-Archaic site based on the presence of one GBSP, three GBSP point bases, one GBSP fragment, and two possible GBSP fragments. The site is also at an elevation of 1229 m and contains a high number of bifaces in comparison to other tools. This site does contain diagnostic points from the later Archaic, but the small number of these points suggests this site has a predominantly Pre-Archaic component (Table 12).

Table 12. BRD-21 raw material per tool-class

BRD-21 (CrNV-22-8121)	TOOL TYPE							
	PROJECTILE POINTS		BIFACES		UF/BF/FS TOOLS		CORES	
RAW MATERIAL	N	%	N	%	N	%	N	%
<i>OBS</i>	7	0	16	80	1	7.69	0	0
<i>CCS</i>	0	0	4	20	11	84.61	4	100
<i>FGVR</i>	0	0	0	0	1	7.69	0	0
<i>OTHER</i>	0	0	0	0	0	0	0	0
TOTAL	7	100	20	100	13	100	4	100

BF (Bifacial), CCS (Cryptocrystalline silicate), FGVR (Fine-grained volcanic rock), FS (flaked stone), OBS (obsidian), UF (unifacial)

Flowing Springs-1 (CrNV-22-8189). FS-1 is considered a Pre-Archaic site based on the presence of one Parman stemmed point, five GBSP bases, and four GBSP fragments. The site is also at an elevation of 1219 m and contains a high number of bifaces in comparison to other tools. This site does contain diagnostic points from the later Archaic, but the small number of these points suggests this site has a predominantly Pre-Archaic component (Table 13).

Table 13. FS-1 raw material per tool-class

FS-1 (CrNV-22-8189)	TOOL TYPE							
	PROJECTILE POINTS		BIFACES		UF/BF/FS TOOLS		CORES	
RAW MATERIAL	N	%	N	%	N	%	N	%
<i>OBS</i>	10	100	5	62.5	2	33.3	0	0
<i>CCS</i>	0	0	3	37.5	4	66.6	1	100
<i>FGVR</i>	0	0	0	0	0	0	0	0
<i>OTHER</i>	0	0	0	0	0	0	0	0
TOTAL	10	100	8	100	6	100	1	100

BF (Bifacial), CCS (Cryptocrystalline silicate), FGVR (Fine-grained volcanic rock), FS (flaked stone), OBS (obsidian), UF (unifacial)

Flowing Springs-2 (CrNV-22-8190). FS-2 is considered a Pre-Archaic site based on the presence of two GBSP fragment and one Crescent. The site is also at an elevation of 1214 m and contains a high number of bifaces in comparison to other tools. This site does contain diagnostic points from the later Archaic, but the small number of these points suggests this site has a predominantly Pre-Archaic component (Table 14).

Table 14. raw material per tool-class

FS-2 (CrNV-22-8190)	TOOL TYPE							
	PROJECTILE POINTS		BIFACES		UF/BF/FS TOOLS		CORES	
RAW MATERIAL	N	%	N	%	N	%	N	%
<i>OBS</i>	2	100	10	100	2	40	0	0
<i>CCS</i>	0	0	0	0	3	60	0	0
<i>FGVR</i>	0	0	0	0	0	0	0	0
<i>OTHER</i>	0	0	0	0	0	0	0	0
TOTAL	2	100	10	100	5	100	0	0

BF (Bifacial), CCS (Cryptocrystalline silicate), FGVR (Fine-grained volcanic rock), FS (flaked stone), OBS (obsidian), UF (unifacial)

Table 15. Summary of raw material selection per tool-class

Pre-Archaic Sites (Mud-1, Mud-6, Mud-8, Mud-11, Mud-16, BRD-20, BRD-21, FS-1, FS-2)	TOOL TYPE							
	<i>PROJECTILE POINTS</i>		<i>BIFACES</i>		<i>UF/BF/FS TOOLS</i>		<i>CORES</i>	
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
RAW MATERIAL								
<i>OBS</i>	43	97.72	87	76.31	20	36.36	5	26.31
<i>CCS</i>	1	2.27	24	21.05	29	52.72	13	68.42
<i>FGVR</i>	0	0	3	0	4	7.27	1	5.26
<i>OTHER</i>	0	0	0	0	2	3.63	0	0
TOTAL	44	100	114	100	55	100	19	100

BF (Bifacial), CCS (Cryptocrystalline silicate), FGVR (Fine-grained volcanic rock), FS (flaked stone), OBS (obsidian), UF (unifacial)

Discussion

One of the most difficult aspects of interpreting the Pre-Archaic record in the Great Basin is that a large number of sites are located on the surface. Open-air sites remain difficult to date, other than using lithic cross-dating. One other issue with these sites is that they often occur near permanent water sources and therefore were utilized by early and later groups throughout most of the Holocene. Technological organization is one method researchers (e.g. Binford 1979; Kelly 1988b; Nelson 1991; Amick 1993) have used to answer some key questions regarding these surface sites without eliminating the data completely. Patterns of toolstone selection may lead to additional understanding beyond the more traditional approaches.

Using the sites from the West Arm of the Black Rock Desert, some patterns emerge about toolstone selection. Of the 16 surface sites that were considered Pre-Archaic, only nine contained a high enough numbers of Pre-Archaic tools (e.g., GBSP, Black Rock Concave point, or Crescents), a low number of later Archaic projectile points (e.g., Pinto, Gatecliff split-stemmed, Large side-notched, Northern side-notched,

Humboldt or Elko series, Rose Spring, Eastgate, and Desert side-notched points), and a large number of bifaces in comparison to other tool-types, to be used in this analysis.

Using these data, the sites were analyzed for numbers of Pre-Archaic projectile points, bifaces, bifacially and unifacially modified flaked stone tools, and cores, which were then separated by raw material type (Table 15). Similar to what Amick (1993, 1995) observed in other parts of the northern Great Basin, obsidian is the dominant raw material used for the production of Pre-Archaic projectile points (43 out of 44 or 97.73%) and bifaces (87 out of 114 or 76.32%). Another pattern that emerged is that the less formalized or more expedient tools (29 out of 55 or 52.72%) as well as cores (13 out of 19 or 68.42%) were manufactured on local cherts or CCS.

