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CHARACTERIZING MUSCUPIABIT (CA-SBR-425/H) AND ITS PLACE IN THE GREATER SERRANO SETTLEMENT SYSTEM

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CHARACTERIZING MUSCUPIABIT (CA-SBR-425/H) AND ITS PLACE IN THE GREATER SERRANO SETTLEMENT SYSTEM

A Thesis

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

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Master of Arts

in

Applied Archaeology

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by

Robert Dalton Grenda

June 2017

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Amy Gusick, Committee Chair, Anthropology

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ABSTRACT

First excavated in 1938, the site of Muscupiabit (CA-SBR-425/H) has long been a subject of archaeological research in the San Bernardino Mountains. Previous excavations at the site have either been unpublished or limited in scope. A primary goal was to obtain a radiocarbon date for the site, giving a definitive age to the site. Other goals included determining the population size of Muscupiabit as well as the function of the site and its place in the Serrano settlement system.

To obtain dateable material, an excavation was conducted in hopes of locating a thermal feature. An intact thermal feature was found and charcoal was recovered. In order to adequately address the proposed research questions, museum collections were used to gain a larger sample size. A large quantity of artifacts had been excavated in the 1980s but were never analyzed. Between those excavations and the 2017 excavations, 7 units were analyzed. Additionally, population records from the Spanish mission system were analyzed to address research questions about population size.

Based on a radiocarbon date, shell bead types, and population records, it appears that Muscupiabit was occupied in the late 17th/early 18th century and was likely abandoned by 1815. Despite its location along a trade route, the site does not appear to have been controlling trade. Muscupiabit was intermarried with other villages but its level of political independence cannot be determined at this time.

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CHAPTER ONE

INTRODUCTION

In August 2016, the Blue Cut Fire burned 37,000 acres of the San Bernardino National Forest and adjacent private land. This fire was the twentieth most destructive wildfire in the history of California and caused the loss of over 300 structures. Among these structures was the caretaker's residence at the ancestral Serrano village of Muscupiabit (CA-SBR-425/H) in Cajon Pass (Figure 1) which is on a 28-acre parcel of land (Figure 2) owned by the San Bernardino County Museum Association (SBCMA). The residence was constructed in the 1940s and was built directly on the archaeological site. The fire not only destroyed the structure but also burned a few small outbuildings, multiple antique vehicles, and all the vegetation on the property. Aware of the archaeological sensitivity of the property, the SBCMA asked Statistical Research, Inc. (SRI) for an evaluation of the site prior to conducting clean-up activities on the property. The concern was that heavy equipment may damage midden and/or human remains that could be in the vicinity of the burned house remains. The data from this evaluation were used to address the research topics presented in this thesis.

This site of Muscupiabit is also known as Muscupiabe and Amuscupiabit (Douglas *et al.* 2008) and is located near the north end of Cajon Pass. The site was first recorded in 1791 in California mission baptismal records. In 1791, a person who listed their origin as "Amuscopiabit" was baptized at Mission San Gabriel. However, the first known Spanish visitor to the site was Fray Jose Maria Zalvidea in 1806 (Cook 1960; Smith 1953). In Zalvidea's report, he wrote that the village had approximately 25 inhabitants. Lt. Amiel Whipple, surveying Government Road in 1853, reported huts at Camp Cajon built on circular depressions about 10 feet in diameter and 2 feet deep (Smith 1963).

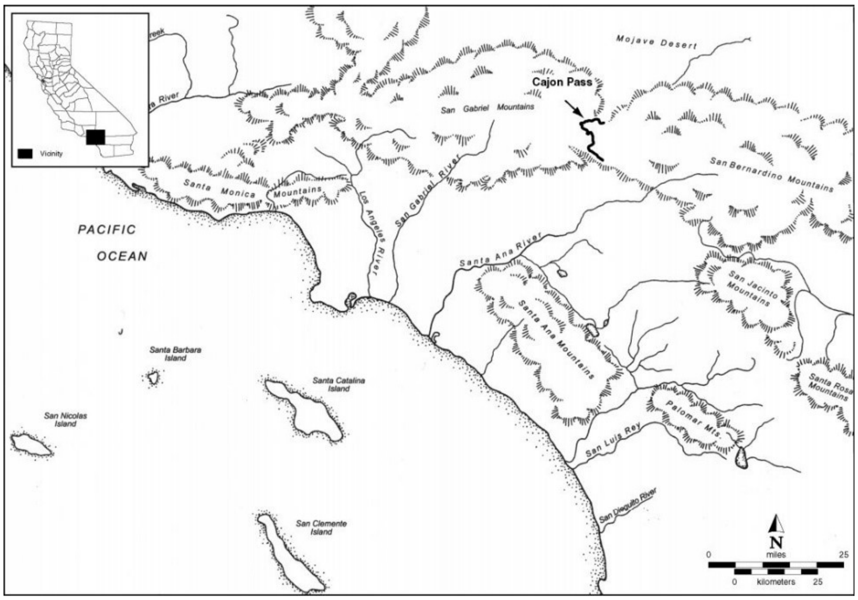

Figure 1. Location of Cajon Pass in Southern California (Adapted from Grenda 1998)

Emergency fieldwork for this evaluation was conducted between September 1 - 4, 2016. The site was initially surveyed through shovel testing and pedestrian survey. After it was determined that the house was located away from the prehistoric deposit, a small midden sample was hand excavated from the main site area to provide material culture to compare with previously excavated artifact collections. Based on the results of pedestrian survey and shovel tests, combined with a map of previous excavations, a 4-m-by-0.5-m hand trench was placed in the middle of the deposit. After encountering a feature in the north end of the trench, an expansion unit (1-m-by-2-m) was added to northwestern portion of the trench. Data gathered from the shovel tests demonstrated that there are minimal intact archaeological deposits on the lower terrace in the northern part of the site. The archaeological material is generally concentrated on a small, higher, river terrace oriented approximately northwest-southeast and raised about two meters above the rest of the mapped site area.

For my thesis, I have created a site map showing all previous excavation areas, analyzed the materials excavated during the emergency evaluation, and analyzed a sample of the existing collections from the site that are housed at the San Bernardino County Museum (SBCM). Using these data, I address the research topics presented in Chapter 4, including the technologies used and the nature of the subsistence strategies practiced at the site. I also evaluate Muscupiabit's place in the regional settlement and subsistence system. Once my research is complete, SBCMA will be able to minimize damage from post-fire cleanup activities and interpret the nature of the occupation so they can provide good stewardship for the resource and provide better interpretive materials for the public.

This thesis begins with a review of the local environment and culture history. Some of the more informative sites in the region are discussed in relation to Muscupiabit and the Serrano settlement pattern as a whole. Next, a review of the Serrano settlement and subsistence pattern is given. After a discussion of the settlement and subsistence pattern, a history of settlement-pattern studies in the San Bernardino Mountains is provided.