Although Jones and Beck (1999) suggest that FGVR is the dominant material used for the manufacturing of Pre-Archaic projectile point or more formalized tools throughout the eastern Great Basin, they have also suggested that obsidian would be the dominant raw material used in the northern Great Basin because it is more readily available than FGVR in this region.

Toolstone Sources and Distance to Source from MMC Pre-Archaic Sites

Introduction. Geologic source provenience has become a major component of Great Basin research over the past few decades (Jones et al. 2005). Using the ratios of trace elements to characterize sources of volcanic stone (Hughes 1986; Taylor 1976) allows researchers to demonstrate how toolstone was culturally transported and manufactured on such materials, permitting reconstructions of prehistoric mobility and/or exchange (e.g., Amick 1995, 1997; Jones et al. 2003; Kelly 2001; McGuire 2002; Smith 2006). XRF analysis in Pre-Archaic assemblages has been particularly useful in the

Great Basin for a couple of reasons. First, this region is rich in toolstone sources, and second these sources were often used for the manufacturing of projectile points by Pre-Archaic people (Amick 1993, 1995, 1997; Beck and Jones 1988, 1990a, 1990b, 1997; Beck et al. 2002; Jones and Beck 1999; Jones et al. 2003).

Pre-Archaic Mobility and Lithic Raw Materials. While trade of these sources has been considered, it is more likely that Pre-Archaic people were transporting raw materials based on the low population densities and the importance of lithic raw materials in prehistoric economies (Bamforth 2002; Beck and Jones 1990b; Beck et al. 2002; Jones and Beck 1999; Jones et al. 2003; Kelly and Todd 1988). These ideas are based on Pre-Archaic site densities being low as well as little evidence of people staying in one place for long periods of time.

Using ethnographic studies of hunter-gatherers combined with archaeological data it is argued that there is an association between levels of mobility and the effort spent to produce lithic assemblages (Andrefsky 1994a, 1994b). For example, formal tools (artifacts manufactured with a high level of effort expended in their production) are often associated with high levels of mobility. Informal tools (artifacts manufactured with less effort) are associated with low levels of mobility (Andrefsky 1994a, 1994b, 1998). As mentioned before, bifaces are one class of formal tools commonly found in chipped stone assemblages that are often linked to high degrees of residential or logistical mobility (Kelly 1988, 1992, 2001; Kelly and Todd 1988; Parry and Kelly 1987). Bifaces provide a reasonably large number of usable tool blanks and are flexible with a long use-life (Andrefsky 1998; Kelly 1988). These tools often have multiple purposes, making them important to groups with a highly portable lithic technology.

Pre-Archaic Mobility in the West Arm

Introduction. It is difficult to show a change in mobility through time by just sourcing certain tool-types. For this project the choice was made to only source lithic tools associated with the Pre-Archaic and because of this decision very little can be said about change in mobility. On the other hand, information about the specific sources used in this area may imply something about distances traveled for toolstone during the Pre-Archaic.

West Arm Tool-Stone Selection. While not all tools could be sourced from the 16 Pre-Archaic sites located within the West Arm, all of the obsidian tools that could be associated with the Pre-Archaic, as well as a core and a split cobble, were sent in for sourcing. These data allow for a general idea of the distances people traveled to procure raw materials in this area. As mentioned before, forty-nine obsidian projectile points were submitted for geochemical analysis as well as one split cobble and one core. IF 39 will be left out of this discussion because it was found outside the research area. Thus, 50 tool specimens, 48 of which are stemmed points, are discussed. The distances from the West Arm of the Black Rock Desert to the raw materials sources are displayed in Table 16.

As can be seen in Table 16, Pre-Archaic people traveled from 137 km to 27 km to obtain lithic raw materials. Only 2% of the Pre-Archaic tools found at the West Arm sites are sourced to locations as distant as 137 km, and 26% came from sources 113-42 km in distance. The highest proportion of specimens (34%) were sourced to a location 27 km from the West Arm. Another 10% (BS/PP/FM/Whitehorse) of the tools come from

42-103 km in distance. It does not seem unusual that people would utilize a good lithic source closest to the site locations.

Discussion. Regardless of the fact that the most highly selected toolstone came from a distance of only 27 km, obsidian was preferred over the local CCS, which occurs in the pluvial deposits of the Black Rock Mountain range, which borders the east side of the West Arm.

Table 16. Distances from the West Arm to raw material sources

<i>Raw Material Source</i>	<i>Distance from West Arm (km)</i>	<i>Number of Specimens</i>	
		N	%
Badger Creek	72 km	1	2
Beatys Butte	137 km	1	2
BS/PP/FM	27 km	17	34
BS/PP/FM/Whitehorse	27-103 km	5	10
Buck Mountain	113 km	2	4
Buffalo Hills	56 km	2	4
Coyote Springs	42 km	6	12
Double H/Whitehorse	103 km	1	2
ML/GV	28 km	14	28
Mount Majuba	73 km	1	2

Pre-Archaic Tool-use and Function in the Great Basin

Introduction. While Folsom and Clovis points have been found in association with extinct mammals, there is no direct link between stemmed points and the resources such as game animals activities they were used to procure or process. Although stemmed points are not associated at this time with extinct mammals, they are usually found at

sites that have one major commonality: they are often found on the remnant shores of Pleistocene lakes.

Background. In 1935, Cambell and Campbell found stemmed points on the remnant shorelines of the Pinto Basin in Southern California. Amsden (1935) analyzed these points and concluded that they probably represented a single cultural complex. Later finds include the Lake Mojave and Silver Lake type (Cambell and Cambell 1937), Borax lake type (Harington 1948), now known as Black Rock Concave points, and Lind Coulee points (Daugherty 1956). After analysis of the separate collections both Daugherty (1956a) and Jennings (1953) concluded that these types did not represent different cultures, but different styles.

Western Stemmed Tradition. While use was not specifically addressed early in stemmed point studies, Daugherty (1962) described these cultures as being hunter-gatherers with a diverse economy including fishing. For many years the association of stemmed points with groups of people has been argued as well as the association of stemmed points with fluted point traditions. Several different types have been named and analyzed, including Windust (Rice 1965), Haskett (Butler 1965), and Cougar Mountain points (Layton 1972). Layton later argued that there was a need for some kind of chronology for a better understanding of the people who made the points and their lifeways. Using obsidian hydration and stratigraphic control, Layton determined that there were changes in point shapes through time (Layton 1972).