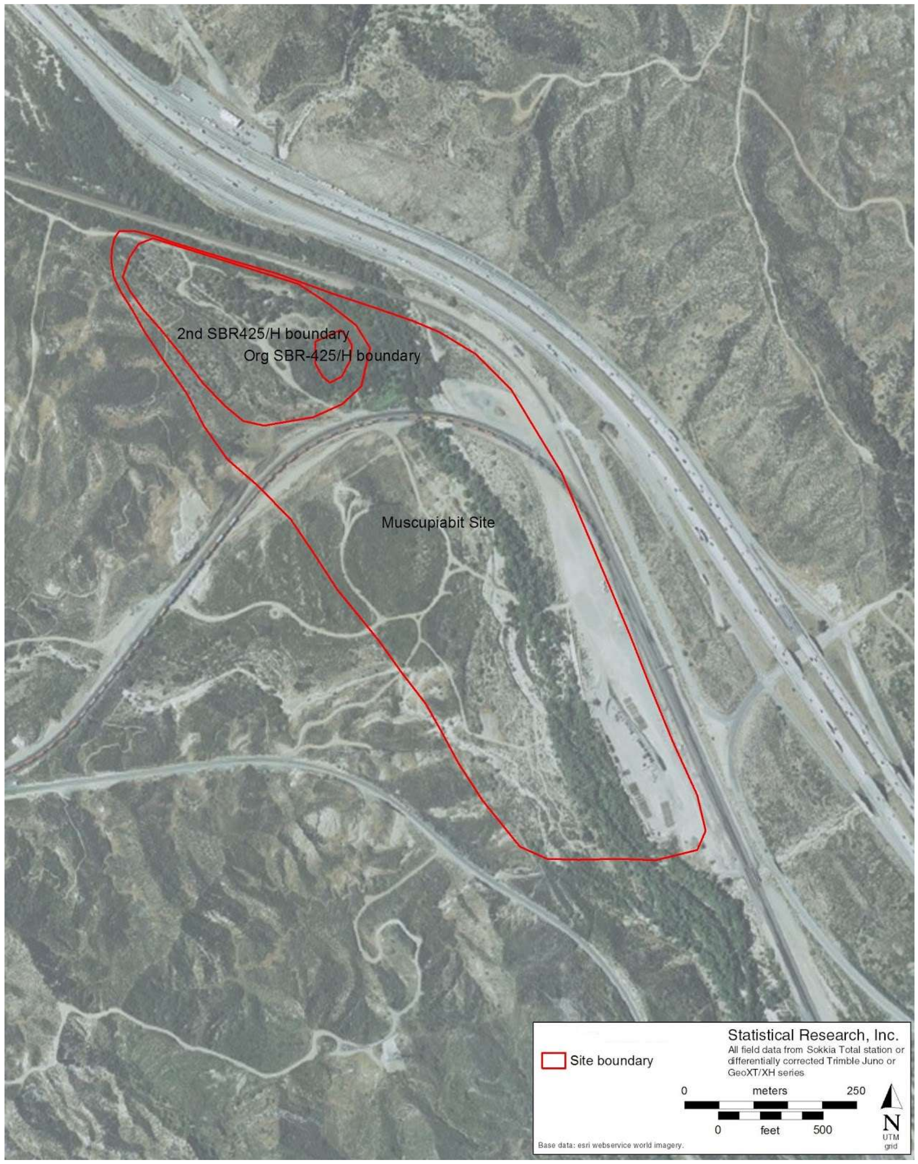

Figure 2. Location of CA-SBR-425/H Showing Various Site Boundaries on File at the South Central Coastal Information Center.

This history focuses especially on Altschul and his colleagues' (1985) settlement and subsistence model for the San Bernardino Mountains. Following this is a section introducing balanophagous (i.e. acorn-based) economies and details on the reliability of acorn crops. The next section is an explanation of Halstead and O'Shea's (1989) economic buffering model. After explaining the economic buffering model, the ways that the model can be applied to Serrano settlement and subsistence are discussed. This section concludes with a presentation of research domains and specific research questions that may be addressed through analysis of artifacts recovered from Muscupiabit.

CHAPTER TWO

ENVIRONMENTAL AND CULTURAL BACKGROUND

Environmental Background

The protohistoric Serrano occupied the east-west trending (i.e., transverse) San Bernardino Mountains, which are approximately 50 miles long and roughly 20 miles wide. The mountains were formed between five and eleven million years ago by uplift along the San Andreas Fault which runs to the west and south of the range (Lerch *et al*. 2002). The mountains form the rain shadow that helps create the arid Mojave Desert and separate the desert from the Los Angeles Basin and coastal plain. The mountains are relatively young and fairly steep. The highest peaks exceed 11,000 feet above mean sea level (AMSL) but most of the range is less than 8,000 feet AMSL. The Mojave River has its source in these mountains and flows north out of the mountains where it is joined by Deep Creek. The Santa Ana River is the primary drainage on the southern/coastal side of the mountains. Other major drainages include Mill Creek, City Creek, and Plunge Creek on the south, Whitewater, Noble, and Mission Creeks to the southeast, Furnace Creek on the northeast, and Cajon Creek on the west end.

Climate. The climate of the low elevation areas surrounding the San Bernardino Mountains is Hot-summer Mediterranean (*Csa* in the Köppen climate classification system), with hot dry summers and cool, mild winters (Rubel 2010). The climate of this area, and California as a whole is dominated by a semi-permanent high pressure region over the northern Pacific Ocean. During the summer, this high-pressure zone blocks Pacific storms from reaching California. At the same time, the heat of the Arizona and southern California deserts creates a low-pressure area that allows for occasional thunderstorms from the Gulf of California and Gulf of Mexico to reach the San Bernardino and San Jacinto Mountains. The San Jacinto Mountains lie approximately 30 miles southeast of the east end of the San Bernardino Mountains. The direction of movement of these storms means that the south side of the mountain ranges receive rain but the mountains cast a rain shadow on the north side. The crest of the San Bernardino Mountains receives two to three times the amount of precipitation that the valleys receive. Summer precipitation is characterized by short, intense thunderstorms which do little in the way of adding moisture to the soil. Most of this water ends up as runoff and these storms can induce major flooding (Ahlborn 1982).

The elevation of the San Bernardino Mountains creates a boundary bridging two drastically different ecological zones. The southern side of the mountains receives the greatest amount of rain but is covered by scrub vegetation usually seen in drier areas. This is because the slopes on this side of the mountains are so steep that water is unable to settle into the ground, making it difficult for large trees to grow. While the north side of the mountains is in the rain shadow of the mountain peaks, there is a mixed coniferous forest even near the desert floor. This is the result of low evaporation and runoff rates because the north slope is not nearly as steep as the south slope (Lerch 2007). Also, the north-facing slopes hold snowpack much longer than the southern slopes. The combination of these factors means that water can enter the soil and become available to large trees.

Flora. The north slope of the of the mountains is predominantly covered by a pinyon-juniper forest (Lerch *et al.* 2006). The major species in this environment are the pinyon pine (*Pinus edulis*), single leaf pinyon (*Pinus monphylla*), western juniper (*Juniperus occidentalis*), and California juniper (*Juniperus californica*). This plant community grows between 4500 and 8000 feet AMSL. Ground cover is sparse and the amount of juniper increases with elevation. In flat, dry areas great basin scrub is commonly found. This environment includes a variety of low, drought tolerant bushes and at lower elevations may include Joshua trees (*Yucca brevifolia*). At high elevations, the mixed-conifer-and-oak forest is often found. Common species in this environment include Ponderosa pine (*Pinus ponderosa*), Jeffrey Pine (*Pinus Jeffreyi*), incense cedar (*Calocedrus decurrens*), and the canyon live (*Quercus chrysolepis*) and black oaks (*Quercus kelloggi*). The dense canopy of these trees prevents any significant ground cover from forming. Areas of less dense oak growth are known as oak woodland. These oak stands generally consist of canyon live oaks and can have a relatively dense understory. Drainages create unique environments that are home to plants found nowhere else in the mountain environment. The most common tree in these riparian corridors is the white alder (*Alnus rhombifolia*) but sycamores (*Platanus racemosa*) and big-leaf maples (*Acer macrophyllum*) are also found at lower elevations.

Fauna. A wide variety of animals inhabits the San Bernardino Mountains, many of which were used as a food resource (Lerch *et al*. 2006). Animals used by the natives included mule deer (*Odocoileus hemiones)*, pronghorn antelope (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), cottontail rabbit (*Sylvilagus audubonii*), jackrabbit (*Lepus californicus*), wood rat (*Neotoma* sp.), ground squirrel (*Spermophilus* sp.), desert tortoise (*Gopherus agassizi*), pond turtle (*Clemmys marmorata*), and chuckwalla (*Sauromalus obesus*). Large carnivores such as coyotes (*Canus latrans*) and mountain lions (*Puma concolor*) are founf in the area but were not economic species. Prior to historic times, the California grizzly bear (*Ursus arctos californicus*) inhabited the area. Golden eagles are found in the area and were raised for use in ceremony but not eaten (Benedict 1924).

Regional Culture History

This section outlines the culture history of the desert and mountain regions inhabited by the protohistoric Serrano culture. The broad cultural history of the region is generally divided into "early", "middle", and "late" periods. Because the middle period persists for so long, Douglas *et al.* (2008) split the middle period into "early middle" and "late middle." The prehistoric sequence concludes with the protohistoric period.

Early Period. Whereas the earliest date of human occupation in the Mojave Desert is disputed, it is generally accepted that humans first entered the region between 8000 and 10,000 years ago. The cultural unit for this period is called the Lake Mojave complex and is identified by Silver Lake and Lake Mojave projectile points. The presence of fluted points suggests that there was an earlier occupation but there are no further data to support this. People of the Lake Mojave complex probably lived in small, highly mobile groups based around pluvial lakeshores and used plants and small animals for subsistence (Grenda 1997). No sites from this period are known to exist around the San Bernardino Mountains. It is possible that no early sites have been found because alluvial deposits have buried the sites.