Once there was a manageable chronology to work with, researchers were able to postulate what subsistence strategies these people employed. Researchers began to question whether the makers of stemmed points were either big game hunters or part of

the Western Pluvial Lake Traditions (Willig 1988; Willig and Aikens 1988). They argued that the term "Desert Culture" worked to describe these broad spectrum generalized foragers (Willig and Aikens 1988). Combining the idea of Desert Culture and the Western Pluvial Lakes Tradition, Willig and Aikens (1988) devised the term "Western Stemmed Tradition." These groups were described as having "a generalized adaptation to a wide variety of mesic habitats offering critical food and water supplies" (Willig 1988:478).

Some current researchers agree that Western Stemmed Tradition is a usable term, but there is still little direct evidence of what these points were specifically used for. Beck and Jones (1997) think that like most projectile points, stemmed points were multi-functional based on their lack of symmetry, rounded points, as well as extensive use-wear and resharpening. Through use-wear analysis and experimental archaeology, Lafayette (2006) was able to demonstrate that stemmed points were probably in fact used as multi-purpose tools. She found that stemmed points were used as projectile points, but also for several other tasks. She concluded that Haskett and Parman points were used most commonly for purposes other than projectiles, while Cougar Mountain points were used mostly as projectiles (Lafayette 2006:135).

Stemmed Point Use in the West Arm. It seems likely that stemmed points would have been used as multi-purpose tools in the West Arm as they were probably used throughout the Great Basin. I did no use-wear analysis, and so I cannot say this conclusively. Using the combination of factors explored in this study, I can say with confidence that these tools were most likely used for several foraging tasks. It cannot be ruled out that hunting

around shrinking lakes and marshes was a main part of Pre-Archaic groups' subsistence activities.

CHAPTER 9; CONCLUSION

For almost a century, researchers have been interested in the past and present occupants of the Great Basin. Perhaps it was the extremely arid conditions and the ways in which native people adapted to these conditions that attracted researchers to this region. Alternatively, perhaps it was because the region was one of the last explored regions in the west where people lived vastly different ways of life than the western colonizers. For whatever reason, the Great Basin remains a study area with countless research questions to be asked that require multiple kinds of research strategies to answer them.

One of the most interesting aspects of Great Basin research is its geographic location. Situated between the Sierra Nevada, Rocky, and Cascade Mountain ranges, the Great Basin is place where water drains inward from the surrounding mountains. It is because of its internal drainage that Great Basin environments responded dramatically to global changes. These changes often meant the fluctuations in wetland and marsh areas. It is this unique environment that originally influenced the interpretations of prehistoric people, but it is also what prompted researchers to question the continuity between ethnographic people and the people that first inhabited this region.

The Pleistocene Holocene transition (11,500 and 7,500 BP) is the time interval when the first well-dated signs of human occupation is recognized, and it is during this time that the Great Basin experienced major environmental shifts with no modern analog. The Great Basin as a whole is made up of hundreds of subbasins, each of which had a unique reaction to this climate change. The Black Rock Desert, located in the

northwestern portion of the larger Lahontan Basin, offers a unique look at the first human occupations within this greater region.

Pre-Archaic Site Elevation. Similar to many parts of the Great Basin, the first people to occupy this area focused their activities around lake and marsh edges. Much of the archaeological record is located on the surface. While a surface record is usable, it can be problematic when it comes to pinpointing when people occupied these areas. The lithic record offers some information, but the mixture of Pre-Archaic tools with Archaic tools does not allow for exact dating.

One way to control the dating of these first occupations is by correlating the location of remnant shorelines with archaeological sites that contain early components. Researchers can also look at the kinds of lithic assemblages found at these early sites to see if there are similarities between them and sites from different locations that have early components as well.

Using area specific examples, such as the west arm of the Black Rock Desert, paired with regional models used throughout Great Basin research, similarities and differences in the lifeways of Pre-Archaic compared to ethnographic people can be observed through site location and lithic assemblages. With these ideas in mind, fieldwork was done during the 2004-2006 field seasons and a collection of Pre-Archaic sites were recorded along the ancient shoreline of the Lahontan Basin. During these field surveys of surface sites throughout the west arm of the Black Rock Desert, 16 Pre-Archaic sites were recorded within the Mud Meadow Creek area. All but two of these sites are located in between 1200 and 1230 m elevation, which is the predicted shoreline of this portion of the Lahontan Basin between 11,500-7,500 B.P.

Location Analysis. All but two (WC-3 and JAF-4) of the Pre-Archaic sites found in the west arm occur between 1200 and 1230 m (the estimated shoreline of Lake Lahontan between 7,500 and 11,500). There is no reason to suggest that there is an apparent difference between Pre-Archaic and later Archaic sites without equal investigation of the diagnostic lithic tools. Unfortunately, assemblages were only collected from Pre-Archaic sites; therefore, a complete analysis of these tools would be impossible without revisiting the later Archaic sites to do a full collection and analysis.

Despite the missing materials needed to do a full lithic analysis, some interesting things can be said about the similarities and differences in the assemblages of the sites located throughout the west arm and surrounding areas. The Box Canyon sites recorded during the 2004 field season consist of small lithic scatters with very few diagnostic points. Box 1 and Box 5 are the only sites that contain diagnostic points, which include one DSN, one Rose Spring, one side-notched, and one corner-notched projectile point. These all date to the Middle to Late Archaic. There are no other diagnostic tools found in these assemblages. These sites are small sites that offer little information regarding the prehistory of this area.

The sites recorded during the 2004 survey in the Mud Meadow Creek area are mostly non-diagnostic, but there are four sites that have assemblages with tools that date to the Early, Middle, and Late Archaic. There are not many similarities between the Archaic sites recorded during this field season, except they all consist of Early to Late Archaic projectile points, bifaces and some grinding stone implements. These sites include Mud 4, Mud 10, and Mud 15. Sites such as Mud 1, Mud 6, Mud 8, and Mud 16 contain one or two Great Basin Stemmed points. These sites have similar assemblages to

the Archaic sites, besides the lack of Late Archaic points found, which include Rose Spring and Desert side-notched points. There is also a lack of grinding stone implements recorded. Mud 6 is the only site in this group that contained a mano. Mud 11 has six Great Basin Stemmed points and the tool assemblage had more stemmed points than projectile points diagnostic to the Middle or Late Archaic. There was also a high frequency of bifaces at these stemmed point sites and an absence of grinding stone.