Early Middle Period. By 7000 years ago, the climate warmed to a point that most of Pleistocene lakes in the Mojave Desert had disappeared. The local populations, dependent on the now desiccated lakes had to adapt to their worsening environment. It is unclear how populated the desert was between 7000 and 4000 years ago but it appears that it was populated by a very small, sparse population. Based on evidence of coastal population growth, it is suggested by Kowta (1969) and Grenda (1997) that desert populations fled to coastal areas. This period is called the Pinto period and is identified by Pinto projectile points. Other names for this period include Millingstone horizon and the Encinitas tradition. In the Cajon Pass, this period is known as the Sayles Complex (Grenda *et al.* 1998).

Late Middle Period. After about 4000 years ago, people began to return to the desert. Subsistence strategies of this period relied primarily on hunting. The method of hunting shifted from atlatl to the bow and arrow towards the end of the period. There was an increase in milling stone use relative to the Pinto period, suggesting an increase in plant use. Trade and ritual also appear to have increased in this period based on split-twig figurines (Smith *et al.* 1957). These figurines originated in Southwest cultures and have been found in association with pictographs. The period from 4000 to 1500 years ago is called the Gypsum period. Sites in the San Bernardino Mountains area that date to this period include the Siphon site in the Summit Valley (Sutton and Schneider 1991) and the Greven Knoll of the Yukaipa't site (Grenda 1998).

Late Period. Beginning about 1500 years ago, trade between inland and coastal populations increased, as did the complexity of inland societies. This period, known as the Saratoga Springs period, can be seen as a continuation of the preceding Gypsum period. It is possible that ceramics were introduced to the region during this period but there is little evidence (Waters 1982). Projectile points common during this period include the Cottonwood and Desert Side-notched points. Increased trade with coastal populations is evidenced by an increase in shell beads (Lerch 2007).

Protohistoric Period. From 800 years ago to European contact, the regional culture continued to develop as it had during the Saratoga Springs period. Sites dating to this period are common in the San Bernardino Mountains and the surrounding areas. Takic language speakers (the Serrano) were established in the mountains and low deserts and had expanded their trade connections. Lower Colorado Buff ceramic from the Colorado River and the continued use of shell beads are evidence of long-distance trade. However there is less obsidian use during this period, suggesting that some trade connections were lost. In addition to Muscupiabit (CA-SBR-425), significant sites dating to this period are Deep Creek (CA-SBR-176), Guapiabit (CA-SBR-93), and Yukaipa't (CA-SBR-1000/H) which are discussed below.

Recorded Serrano Villages

Ethnohistoric accounts (Benedict 1924) describe the southern California Serrano Indians' settlement and subsistence pattern as living in permanent villages around the foothills of the San Bernardino Mountains and following a seasonal round that involved moving to higher elevations to exploit the fall acorn and pinyon crops. At contact, several villages were recorded by Spanish missionaries and European explorers. These villages included Guapiabit in Summit Valley, Yukaipa't in Yucaipa, Yuhabiat near Baldwin Lake, Muscupiabit in Cajon Pass, and a number of others around the base of the mountains (Figure 3). Many of these villages were recorded by the first archaeologists in the region but, except for Yukaipa't (Grenda 1997), no comprehensive reports exist for any purported Serrano village site. As a result, few of these sites have been properly placed into the broader settlement and subsistence pattern for the region.

Deep Creek (CA-SBR-176)

Deep Creek lies at the confluence of Deep Creek and the Mojave River. It has been the subject of multiple investigations since 1939 (Smith 1939, 1955, 1963). Deep Creek was interpreted by Altschul *et al*. (1989) to be a protohistoric winter village from which inhabitants would begin their yearly round. It is believed that Deep Creek was the base camp or primary village for a series of sites along Summit Valley.

Guapiabit (CA-SBR-93)

Guapiabit is a village located in Summit Valley which had approximately 80 inhabitants at European contact. It is located on a series of benches above the Mojave River. The site was first investigated by Gerald Smith in 1939 (Smith, Circular Pits of Summit Valley, California 1939) and later excavations were conducted by Moseley and Smith in 1961 and Bowers in 1976. More than 140 circular depressions which were later determined to be the remains of houses were located here.

Yukaipa’t (CA-SBR-1000/H)

This Serrano village is in the San Gorgonio pass on a trade route between the Los Angeles basin and Colorado River. It was placed at the mouth of a canyon and near the oak groves at Oak Glen. Excavations yielded evidence for house pits and evidence of more than 10 different obsidian sources, suggesting that the village had extensive trade connections with groups in the interior of California, Nevada, and Utah (Grenda 1998).

Previous Archaeological Excavations at Muscupiabit (CA-SBR-425/H)

The first archaeologist to visit Muscupiabit was Gerald Smith when he recorded the site in 1938 and reported ten circular pits 10 to 15 feet in diameter and two feet deep. Smith and the Archaeological Survey Association of Southern California (ASA) returned to the site in 1949 and conducted surface collection and excavated a few test pits (Smith 1963). When Smith concluded his research, he marked several units which he planned for Dr. Gil Becker to excavate. Becker began these excavations in 1976 using avocational, volunteer labor. Becker established a grid of two meter squares and 14 units, all adjacent to one another. None of these units extended beyond 42 cm below ground surface. Excavation continued in 1979 when Dr. Roger Baty excavated nine more pits.

In 1983, Dr. Thomas Blackburn began systematic excavation of the site. That year Blackburn and his students excavated ten, two meter square units. The following year, Dr. Blackburn excavated 13 more units and discovered a series of burnt posts in a circular pattern (Blackburn 1984). A magnetometer survey was conducted during Dr. Blackburn's excavations but anomalies discovered by this survey were never investigated. In 1987 and 1988, University of Redlands student Donn Grenda continued Baty's work by excavating two more units (Grenda 1988).

Table 1. Blackburn (1984) Units Selected for Analysis

			Unit		
Material	**Pit 1**	**Pit 5**	**Pit 8**	**S1 E2**	**Grand Total**
Bone	1848	90	1349	2154	5441
Ceramic	7	1	21	27	56
Groundstone	1	-	1	2	4
Lithics	45	3	48	71	167
Shell	2	-	-	1	3
Shell Beads	31	5	32	195	263
Grand Total	**1934**	**99**	**1451**	**2450**	**5934**

Table 2. Units from Grenda (2016)

		Unit			
Material	**1**	**2**	**3**	**Feature 1**	**Grand Total**
Bone	220	300	406	*	926
Ceramic	-	1	2	*	3
Groundstone	1	3	1	8	13
Lithics	27	22	78	*	127
Shell	1	1	2	*	4
Shell Beads	1	-	6	*	7
Grand Total	**250**	**327**	**495**	**8**	**1080**

Serrano Ethnographic Settlement and Subsistence Patterns

Ethnographic and historical accounts (Benedict 1924, 1926; Bolton 1930; Gifford 1918; Kroeber 1925; Smith 1963; Strong 1929; Whipple *et al*. 1856) suggest that the Serrano lived a hunting and gathering lifestyle, based around permanent villages located near reliable water sources, preferably near the mouth of a canyon, and diverse food sources. These locations generally lie at the base of the San Bernardino Mountains (Figure 3). Throughout the year, small groups would leave the village to gather food. The location and targeted resources of these trips depended on the time of year. Because of the wide range of elevations and environments within a group's territory, different areas could be utilized at different times of the year. The territory of village inhabitants encompassed the village as well as the mountain slopes above it. At higher elevations, food resources were controlled by a single clan but utilized by many groups within that clan. At low elevations, rivers were used to divide the land into village territories. During winter, a group would stay in its village, living off of stored acorns and pinyon nuts that were collected in the fall. Small game and the occasional larger game such as deer would be used to supplement the diet. As plants ripened in the spring they did so gradually, starting at low elevations and progressing up the mountain as temperatures warmed. As the plants became edible, people followed them upslope. In the summer, small groups would camp on flat spots adjacent to canyons, hunting deer that traveled down the canyons.

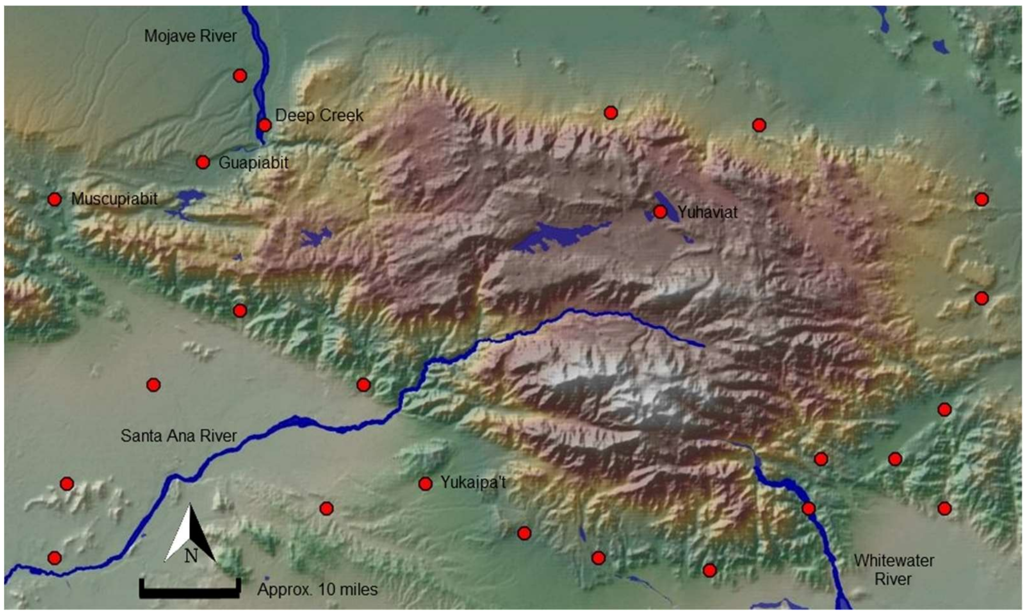

Figure 3. Locations of Recorded Serrano Villages

The most important harvest of the year occurred in the fall (Altschul 1985; Michael Lerch, personal communication 2016). Large groups of people would ascend the mountains to the black oak groves. The black oak acorn was the preferred acorn of the Serrano due to its large size and good taste. Canyon live oaks are also common in the area but the acorns are not as desirable due to higher tannins which requires more labor to process. Pinyon nuts were also collected in large numbers but pinyon pines primarily grow at higher elevations in the eastern San Bernardino Mountains. These stands of pinyons were controlled by eastern Serrano groups but a surplus of pinyon nuts would be shared with the surrounding groups. During the pinyon harvest, many groups would gather at Baldwin Lake to participate in communal hunts and ceremonial activities. After the harvest ceremonies concluded, groups would assemble at certain villages to conduct annual mourning ceremonies. After these ceremonies, people would return to their villages to spend the winter. This pattern of moving up the mountain as the weather warmed and descending before the winter allowed the Serrano to exploit food resources in multiple environments at different times of the year. This diverse subsistence system prevented reliance on any single food source which could lead to catastrophic food resource failure.

CHAPTER THREE

THEORY

As a subfield of anthropology, archaeology is tasked with studying human culture and past human behaviors. But what can we actually analyze about past cultures, and what can we learn from this analysis? Whereas other fields of anthropology are afforded living populations to learn from, archaeology has nothing but the material culture of past people and the physical context within which the material culture is found. Past languages, economies, and religious systems are not preserved in the ground and you cannot interview human remains. What is preserved are people's material things which all had their place in a living culture. It has been argued, however, that from these material remains, one can make inferences about past cultures and human behaviors. The idea of this type of archaeology was first introduced in the 1940s by Walter Taylor (Taylor 1948). From Taylor's pioneering ideas Binford then led the development of processual archaeology (Binford 1962). Out of this paradigm shift in archaeological thought (Kuhn 1962) debate began over how to interpret past human behavior from the physical remains. The two sides of the debate were best represented by Lewis Binford and Michael Schiffer (Binford 1962, 1981, Schiffer 1985, 2002). The outcome of this debate was behavioral archaeology which seeks to do anthropological investigations by explaining the relationship between human behavior and material culture, rather than simply analyzing material objects left behind by humans.

When Binford's (1962) suggestions that material remains may be a direct reflection of past culture appeared in archaeological theory it was criticized for being an oversimplification (Schiffer 1985). Schiffer believed that Binford was operating under the "Pompeii premise" or the idea that artifacts in the ground are frozen in time and space when they are last touched by their user. To understand how artifacts ended up in their current time and space, Schiffer (1976) suggested that archaeologists need to focus on the study of formation processes, also called taphonomy. This field seeks to understand the processes that have acted on an artifact throughout its entire life. Only when these processes are understood and explained can one begin to develop better inferences from the archaeological record.

This chapter provides information about the development of behavioral archaeological theory and the development of the study of formation processes from the initial Binford-Schiffer debates of the 1970s to the present. After exploring the history of the behavioral approach to archaeology and the study of formation processes, the use of this theory and method in modern archaeology is explored.

Archaeology as Anthropology: The Charge Begins

In its earliest forms, archaeology often consisted of digging up artifacts and recording their physical characteristics. Archaeologists were essentially making lists of artifacts with no regard for what these artifacts could reveal about the life of the person or people who made the artifact or the broader culture within which the artifact was used. The first archaeologist to demand more rigorous study was Walter Taylor in his 1948 article “A Study of Archaeology.” In this paper, Taylor criticized many authors for failing to come to any conclusions based on their data. Taylor (1948:157) states that “If anthropology, as the study of culture is to be able...to base its conclusions on the broadest foundations, it cannot be satisfied with data gathered only from the shallow depth provided by the ethnographic reach.” This is an incredibly important development because without this belief, anthropology could realistically only study living populations. The only way to study past human cultures according to Taylor (1948:158) is by “making full use of the archaeological record.” Without directly stating it, Taylor calls for an increase in scientific discourse. He insists that archaeologists have the right to interpret their data and that they should be questioned only by those who have gathered more data or by those who analyzed the same data in a better way. Taylor was so firm in his belief of a scientific archaeology that he not only said that archaeologists *should* do science but that they *must* do science. If an archaeologist has any data at all, Taylor implores them to make some sort of conclusion. Waiting until “all” of the data are gathered stalls the growth of the field and the pursuit of knowledge. This call for archaeology to contribute to science and to draw real conclusions from material culture was ahead of its time but would later prove to be hugely influential on the field of archaeology.

The demand that archaeologists do more than gather data appeared again in Gordon R. Willey and Philip Phillips’ 1958 book *Method and Theory in Archaeology*. The introductory chapter of this book lays out the authors’ belief that American archaeology was severely lacking in the use of theory, and even worse, that archaeology was not developing its own theory. To assess whether theory is being used, first one must define theory. Using the definition of theory from Matthew Johnson's *Archaeological Theory: An Introduction*, "theory" is "the order we put facts in"(Johnson 2010:2). By this definition, early archaeologists were hardly using theory at all. They had mountains of "facts" but no order. Willey and Phillips wrote their book with two basic assumptions in mind: that anthropology is a science and that anthropology should study both society and culture. They were very clear on the first point that archaeology is not merely a retelling of the past like what is done by historians. This was a very necessary point because European archaeology was generally done as an extension of history. They explain their second point by reinforcing their belief that anthropology must study both society and culture. Society and culture can be seen as parts of the same reality. This reality is essentially human behavior. The authors then warn of the trend of seeing culture as something more than human, that it can be understood apart from the people that create it. They use the term "cultural superorganic" to describe this idea.

Willey and Phillips (1958) try to show that archaeology and cultural anthropology are not independent fields as many perceive them to be. Whereas the methods of these two fields seem very different, the authors attempt to convince the reader that the methods are essentially the same. Cultural anthropology observes human behavior and the social and cultural products of that behavior. Meanwhile, archaeology observes the tangible products of human behavior and is occasionally offered clues towards behavior. In their most basic forms, archaeology is of capable observing half of human behavior while cultural anthropology can get the whole picture. The way the two fields approach describing their observations are also similar. Archaeologists report their findings in lists of artifacts detailing their physical characteristics and their place in space. Meanwhile, cultural anthropologists simply recount their experiences through ethnography. At this point in the process, nothing scientific has happened. This is where Willey and Phillips saw the gap in American archaeology. Archaeologists were stopping just short of doing real scientific work. In fact, the authors struggled to come up with a term for this step in the process, eventually settling on “processual interpretation.” Willey and Phillips stress that this step must occur and that it must be explanatory. It is not enough to simply ask “what happened?” One must continue with their questioning and ask “how did it happen?” and possibly even “why did it happen?” To understand why something happened, it is often necessary to look at human behavior.