Sites located on the valley floor of the west arm recorded during the 2005 field season have similar characteristics to the Mud sites recorded in 2004. BRD 1, BRD 12, and BRD 19 had Early to Middle Archaic tools and no tools dating to the Pre-Archaic. BRD 11 contained one Crescent diagnostic to the Pre-Archaic, but had no grinding stone, while BRD 15 and BRD 16 had one Great Basin Stemmed point at each site and high numbers of grinding stone. BRD 20 and BRD 21 both contain more stemmed points than any other sites recorded during the 2005 field season. They also had high numbers of bifaces, and both were located on raised and gravel-topped landforms similar to those discussed in Oviatt et al. (2003) associated with the Old River Bed in the Bonneville Basin.

During the 2006 field season, various landscapes within the west arm and the Black Rock Mountain range were surveyed. Several Archaic sites were recorded at elevations higher than the 1230 m and lower than the 1200 m. Sites surveyed in the higher elevations include BRP 2-5 and Playette 1-4. Of all of these sites there was one site containing a Gatecliff Split-stem. There was also one Haskett point found as an isolate. Otherwise there was no site that contained stemmed points and other tools

diagnostic to the Pre-Archaic. These sites had very few diagnostics and were mostly sparse lithic scatters.

Sites surveyed on the valley floor but above 1230 m include BC 1-2, WC 1-7, and WS 1-3. Of these sites, five contained diagnostic tools. One Black Rock Concave base point, diagnostic to the Pre-Archaic, was recorded at WC 3. Other tools at this site included a variety of Middle and Late Archaic projectile points, grinding stone and high numbers of bifaces. The WS 1 and WS 2 contained tools that are associated with the Archaic. Grinding stone occurred at these sites.

Sites located below 1230 m included JAF 1-9 and DH 1-11. JAF 4 was the one site found with a possible stemmed point fragment, but the fragment is worn and the limited amount of other tools at this site makes it difficult to diagnose as Pre-Archaic. JAF 1 and DH 9 have points diagnostic to the Archaic; they both contain grinding stone implements, calcified bone, and fire-cracked rock. Both the DH and the JAF sites are located close to hot springs as well as Mud Meadow Creek and they may reveal different kinds of activities taking place later in the Archaic.

It is difficult to say that there is a significant difference in the location of Pre-Archaic and Archaic sites, because many of the Pre-Archaic sites recorded in the west arm also contain Archaic projectile points. There are a few things that can be said regarding the west arm sites and their locations. All of the sites with more than two tools diagnostic to the Pre-Archaic are located on the valley floor of the west arm between 1214 m and 1229 m. These sites contain more Pre-Archaic tools than they do Archaic ones, they have little to no grinding stone implements, fire-cracked rock, calcified bone

fragments, and they all have assemblages associated to Pre-Archaic sites in other areas of the Great Basin (e.g. GBS points, bifaces, graters and scrapers).

Sifting through each site by size, age, location, and the richness of the archaeological record gives some order to the west arm data. Once the data are examined, that which is not useful to this research can be put aside. The idea of this research was to see if there is any correlation between the estimated shorelines of Lake Lahontan and the initial occupation of this specific area. If there was some kind of correlation, we might be able to state that Pre-Archaic people had an affinity to well watered areas. All Pre-Archaic sites within the west arm occur on the valley floor and, so far, there are no sites that have been recorded in the mountains surrounding the west arm just above the valley floor. Both lower and higher elevations in the west arm have multiple Archaic sites, some containing Pre-Archaic tools, but these tools could be present at these sites for multiple reasons. Most Archaic sites that were recorded have evidence for activities common to this period such as grinding stones and fire-cracked rock.

By eliminating sites that contain very few Pre-Archaic tools within their assemblages, five sites best represent this period. These sites include Mud 11, BRD 20, BRD 21, FS 1, and FS 2. At all of these sites the lithics record is dominated by projectile points that are diagnostic to the Pre-Archaic, other lithics such as bifaces, unifacially flaked blades, unifacially reduced flakes, scrapers, and knives or choppers. Of these five sites, one (BRD 21) has a possible mano, which is the only grinding stone at these sites, and no fire-cracked rock. These five sites were located between 1214 m and 1229 m, and Mud 11, BRD 20, and BRD 21 are all located on raised gravel topped landforms. These

five sites have the characteristics of Pre-Archaic sites in surrounding areas and in other parts of the Great Basin. Sites with small amounts of Pre-Archaic points are not consistent in their characteristics. For example site BRD 11 has one Crescent, which is diagnostic to the Pre-Archaic, but there are no other diagnostics representing this period. BRD 12, which is directly across the creek from BRD 11, has large numbers of grinding stone implements and no diagnostic projectile points.

The Lithic Record of the West Arm. A variety of diagnostic tools were found at these west arm sites, which include 51 Great Basin stemmed points, four crescents, 67 projectile points dating to the later Archaic (34 of which are Humboldt points), 238 bifaces, 30 pieces of ground stone, 33 cores, 49 retouched and utilized flakes, and 28 scrapers. The variety of artifacts found from both the Pre-Archaic and later Archaic suggests that people were occupying this area intermittently for over 11,000 years, but Pre-Archaic people seemed to be concentrating their activities on a specific elevations.

The mixture of Pre-Archaic tools and later Archaic tools found at these sites suggests there were resources available other than wetland resources within the west arm, throughout the Archaic. The fact that later Archaic diagnostic tools are found at these sites, as well as sites at higher and lower elevations, suggests that later groups were not as focused on one particular area or elevation in the west arm, but perhaps concentrating their activities at sites in close proximity to Mud Meadow Creek and other adjoining water sources.