Echoing Willey and Phillips (1958) sentiments, Binford opens his 1962 article “Archaeology Anthropology” with their famous quote that “American archaeology is anthropology or it is nothing.” Binford agrees with Willey and Phillips’ statement that it is difficult to come up with a name for explanatory archaeology. Binford is thus careful to define what “explanatory” means. Binford (1962:217) defines the concept of scientific explanation as “the demonstration of a constant articulation of variables within a system and the measurement of the concomitant variables within the system.” Here, Binford seems to be calling for the development of equations or laws to apply to cultural systems. In order to have an equation, one must first have variables and this is where Binford sees archaeology falling short. He states that most archaeologists view all artifacts as undifferentiated and unstructured (Binford 1962:218). This is a problem because Binford views artifacts as existing in subsystems of culture which interact differently with the cultural system as a whole. Also, the place of these artifacts in time and space can differ greatly, creating a structure. Binford believes that the temporal and spatial locations of these artifacts can reveal information about the organization of the society that created them as well the interactions that one socio-cultural system had with another. Binford offers the example of a migration that appears in the archaeological record. Merely stating the migration took place does not make a meaningful contribution to anthropology. However, discovering the circumstances under which this migration took place and the way that it happened is explanatory and achieves the goal of anthropology. In short, Binford (1962) insists that archaeologists interpret and explain past human behavior, and not be content with just stating that the behavior occurred.

Binford then offers a way of evaluating archaeological assemblages. While culture is extra-somatic, many sub-systems are formed and modified by a biological process. These sub-systems are created by humans and serve to adapt people to their physical and social environment. While there are many ways to adapt to an environment, humans tend to adapt to similar environments in similar ways. Binford (1961:218) points out that this is not environmental determinism, but is the result of an ecological system. By comparing different cultures from similar environments or similar cultures from differing environments, one can begin to gain a greater understanding of culture. In fact, Binford writes that this is the only way to develop explanations for why humans do things. If one tries to explain human behavior from a single frame of reference, it cannot be done. In a single cultural system, all variables fit together and make sense within that frame of reference. Once one gains an outside perspective and has something to which to compare a culture, variables can be separated out and studied. Thus, while one cannot dig up a religion or economic system, one can recover the tangible items which made up the variables in these sub-systems. Through an analysis of these variables, one can begin to understand human behavior.

In 1964, Binford published "A Consideration of Archaeological Research Design." In this article, he is mostly focused on methods of investigating different types of observational populations. However, in in his introduction, he makes a statement that was the genesis of a debate between Binford and Michael Schiffer. This statement reads "The loss, breakage, and abandonment of implements and facilities at different locations, where groups of variable structures performed different tasks leaves a 'fossil' record of the actual operation of an extinct society" (Binford 1964:425). This idea of a fossilized culture came to be criticized as the "Pompeii premise."

A Behavioral Approach

In his 1976 book *Behavioral Archaeology*, Michael Schiffer attacked the idea that the archaeological record is "fossilized." Schiffer (1976:11) stated that the archaeological record has been transformed "spatially, quantitatively, formally, and relationally” by a series of processes both cultural and non-cultural. To understand what is actually being observed in the archaeological record one must study these processes. Additionally, there must be a general principle that can be applied that explains the relationship between past cultural systems and the archaeological record. Schiffer proposed that the archaeological record contains the remains of past cultural systems but that the record is distorted. With this in mind, Schiffer asks, how can we take the aforementioned processes into account? Schiffer proposed that the cultural and noncultural processes and the relationship between humans and objects form the “synthetic model of archaeological inference” (Schiffer 1976:12). To develop his model, Schiffer first had to determine the basic properties of archaeological data. Schiffer (1976) proposed that the following three properties are true of all archaeological data:

> They consist of materials in static spatial relationships.
> They have been output in one way or another from a cultural system.
> They have been subjected to the operation of noncultural processes.

When making an inference about archaeological data, all of these things must be accounted for. The first step in Schiffer’s process of making an inference is to find correlates. For example, if one found many pieces of ground-stone at a site, one could infer that the inhabitants ate food after grinding it. This is a very simplified example and correlates can contain many variables. Correlates are critical in justifying an inference because they allow the identification of cultural systems which may be visible in the archaeological record. The use of correlates is intended to find some behavioral information in nonbehavioral data.

The second step in the inference process is to identify the ways that culture has affected the data. Schiffer called these processes “C-transforms.” This essentially asks the archaeologist to explain the effects humans have had on the data present at a site. An example of this would be a person eating an animal and moving the bones away from their living area after they were done eating. Next, one must determine how to account for noncultural processes that have acted on the archaeological record. If the bones from the previous example were then washed away by rain or buried by soil deposition, they would undergo what Schiffer calls an “N-transform.” Finally, Schiffer leaves room for “stipulations.” This is a catch-all of testable hypotheses that do not exactly fit into one of the other three categories. Once all four of these categories have been accounted for, one can attempt to explain archaeological observations. If one correctly uses the synthetic model, it is possible to predict certain archaeological observations.

An important aspect of studying formation processes is to understand what transforms are actually transforming. When an object enters the archaeological record, it is no longer part of the system that created it. Once an object has exited a behavioral system, it is in archaeological context. When the object is still taking part in the behavioral system, it is said to be in systemic context.

In 1981, Binford responded to Schiffer's idea of formation processes. In his article "Behavioral Archaeology and the Pompeii Premise" Binford was incredulous that Schiffer would accuse him of believing in a Pompeii premise. Despite Binford previously stating that the archaeological record was "fossilized," Binford attempts to clear up his beliefs by citing previous writings of his but never convincingly doing so. What Binford is clear about is that he does not believe in the concept of C-transforms distorting a system. Binford believes that an artifact is not in context until it is no longer affected by culture; therefore, culture cannot distort the archaeological record, only transform it (Binford 1981:200). Binford writes that for Schiffer to believe in "distortion" that at some point in time, the archaeological record is more preferable for an archaeologist to find. If Schiffer believes this, then he is not studying human culture but rather a small piece of history (Binford 1981:201).

In 1985, Schiffer responded to Binford in "Is There a "Pompeii Premise" in Archaeology?" Schiffer states that there is, in fact a Pompeii premise, but that it is not intentionally employed. Schiffer restates that there are essentially no sites which can be viewed as a Pompeii but that archaeologists who ignore formation processes are operating under the Pompeii premise. Using house floors from sites in the Southwest United States, Schiffer criticizes authors who have studied the house floors as if the objects were dropped on the floor and never touched again.

Settlement and Subsistence Studies in the San Bernardino Mountains

Settlement and subsistence studies have a long history in the field of archaeology in the Americas. Beginning with Gordon Willey's groundbreaking 1953 study "Prehistoric settlement patterns in the Virù Valley" in Peru, archaeologists have sought to understand the ways that human settlements interact with each other and the environment. Several landmark settlement pattern studies followed Willey including Butzer's "Environment and Archaeology" (1971), Bettinger's "Multivariate Statistical Analysis of a Regional Subsistence-Settlement Model for Owens Valley" (1979) and Binford's "Willow Smoke and Dogs' Tails" (1980).

In their own approach, White and Reeder (1970) classified prehistoric sites in the Deep Creek drainage of the San Bernardino Mountains into types based on location (e.g., ridge sites and meadow sites) and time period (i.e., recent sites). Fourteen years later, Altschul and his colleagues (1985) reviewed this classification scheme and built the first settlement pattern model for the San Bernardino Mountains that included a subsistence component. They suggest that the settlement pattern was based around permanently inhabited low-elevation villages ringing the mountain range with tethered, seasonally-occupied camps at higher elevations. Additionally, there were temporary camps, quarry sites, and plant processing sites scattered throughout the mountains, at all elevations. The seasonally occupied camps were used to exploit plant resources as they became available at higher elevations throughout the spring and summer months. The seasonal round culminates in fall, at a ceremony following the pinyon and acorn harvests. This type of subsistence pattern, where a group has an intensive reliance on acorns, is called balanophagy.

Altschul and his colleagues (1985; Altschul *et al*. 1989) developed their model based on ethnographic accounts of the native Serrano. Whereas ethnographic accounts are reasonably reliable for predicting the recent past, the further into the past that an ethnographic account is projected, the less reliable it becomes. To understand the origin of the complex settlement pattern and balanophagous economy described in the ethnographic record, we must explain how the pattern developed and understand the adaptations that inhabitants were forced to make due to population increases and environmental change.

Evidence of widespread exploitation of the acorn in protohistoric and historic times is well documented. The only place on mainland California that the acorn was never a major food source during these times was in the Great Basin, east of the Sierra Nevada. A strong correlation between acorn exploitation and population was discussed by Baumhoff (1963, 1981), suggesting that acorns became a staple of the Central and Northern California Native diet. Basgall (2004) states that while the acorn is a high-quality food resource, balanophagous economies only appear in the late prehistoric period. Basgall's theory is that the acorn is a good food resource, but requires significant labor and a sedentary population to become an edible product. Therefore, small, highly mobile groups cannot effectively use the acorn. Basgall notes that while balanophagy provides a reliable diet, it is not a better diet. During the transition to a balanophagous economy, a group could expect increased subadult life expectancy but an increased mortality rate. The combination of the labor-intensive preparation process and the limited overall advantages of balanophagy means that groups would likely only adapt balanophagy when necessary. Results of a transition to a balanophagous economy would include higher population density and smaller territories. Basgall (2004) suggests that this is the beginning of the tribelet system found in historic-period California. This relatively sedentary lifestyle also could have led to the expansion of trade systems to protect groups from variations in food resources. A sedentary, balanophagous group requires leadership to organize food production, trade, and defense. These needs could have led to the establishment of leaders within groups. Finally, increased possibility of a food surplus may lead to an increase in societal stratification.

As a habitation site at the base of the San Bernardino Mountains, Muscupiabit could have been shaped by a balanophagous economy. The age of the site and whether the acorn was a food staple are discussed in Chapter 10.

Application of Theory to Muscupiabit

The Muscupiabit site (CA-SBR-425/H) can be used as a case study in the use of formation processes and behavioral archaeology. Muscupiabit is located on a stream terrace with Cajon Creek flowing to the north of the site and an uphill slope to the south. Prior to the construction of Interstate 15, Crowder Creek would have intersected Cajon Creek at Muscupiabit. During the historic period, a ranch occupied the site and in more recent times, a caretaker lived on the site in a small house. What do all of these factors mean for the archaeological record at Muscupiabit?

Hundreds of years of these various formation processes acting on the site have heavily altered it and, in some areas, completely destroyed it. The northern extent of the site has been completely washed away by erosion from the two creeks. This area is especially prone to erosion because of flash flood events that frequently occur in the Cajon Pass. Shovel tests confirmed that there is minimal archaeological material in this area. This area also includes the relatively modern house that burned in August 2016. Construction of the house undoubtedly disturbed the soil underneath it, but this area could not be safely examined due to the burned structure on top of it. Approximately 50 meters south of the house lies a small stream terrace approximately 200 meters by 50 meters. This terrace was used for agriculture by the historic ranch that occupied the site. Plowing of the soil here has disturbed the archaeological deposit to a depth of about 40 centimeters below ground surface (Smith 1963). Bordering this terrace on the south is a slope which drains water across the terrace, heavily eroding it in some places. The Cajon Pass is also consistently windy, with winds commonly reaching 20 miles per hour and sometimes reaching 70 miles per hour. These winds have surely removed some topsoil from the site.

So what part of the archaeological record is intact at Muscupiabit? The northern part of the site is completely gone and the rest of the site has been subject to erosion, plowing, and other mechanical disturbances. To find strong, behaviorally relevant contexts, one must find those artifacts that remain in their primary context. The only way to be sure that an artifact has not moved is to find a feature, preferably dug into the B horizon or at least below the plow zone within the A horizon. There are three common types of features likely to be found at prehistoric archaeological sites in southern California. These three types are thermal features, house pits, and human burials. Based on ethnographic accounts (Whipple 1856) and previous excavations at Muscupiabit (Smith 1939, 1955; Grenda 1988) and similar sites in the region such as Guapiabit it can be assumed that any burials here would have been cremations, making it unlikely that they are intact. Even if they were intact features, it would difficulty to find and identify a cremation. House pits were recorded at the site by early pioneers and missionaries moving through the pass so it is known that they existed at the site. Shovel testing failed to reveal areas of high artifact density which may indicate house pits. It is possible that the houses were near the creek and have been washed away. Also because the house pits were visible well into the 20th century (Smith 1939), it is possible that they could have been looted. That leaves thermal features that can be easily determined to be in primary context because it is very unlikely that they would have been moved and remained in a pit with thermally-altered soils. Thermal features are often dug into the surface, providing an easy way to determine if they are in context. Finally, thermal features are easy to identify. Large piles of burned rocks in otherwise sandy soils are distinct and unlikely to be missed during excavation.

In an attempt to find one of these features, a 4m by 0.5m trench was dug on the stream terrace. Approximately 60 centimeters below surface in the northern half of the trench, a thermal feature was discovered. The trench was then expanded to more fully expose the feature. Through this method, it was possible to find part of the archaeological site that was in its original context. This strong primary context is critical in the use of carbon dates recovered from the feature. Using the dates from this feature, one can know when that feature was last used. From the analysis of this feature and the use of previously excavated features, explanatory statements about the behavior of the site inhabitants can be made. This is critical to the furthering of knowledge about Muscupiabit.

For 80 years, archaeologists have excavated the site, cataloged the artifacts, and put the artifacts in boxes. While the artifacts are interesting to hold and observe, they don't actually help contribute data to make behaviorally relevant statements about past life at the site. A projectile point and a mano tell us that people made projectile points and ground their food. But what was actually happening at Muscupiabit? Since it was first recorded (Smith 1939), the site has been called a "village" but this term has no real interpretive meaning. Did people use its strategic location in the Cajon Pass as a trading location? Or is Muscupiabit there because of its proximity to the oak and pinyon groves in the nearby San Bernardino Mountains? How did people make a living at the site?

CHAPTER FOUR

RESEARCH DESIGN

This research design was intended to provide goals for fieldwork as well as post-fieldwork analyses. While some questions may never be definitively answered, the data gathered may make it possible to address them. While fieldwork was previously conducted at the site, there does not appear to have been comprehensive research designs to guide the studies.

Multiple research domains can be investigated at Muscupiabit. These domains include: (1) chronology, (2) settlement and subsistence, (3) site structure, (4) religion and ideology, (5) technology, and (6) exchange and intergroup relations. These domains encompass both regional questions and site-specific questions.

Chronology

1. When did occupation of Muscupiabit begin? Is there evidence of pre-contact occupation at Muscupiabit?
2. Is a late-prehistoric occupation present, and if so, can it be distinguished from a protohistoric occupation? Is a post-Mission or Rancho period occupation present?
3. Are there periods of abandonment seen in the archaeological record? When was the final site abandonment?

Data Requirements and Methods. No absolute dates exist for Muscupiabit. While a general time frame can be established through bead typologies, no exact date such as a radiocarbon date has been obtained. Ethnographic accounts of

Muscupiabit recorded habitation at the site in 1806. There is no evidence for extended pre-contact occupation; however, sites around the pass were inhabited as early as approximately 4000 years ago (Douglas 2007). An objective of research at Muscupiabit is to locate and recover an intact thermal feature and other datable features and artifacts. Whereas post-depositional processes such as discing and other agricultural activity and bioturbation have disturbed the strata, it is possible that features in the lower levels remain undisturbed.

Settlement and Subsistence

1. How mobile were the inhabitants of Muscupiabit? Was the site permanently occupied or was it used seasonally? If it was seasonally occupied, can the season be determined? Does the site appear to be linked to other sites in the area?
2. Can specific technologies be linked to the exploitation of specific resources?
3. What types of animal were exploited? Can intrusive species be distinguished from economic species? What type of disposal pattern is evident at the site? Are the bones highly fragmented suggesting that grease rendering was practiced?

Data Requirements and Methods. Settlement and subsistence in the San Bernardino Mountains area have been extensively studied but Muscupiabit's place in the proposed settlement pattern has not been established. The site is one of a limited number of recorded habitation sites in the area so determining its function could be used to support or refute the settlement models discussed in Chapter 3.

To address these questions, data regarding diet and the environmental context of the site are needed. Faunal remains will be analyzed to characterize the targeted species and to determine how the remains were processed. Lithic identification and analysis will determine if certain technologies are present in an effort to link technology to specific resources.

Site Structure and Organization

1. What are the site's horizontal and vertical spatial boundaries? Is there evidence of multiple occupations?
2. How and to what extent was the upper 50 centimeters of the site changed between abandonment and the present day?
3. How are artifacts distributed across the site? Are there discrete activity areas?
4. Are there features present? If so, what is their function?