The makeup of Pre-Archaic sites can often lead to confusion about the time of occupation and interpretations of the site function. Often these sites contain small numbers of stemmed points compared to later Archaic tools. While in many parts of the

Great Basin, FGVR is the most common toolstone used for the manufacturing of Pre-Archaic formal tools, obsidian is the dominant toolstone used in the northern Great Basin (Amick 1993, 1995). In the west arm sites that possess Pre-Archaic components (Mud-1, Mud-6, Mud-8, Mud-11, Mud-16, BRD-20, BRD-21, FS-1, FS-2), obsidian was the dominant raw material used for the manufacturing of Pre-Archaic projectile points (97.73%) and bifaces (76.32%). The more expedient tools (e.g., cores) were manufactured predominantly (52.72%) on local cherts and CCS. This pattern can be seen in other Pre-Archaic sites within the northwestern Great Basin (Layton 1979; Amick 1997; Smith and Goebel 2003; Smith et al. 2006; Smith 2006, 2007a; Smith 2008). These characteristics provide valuable evidence for defining Pre-Archaic sites within this region and determining the value, use, and availability of certain toolstone in different part of the Great Basin.

It has been hypothesized that Pre-Archaic peoples were highly mobile and often traveled between wetlands. The mobility of these people would account for the movement of raw materials for formal tool making within what is referred to as a lithic conveyance zone. One way to get at the size of lithic conveyance zones is by using the ratio of trace elements to characterize sources of volcanic stone, specifically through XRF analysis.

A sample of 50 obsidian specimens, 48 of which were Pre-Archaic projectile points and point fragments, were geochemically sourced from the west arm sites. The sourcing analysis had the intention of determining possible mobility of Pre-Archaic people in the west arm based on the size of this lithic conveyance zone. According to the data, people travelled between 27 and 137 km to obtain lithic raw materials for the

making of Pre-Archaic projectile points. While a small percentage (2%) of these tools are located 137 km away, people were procuring or trading nonlocal obsidian when local cherts and CCS were available. While it is debatable, it is more likely that obsidian is thought to be directly procured from the source rather than traded with other Pre-Archaic groups.

Ethnographic Relevance. Later Archaic occupants of this region had very little in common with their predecessors and so the ethnographic record can not be used as a ideal example of how people behaved during the Archaic in the western Great Basin. The Pre-Archaic environment, which is discussed in detail in chapter 3, was significantly different from that of the later Archaic and Historic periods. Cultural responses to these environmental differences are seen throughout the archaeological record. For example, there is very little if any evidence for seed and plant processing found in Pre-Archaic sites, while in later Archaic sites groundstone occurs in high frequencies. Often researchers (e.g., Beck and Jones 1997; Elston and Zeanah 2002; Jones et al. 2003; Madsen 2007) describe the groups that lived during the Pre-Archaic “good times” as highly mobile foragers. As has been discussed, these early occupants often took advantage of the shores of the lakes and wetlands, while later groups occupied a variety of places. This can be seen through clustered Pre-Archaic sites, compared to the more dispersed later Archaic sites. Another significant difference between early and later sites in this region is the differences in the toolkit. The Pre-Archaic toolkit reflects a highly mobile people that possessed formal tools that are multipurpose.

While Archaic people in the Great Basin were seasonally mobile, earlier occupants probably had no fixed territorial boundaries and may have been transitory

visitors rather than seasonal or long-term occupants like the ethnographically observed people. Human behavior and response to the environmental conditions of the PHT can be observed in site location and in the lithic assemblages. The 2004-2006 surface surveys suggests that the west arm of the Black Rock Desert follows the expected pattern of early site characteristics, and further research will probably solidify these ideas and add to the knowledge of this region.

On the other hand, it is also important to note that Archaic and Pre-Archaic occupants of the Great Basin both had diverse diets, which is common among even modern highly mobile foragers. The diverse diet during the Pre-Archaic and Archaic differed from each other based on the environmental conditions and what resources were available during that time. With this said, it is uncommon to see any seed processing tools in the Pre-Archaic record and there are no stemmed points with edge grinding seen in the Archaic record, unless the tools were reused and redistributed.

Future Work. The purpose of this research was to use estimated shoreline elevations to locate Pre-Archaic sites within the west arm of the Black Rock Desert. The lithic material were then either collected and analyzed in the lab or in the field in order to answer questions regarding the timing and the mobility of early occupants of the west arm. Using a combination of these materials creates a certain set of criteria for determining the characteristics of a Pre-Archaic site within the west arm.

Additional surveys could be conducted within the west arm using similar criteria. Such survey would add to the sample size and possibly recover further information regarding the Pleistocene/Holocene transition. In addition to conducting new surveys within the west arm, there are several sites that were located during the 2004 and 2005

field seasons that should be revisited and the assemblages should either be collected or a detailed in-field analysis should be done. The change in research strategies during the three field seasons did not allow for a detailed look at the lithic assemblages of certain sites.

The Great Basin in general is a complex geographic area that has undergone many geomorphologic changes, with each subbasin having unique geological characteristics. I feel it would be useful to conduct surveys with someone who has a deep knowledge of the geomorphic changes that occurred in this region and is able to recognize the evidence of these changes visually. This would allow shoreline features to be recognized more readily and suggest explanations why certain landforms were chosen for occupation or use.

On the east side of the west arm one CCS Crescent was found. Other than this artifact, there were no other Pre-Archaic tools found. This suggests there is something different about this location. The east side is bordered by the Black Rock Mountain range, which is a steep mountain range. Possibly it is the colluvium from the foothills of this range that has covered any Pre-Archaic sites there, or maybe the side was not as preferable. One possible reason for the scarcity of early sites is that it would have been a peninsula, a section of the west arm that may have been too difficult to visit based on geographic location and lack of resources or the ability to access those resources. It would be interesting to do further research and have a better understanding as to why Pre-Archaic sites do not occur on the east side of the west arm.

Full lithic assemblages were collected from several of the Pre-Archaic sites and only the early projectile points were sourced using XRF. More could be said regarding

mobility in this region and more specifically at the Pre-Archaic sites, if some later projectile points could be sourced. This might reveal information regarding the differences in mobility and lithic conveyance zones from the Pleistocene/Holocene transition into the late Archaic.

Conclusion. The purpose of this research is to see if Pre-Archaic sites could be predicted, in the west arm of the Black Rock Desert, based on shoreline estimates of the Lahontan Basin. Once these sites were located they were evaluated based on their lithic assemblages, location, and use value to this study. By examining the lithic record of these sites combined with other lines of evidence from the west arm and surrounding subbasins, such as faunal remains, human remains, human coprolites, and environmental data, I attempted to illustrate a general schematic of land-use and behavioral patterns of the people that first occupied this area.