Data Requirements and Methods. To answer these questions it is necessary to determine the spatial distribution of artifacts as well as their technological, material, morphological, and functional characteristics. Because artifacts and their spatial relationships make up the majority of the archaeological record, the provenience of artifacts is critical. The integrity of this site has been compromised through erosion as well as human activities such as discing. The upper levels have undoubtedly been mixed together; however, it is likely that the lower levels are relatively undisturbed and it is possible that there are intact features. An attempt was made to map the entire site but it is possible that the site once existed outside of the mapped boundaries. The site has been surface collected a number of times in the past so no additional surface collection is needed.

Religion and Ideology

1. Are burials present? Is there evidence of burial goods in association with burials? If so, are the burials consistent with recorded Serrano burial practices?
2. Are cremation present? Were they buried in place after cremation or were the bones collected and reburied?
3. Are there artifacts signifying religious or social status, such as beads or ornaments?
4. Are any rare/unique artifacts present?

Data Requirements and Methods. There is a small amount of human remains in an artifact list from previous excavations at the site. Until these remains are found in the museum collection, nothing else can be known about them. A large number of beads are listed in some proveniences suggesting the possibility of a burial. Prior to formal analysis, the faunal remains from the most recent excavations were analyzed by an osteologist and no human remains were found. This was done to ensure that, if human remains were found, that the County Coroner, Native American Heritage Commission, land owner, and representatives from the San Manuel Band of Mission Indians would be properly notified.

Technology

1. What reduction strategies were used at the site? Can differences in reduction strategies be related to raw material types?
2. Is there evidence of on-site biface or ground-stone manufacture?
3. How were locally available lithic resources used? Were exotic lithic resources used? Were bone tools used?

Data Requirements and Methods. Lithic material typically makes up a significant portion of archaeological material at a site. Muscupiabit is no exception in this regard. Artifact lists from previous excavations show a consistent number of stone tools throughout the excavated areas of the site. Muscupiabit's location on a trade route makes it possible that there will be exotic raw materials used for tool manufacture. Material type for each lithic artifact will be recorded.

These research domains and questions were used as a framework for field and lab work. The data used to address these questions are analyzed in the following chapters and the questions are addressed in Chapter 10.

CHAPTER FIVE

FIELD METHODS AND RESULTS

This chapter presents the results of the fieldwork conducted by the author and establishes the recovery context for the following chapters. Fieldwork was conducted September 1-4, 2016 and was focused on collecting sufficient data to answer the research questions proposed in Chapter 4. Four data sets were collected in the course of fieldwork: artifacts and ecofacts for analysis, flotation samples for macrobotanical analysis, shovel testing results, and stratigraphic profiles. The field methods and results of previous excavations (Blackburn 1983) are also reviewed. Finally, the stratigraphy of the site and a radiocarbon assay are discussed.

Project Area

The project area consists of a roughly rectangular parcel of land owned by the San Bernardino County Museum Association. The parcel is bounded on the north, east, and south by Burlington Northern Santa Fe (BNSF) railroad land, and to the west by the San Bernardino National Forest.

Cultural materials were previously excavated in the project area in 1938, 1949, 1976-79, 1983, 1984, and 1987 (Smith 1963, Grenda 1988). These early projects were focused more on collecting and quantifying artifacts rather than scientifically evaluating the site. The only modern, scientific excavation was conducted in 2008 by SRI (Douglas 2008). This work was south of the main site area on the edge of the railroad property, and determined that there was no cultural deposit in that location.

As the primary goal of the project was to determine the condition and location of archaeological deposits at the site, these questions were addressed first. After a pedestrian survey of the site surface, shovel testing was conducted on a 20-m-by-20-m grid. At each test location, a 30 cm diameter hole was dug to determine if a cultural deposit was present in that location. Tests that contained prehistoric/protohistoric cultural material were considered positive, those with no material were considered negative, and those with only Historic-period artifacts were considered positive for historic material. Disturbed areas with recently burned house debris, other trash, or heavy burned vegetation were avoided for safety reasons. The artifacts in positive shovel tests are quantified in Table 3. The results of shovel testing are displayed below in Figure 4.

Table 3. Positive Shovel Tests

Northing (m)	Easting (m)	Artifacts Recorded
960	1000	1 flake, 1 faunal bone, 2 historic material
960	1020	3 flakes
980	1000	8 flakes, 1 FAR, 7 faunal bones
980	1020	15 faunal bones, 4 flakes
1000	980	7 faunal bones, 4 flakes
1000	1000	8 flakes, 15 faunal bones, 1 Cottonwood point, 3 historic material
1020	980	4 faunal bones, historic material
1060	980	1 historic
1080	980	Burned historic material

Figure 4. Shovel Tests at Muscupiabit

Test Pit Evaluation

After shovel testing was complete, an excavation unit was placed within the positive tests. Based on the locations of previous excavations and with the hope of intersecting a feature, a 4-m-by- 0.5-m hand trench was dug between previous excavations. This trench was excavated as two adjacent 2-m-by-0.5-m test units and both were excavated in 10 cm levels. These 10 cm levels did not end up being useful due to the lack of stratigraphy at the site. In the north end of the trench, a concentration of fire-affected rock was uncovered. The northern unit (Unit 2) was then continued and expanded to the west (Unit 3). This uncovered more of the feature. All soil from the feature was collected and floated. Approximately 2.7 m^3 of dirt was excavated.

The primary goals of these units were to collect a sample from the main site area, to avoid intersecting previous excavations, and to find a feature that could yield a radiocarbon date. The importance of a feature was previously discussed in the Research Design and Theory chapters. Also, these units could also be compared to units previously excavated on the site. Four units from Blackburn's (1983, 1984) excavations were selected for comparison. These units were chosen in anticipation that they would generate a diverse and representative artifact collection. Unit S1E2 was in the location of a house pit, Pit 8 was adjacent to the house pit, and Unit 1 was on the stream terrace but not near the house pit. Finally, Pit 5 was on the lower terrace of the project area, closer to the care taker's house. The dimensions and locations of these test pits are described in and mapped in Figure 5 and Figure 6. Pit 5 is not mapped due to its distance from the other units. The artifacts from the Blackburn collection were removed and analyzed in the same manner as the 2016 artifacts. Artifact counts are presented in Table 5 and Table 6