I found that it is possible to predict where Pre-Archaic sites in the west arm were located. Whether or not these sites were formed based on the shoreline of Lake Lahontan during this time or because of the location of Mud Meadow Creek is difficult to tell. It has been mentioned that Pre-Archaic sites are commonly located near shorelines or outflow channels; the west arm once had both. Regardless, there is a clear difference between Pre-Archaic sites and their more general location and Archaic sites, which are dispersed across the landscape at varying elevations. I feel it is safe to say Pre-Archaic people were utilizing both the Lake and the creek, whereas Archaic people were utilizing the creek environment, but not at a specific elevation.

After reviewing all of the west arm data, some conclusions regarding the validity of this project begin to manifest. The Pleistocene/Holocene transition (11,500-7500 BP)

often used as a time marker for archaeological sites, is problematic. The Younger Dryas (10,900-10,100 BP) is also a good environmental time marker, but is generalized and does not always explain environmental variations on a local scale. Having a more exact time of when things occurred in this area would give more value to this research, but it is not possible.

The result of these generalities leave us with patchy data to describe Pre-Archaic sites and the time of their creation. Despite the shortcomings of Pre-Archaic archaeological surface data, it is possible to come up with a general time-line that describes when these Pre-Archaic sites may have formed. It is evident based on the lithic record of the west arm that the Great Basin Stemmed Point Traditions occurs later than the Clovis Tradition. The Great Basin Stemmed Point Tradition, which is described as the Parman Phase by Layton (1973) and Layton and Davis (n.d.), lasted from about 10,000 to 8,000 B.P. This is a phase after the Younger Dryas when Lake levels began their decline. By this time, large mammals would have been extinct in this area, but native people would have made use of the other game animals such as deer, big horned sheep, and antelope, which were found locally. This is suggested by the lithic record. Although lake levels were on the decline, there were remaining wetlands that would have provided a wide variety of resources, such as fish and waterfowl as well as wetland vegetation used for multiple purposes. Evidence for this is seen in the Spirit Cave burial.

It is true that what is collected and analyzed in the lithic record does not tell the entire story of how people behaved and what resources they exploited during the Pre-Archaic. In fact, the surface lithic record can only tell us the kinds of tools that were used and we must infer what these tools were used for. Faunal remains from buried sites

would give more insight into what the particular subsistence strategies were during the Pre-Archaic, but the surface lithic record is what leads researchers to the kinds of landforms and locations these people once found useful and visited or occupied.

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APPENDIX A: Radio Carbon Dates from Geological and Midden Materials

Table 17. Radio Carbon ages of geological and midden materials used for the reconstruction of lake-level fluctuations between 13,000 and 7000 B.P.

Location	Lab #	Age (¹⁴ C B.P.)	Sample material	Age (cal. B.P.) (2σ)	Elevation (m)	Letter in Figures 3 & 5	Reference
Western Subbasins							
Pyramid Lake-Nixon Terrace	Beta-192174	7020 ± 40	charcoal	7760-7950	1189	A	Bell et al. 2005
Pyramid Lake-Nixon Terrace	Beta-192173	7380 ± 40	organic sed	8050-8330	1189	B	Bell et al. 2005
Pyramid Lake-Nixon Terrace	Beta-165453	7800 ± 60	charcoal	8430-8760	1207	C	Bell et al. 2005
Pyramid Lake-Nixon Terrace	Beta-165461	7940 ± 40	bone	8640-8980	1207	D	Bell et al. 2005
Pyramid Lake delta slope	WIS-374	8800 ± 90	wood	9560-9570	1168	E	Born 1972
				9580-10,160			
Pyramid Lake delta slope	WIS-377	9720 ± 100	wood	10,740-11,310	1169	F	Born 1972
Pyramid Lake delta	I-8194	9780 ± 135	wood	10,720-11,630	1176	G	Prokovich 1983
				11,670-11,700			
Pyramid Lake delta	I-8193	9970 ± 140	wood	11,170-12,030	1179	H	Prokopovich 1983
Pyramid Lake beach ridge	CAMS-90412	10,820 ± 35	pelecypod shell	12,800-12,880	1212	I	Briggs et al. 2005
Fishbone Cave	L-245	11,200 ± 250	juniper roots	12,760-13,640	1235	J	Thompson et al. 1986
Guano Cave #11	A-3699	11,580 ± 290	juniper	12,920-14,010	1230	K	Thompson et al. 1986
Guano Cave #7B1	A-3696	11,810 ± 230	juniper	13,200-14,170	1230	L	Thompson et al. 1986
Guano Cave #6A	A-3695	11,890 ± 250	juniper	13,220-14,500	1230	M	Thompson et al. 1986
				14,550-14,561			
Guano Cave #10	A-3698	12,060 ± 260	juniper	13,390-14,870	1230	N	Thompson et al. 1986
Guano Cave #9	A-3697	12,070 ± 210	juniper	13,440-14,730	1230	O	Thompson et al. 1986
Falcon Hill #2	A-3489	12,020 ± 470	juniper	13,000-15,250	1296	P	Thompson et al. 1986
Winnemucca Lake beach ridge	Beta-174833	16,610 ± 80	gastropod shells	19,310-20,290	1231		This study
Carson Sink							
Rainbow Mtn beach ridge	GX-27181	8060 ± 70	charcoal	8650-9135	1228	Q	Caskey et al. 2004
				9180-9200			
				9225-9230			
Rainbow Mtn beach ridge	LLNL-81208	9950 ± 60	charcoal	11,230-11,630	1228	R	Caskey et al. 2004
				11,670-11,700			
Large meander scrolls on Humboldt	Beta-156642	9500 ± 40	charcoal	10,605-10,620	NA		House et al. 2001
				10,654-10,870			
				10,950-11,070			
Humboldt Bar, shore-zone sand	Beta-29024	10,380 ± 80	Anodonta shell	11,980-12,630	1198	S	Currey 1990
Top of Carson River paleodelta	Beta-24290	11,100 ± 110	Tufa	12,870-13,200	1203	T	Currey 1988
Stillwater slough, lake surface =?	Beta-24291	11,300 ± 130	Marl	12,940-13,400	1198	U	Currey 1988
Lahontan highstand at Jessup	NSRL-3014	13,070 ± 60	camel bone	15,150-15,800	1339	V	Adams and Wesnousky 1998

APPENDIX B: Results of X-Ray Fluorescence Analysis

Table 18. Results of XRF Studies from Several Black Rock Desert Region Sites, Humboldt County, Nevada

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ³⁺ O ³⁺	Fe:Mn	Fe:Ti	
CrNV-22-8115	1	8	42 ± 11	14 5	201 5	93 9	29 3	184 10	17 2	1064 90	525 28	564 32	1.05 0.11	17.2	33.6	Coyote Spring
CrNV-22-8120	2	8	144 ± 11	43 5	207 5	9 11	72 3	464 10	21 2	NM NM	NM NM	0 31	NM NM	56.9	48.2	BS/PP/FM/Whitehorse *
CrNV-22-8120	3	12	141 ± 11	41 5	166 5	12 10	63 3	387 10	16 2	780 89	371 28	0 31	2.10 0.11	47.3	88.0	BS/PP/FM
CrNV-22-8120	4	13	145 ± 11	28 5	230 5	7 47	88 3	574 10	28 2	1749 91	971 29	0 31	2.17 0.11	18.5	41.4	Massacre Lake/Guano Valley
CrNV-22-8120	5	17	114 ± 11	27 5	165 5	7 97	59 3	359 10	17 2	862 89	339 28	0 31	2.16 0.11	53.3	82.3	BS/PP/FM
CrNV-22-8120	6	26	155 ± 11	32 5	198 5	10 10	93 3	482 10	24 2	1694 91	495 28	0 31	3.26 0.11	54.2	63.6	BS/PP/FM/Whitehorse
CrNV-22-8120	7	27	126 ± 11	37 5	226 5	11 10	93 3	583 10	28 2	1751 91	865 29	0 31	2.21 0.11	21.2	42.2	Massacre Lake/Guano Valley
CrNV-22-8120	8	37	136 ± 11	31 5	163 5	9 10	55 3	352 10	19 2	847 89	337 28	0 31	2.08 0.11	51.7	80.5	BS/PP/FM
CrNV-22-8120	9	41	175 ± 11	36 5	194 5	8 19	76 3	478 10	25 2	725 89	423 28	0 31	1.95 0.11	38.5	87.8	BS/PP/FM/Whitehorse
CrNV-22-8120	10	93	142 ± 10	41 5	171 5	7 27	56 3	371 10	20 2	920 89	363 28	0 31	2.26 0.11	51.9	80.6	BS/PP/FM
CrNV-22-8120	11	95	162 ± 11	40 5	202 5	9 10	90 3	490 10	25 2	1674 91	396 28	0 31	2.90 0.11	60.7	57.4	BS/PP/FM/Whitehorse
CrNV-22-8120	12	106	139 ± 11	34 5	175 5	8 12	64 3	430 10	20 2	574 89	244 27	0 31	1.84 0.11	64.0	104.1	BS/PP/FM
CrNV-22-8121	13	4	30 ± 11	21 5	132 5	89 9	17 3	154 10	10 2	1065 91	326 27	1066 32	0.84 0.11	22.8	27.5	Badger Creek
CrNV-22-8121	14	11	37 ± 11	14 5	189 5	90 9	33 3	178 10	18 2	1104 90	413 28	597 32	1.14 0.11	23.6	35.1	Coyote Spring
CrNV-22-8121	15	13	126 ± 11	35 5	224 5	10 10	84 3	574 10	30 2	1510 91	828 28	0 31	2.00 0.11	20.1	44.4	Massacre Lake/Guano Valley
CrNV-22-8121	16	14	128 ± 11	19 5	215 5	9 10	89 3	564 10	28 2	1681 91	856 28	0 31	2.24 0.11	21.7	44.6	Massacre Lake/Guano Valley

All trace element values reported in parts per million; ± = analytical uncertainty estimate (in ppm). Iron content reported as weight percent oxide.
 NA = Not available; ND = Not detected; NM = Not measured.; * = Small sample.

Table 18. Results of XRF Studies: Several Black Rock Desert Region Sites, Humboldt County, Nevada

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ² O ³ T	Fe:Mn	Fe:Ti	
CrNV-22-8121	17	23	183 ± 11	36 5	205 5	12 10	92 3	493 10	26 2	1394 91	680 28	0 31	2.94 0.11	35.6	69.6	BS/PP/FM/Whitehorse
CrNV-22-8121	18	24	139 ± 11	37 5	223 5	ND	90 3	582 10	32 2	1590 91	913 29	0 31	2.04 0.11	18.5	42.8	Massacre Lake/Guano Valley
CrNV-22-8121	19	34	51 ± 10	17 5	122 4	171 9	15 3	161 10	7 2	951 91	372 28	1004 32	1.14 0.11	26.4	40.7	Beatys Butte
CrNV-22-8122	20	1	143 ± 11	33 5	171 5	ND	65 3	372 10	21 2	740 89	400 28	0 31	2.04 0.11	42.5	89.9	BS/PP/FM
CrNV-22-8189	21	1	136 ± 10	38 5	164 5	8 12	59 3	365 10	20 2	872 89	433 28	0 31	2.16 0.11	41.5	81.2	BS/PP/FM
CrNV-22-8189	22	2	199 ± 11	44 5	211 5	9 10	92 3	526 10	27 2	1125 90	328 28	0 31	2.74 0.11	69.3	80.0	Double H/Whitehorse
CrNV-22-8189	23	3	40 ± 11	17 5	197 5	91 9	30 3	185 10	14 2	1171 91	493 28	632 32	1.20 0.11	20.8	34.8	Coyote Spring
CrNV-22-8189	24	4	150 ± 10	35 5	182 5	10 10	64 3	403 10	18 2	740 89	373 28	0 31	1.89 0.11	42.5	83.6	BS/PP/FM
CrNV-22-8189	25	5	16 ± 15	28 5	108 4	71 9	20 3	101 10	12 2	604 90	362 28	705 32	0.79 0.11	19.3	44.9	Buck Mountain
CrNV-22-8189	26	6	122 ± 11	35 5	162 5	10 10	59 3	378 10	21 2	725 89	396 28	0 31	1.98 0.11	41.9	89.3	BS/PP/FM
CrNV-22-8189	27	7	141 ± 11	35 5	226 5	10 10	89 3	581 10	33 2	1591 91	836 28	0 31	2.14 0.11	21.3	44.9	Massacre Lake/Guano Valley
CrNV-22-8189	28	9	50 ± 11	24 5	147 5	97 9	23 3	122 10	10 2	809 91	599 28	1110 32	0.94 0.11	13.6	39.6	Buffalo Hills
CrNV-22-8189	29	13	115 ± 11	24 5	207 5	10 10	90 3	566 10	29 2	1642 91	857 28	0 31	2.16 0.11	20.9	43.9	Massacre Lake/Guano Valley
CrNV-22-8189	30	27	119 ± 11	33 5	162 5	9 10	59 3	349 10	19 2	821 89	356 28	0 31	2.06 0.11	48.3	82.2	BS/PP/FM
CrNV-22-8190	31	25	122 ± 11	30 5	222 5	9 11	93 3	580 10	29 2	1633 91	1079 29	0 31	2.24 0.11	17.2	45.8	Massacre Lake/Guano Valley
CrNV-22-8190	32	28	39 ± 11	22 5	202 5	88 9	27 3	177 10	14 2	1038 90	360 28	533 32	1.07 0.11	25.6	35.1	Coyote Spring

All trace element values reported in parts per million; ± = analytical uncertainty estimate (in ppm). Iron content reported as weight percent oxide. NA = Not available; ND = Not detected; NM = Not measured; * = Small sample.

Table 18. Results of XRF Studies: Several Black Rock Desert Region Sites, Humboldt County, Nevada

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ²⁺ O ^{3T}	Fe:Mn	Fe:Ti	
CrNV-22-8191	33	1	42 ± 10	28 5	208 5	97 9	31 3	189 10	19 2	978 90	346 28	563 32	1.00 0.11	25.2	35.1	Coyote Spring
CrNV-22-8194	34	4	30 ± 12	30 5	159 5	120 9	20 3	164 10	10 2	1061 91	544 28	962 32	1.15 0.11	18.1	36.8	Mt. Majuba
CrNV-22-8196	35	1	139 ± 10	34 5	171 5	9 10	61 3	393 10	17 2	692 89	364 28	0 31	1.94 0.11	44.6	91.4	BS/PP/FM
CrNV-22-8199	36	48	133 ± 11	32 5	222 5	0 0	92 3	575 10	29 2	1711 91	941 29	0 31	2.25 0.11	19.8	43.9	Massacre Lake/Guano Valley
CrNV-22-8199	37	63	133 ± 11	33 5	222 5	8 15	87 3	571 10	32 2	1370 90	770 28	0 31	1.81 0.11	19.6	44.2	Massacre Lake/Guano Valley
CrNV-22-8210	38	1	118 ± 11	30 5	162 5	9 11	58 3	352 10	19 2	917 89	368 28	0 31	2.22 0.11	50.5	79.6	BS/PP/FM
Isolated Find	39	19	48 ± 10	26 5	115 4	12 9	33 3	81 10	14 2	183 87	742 28	38 34	0.61 0.11	7.4	104.0	Cowhead Lake
CrNV-21-7776	40	2	113 ± 11	36 5	218 5	9 10	85 3	565 10	33 2	1735 91	860 28	0 31	2.18 0.11	21.0	42.0	Massacre Lake/Guano Valley
CrNV-21-7776	41	3	107 ± 11	35 5	160 5	8 11	58 3	387 10	17 2	856 89	375 28	0 31	2.13 0.11	47.5	81.8	BS/PP/FM
CrNV-21-7777	42	1	137 ± 10	43 4	175 5	8 11	62 3	401 10	19 2	794 89	366 28	0 31	2.01 0.11	46.0	83.0	BS/PP/FM
CrNV-21-7777	43	2	148 ± 10	38 5	230 5	ND ND	87 3	573 10	30 2	1344 90	793 28	0 31	1.84 0.11	19.3	45.7	Massacre Lake/Guano Valley
CrNV-21-7777	44	3	137 ± 11	39 5	225 5	10 10	90 3	585 10	30 2	NM NM	NM NM	0 31	NM NM	21.6	43.0	Massacre Lake/Guano Valley *
CrNV-21-7780	45	5	48 ± 10	20 5	198 5	83 9	31 3	174 10	20 2	994 90	476 28	568 32	0.99 0.11	18.0	34.0	Coyote Spring
CrNV-21-7780	46	9	123 ± 11	27 5	168 5	7 49	61 3	356 10	22 2	817 89	371 28	0 31	2.10 0.11	47.3	84.2	BS/PP/FM
CrNV-21-7780	47	11	166 ± 12	39 5	206 5	12 10	85 3	484 10	25 2	1448 91	692 28	0 31	3.02 0.11	35.9	68.7	BS/PP/FM/Whitehorse
CrNV-21-7780	48	18	136 ± 11	35 5	158 5	ND ND	56 3	352 10	18 2	730 89	552 28	0 31	1.96 0.11	29.6	87.8	BS/PP/FM

All trace element values reported in parts per million; ± = analytical uncertainty estimate (in ppm). Iron content reported as weight percent oxide. NA = Not available; ND = Not detected; NM = Not measured.; * = Small sample.

Table 18. Results of XRF Studies: Several Black Rock Desert Region Sites, Humboldt County, Nevada

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ²⁺ O ^{3T}	Fe:Mn	Fe:Ti	
CrNV-21-7780	49	19	127 ± 11	42 5	158 5	8 11	57 3	352 10	18 2	789 89	379 28	0 31	2.00 0.11	44.2	83.2	BS/PP/FM
CrNV-21-7780	50	20	68 ± 10	25 5	155 5	99 9	24 3	124 10	10 2	683 90	832 28	1044 32	0.83 0.11	8.7	41.4	Buffalo Hills
CrNV-21-7784	51	1	50 ± 10	18 5	102 4	68 9	18 3	100 10	8 2	545 89	584 28	658 32	0.70 0.11	10.6	44.1	Buck Mountain
CrNV-21-7784	52	2	109 ± 11	40 5	206 5	9 11	92 3	568 10	26 2	1525 91	867 28	0 31	2.31 0.11	22.1	50.5	Massacre Lake/Guano Valley
NA	RGM-1	RGM-1	36 ± 11	26 5	151 5	106 10	26 3	221 10	5 2	1623 89	512 28	782 31	1.76 0.11	29	36	RGM-1 Reference Standard

Figure 7. Scatter Plot of XRF Data: Several Black Rock Desert Region Sites, Humboldt County, NV