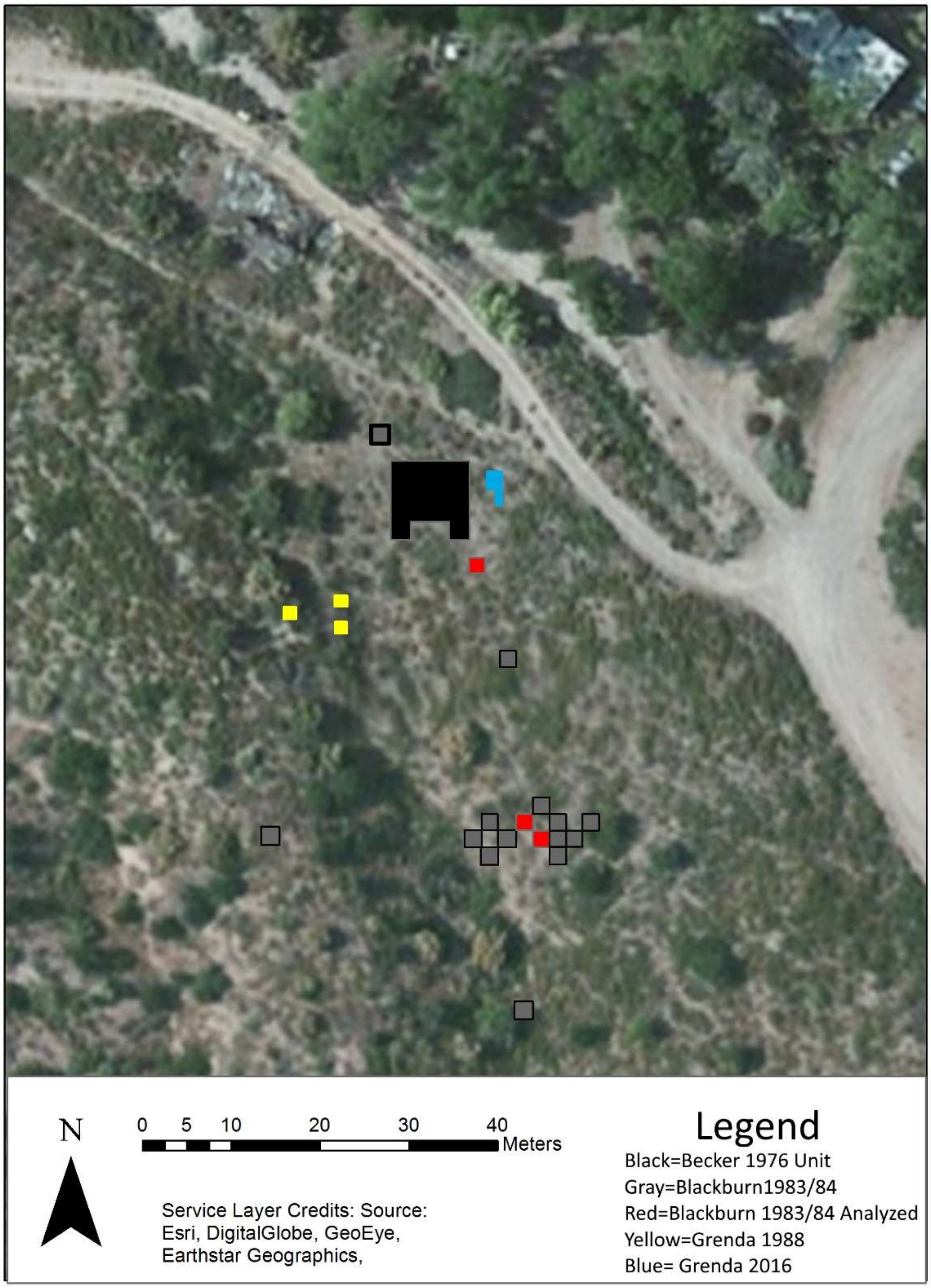

Figure 5. Excavated Units at Muscupiabit

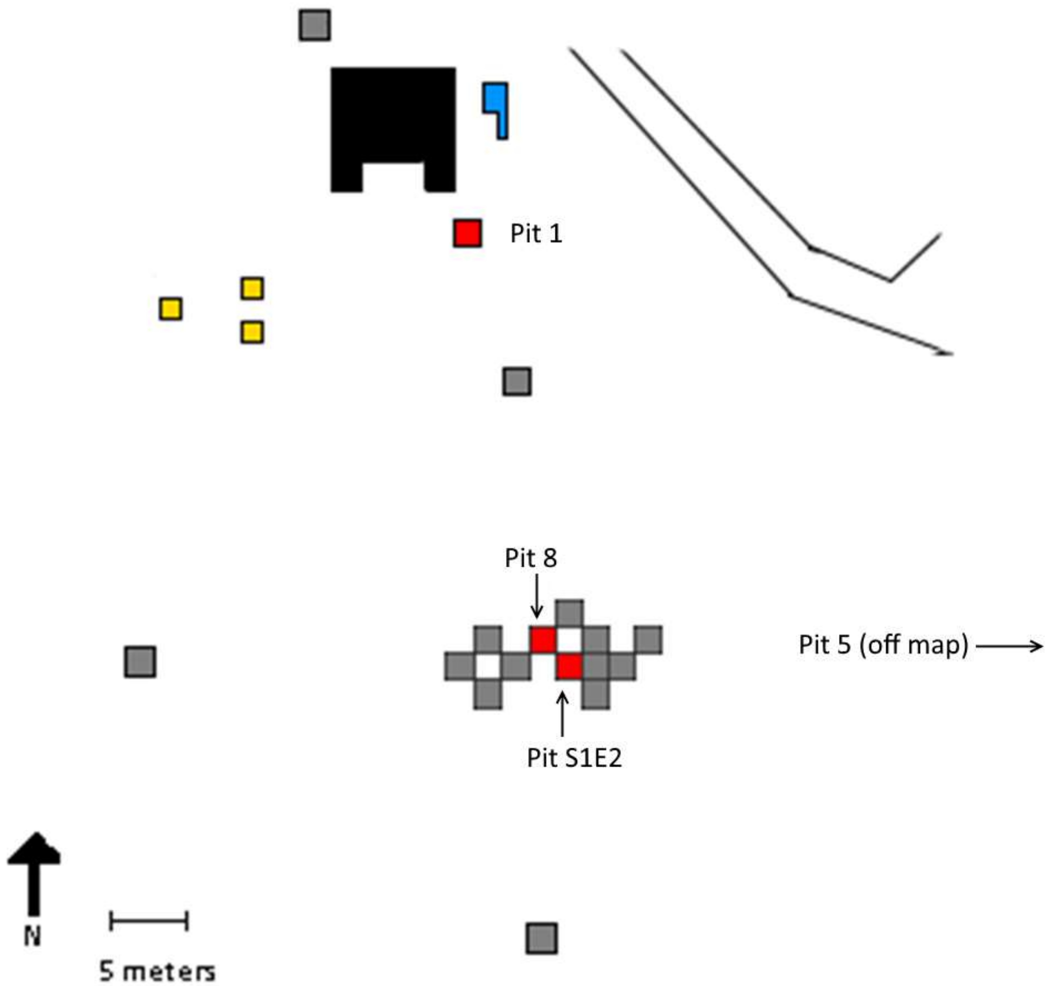

Figure 6. Diagram of Units with Blackburn Units Labeled

Table 4. Grenda 2016 Excavation Units and Selected Blackburn 1983/84 units

Unit #	Grid Coordinates (SW Corner)	Unit Dimensions (m) N/S by E/W	Area (m^2)	Depth (m)	Volume (m^3)
Grenda 2016-1	N1009, E989.5	2 x 0.5	1	0.6	0.6
Grenda 2016-2	N1011, E989.5	2 x 0.5	1	0.7	0.7
Grenda 2016-3	N1011, E988.5	2 x 1	2	0.7	1.4
Blackburn 1983-1	N1011, E991	1 x 1	1	0.8	0.8
Blackburn 1983-5	N1035, E1029	1 x 1	1	0.3	0.3
Blackburn 1983-8	N1008, E1004	1 x 1	1	1	1.0
Blackburn 1984-S1E2	N1007, E1005	1 x 1	1	1.2	1.2
Total			8		6.0

Table 5. Artifact Counts for Grenda 2016 Units

Unit/Level	Faunal	Flaked Stone	Groundstone	Shell Beads
Grenda 2016-1				
Level 1	10	6	-	-
Level 2	36	2	-	-
Level 3	67	3	-	-
Level 4	58	4	-	-
Level 5	32	7	-	5
Level 6	17	2	-	-
Grenda 2016-2				
Level 1	16	2	-	-
Level 2	55	4	-	-
Level 3	67	3	1	-
Level 4	63	5	-	-
Level 5	56	8	-	-
Level 6	36	2	1	-
Level 7	-	-	1	-
Grenda 2016-3				
Level 1	37	12	-	-
Level 2	50	4	1	1
Level 3	125	20	-	1
Level 4	85	6	-	2
Level 5	52	16	-	-
Level 6	23	7	-	1
Level 7	34	9	-	1
Grenda 2016 Feature 1				
Level 1	21	-	7	-

Table 6. Artifact Counts for Blackburn 1983/84 Units

Blackburn 1983-1				
Level 1 (20 cm)	114	3	-	3
Level 2	459	3	-	17
Level 3	414	2	-	-
Level 4 (30 cm)	458	2	-	4
Level 5	403	2	-	1
Blackburn 1983-5				
Level 1	40	1	-	-
Level 2	43	1	-	3
Level 3	7	1	-	-
Blackburn 1983-8				
Level 1	32	3	-	-
Level 2	221	7	-	-
Level 3	254	1	-	5
Level 4	104	4	-	6
Level 5	-	2	-	5
Level 6	115	1	-	-
Level 7	218	2	-	3
Level 8	176	-	-	-
Level 9	273	-	-	4
Level 10	70	1	-	1
Blackburn 1984 S1E2				
Level 1 (20 cm)	20	1	-	8
Level 2	288	-	-	-
Level 3	139	1	-	12
Level 4	387	2	-	13
Level 5	14	-	1	6
Level 6	214	6	-	6
Level 7	-	1	-	19
Level 8	-	2	1	-
Level 9	346	2	-	46
Level 10	424	3	-	16
Level 11	132	2	-	9

Site Stratigraphy

Due to the Historical period disturbance to the upper portions of the archaeological deposit, the stratigraphy of the lower portions of the site was of interest. Based on the theoretical approach described earlier, it was important to find a portion of the deposit that was undisturbed. Generally, the soil at the site is a light-colored sand, with the upper soils containing silt. Figure 7 presents a drawing of the east wall of the trench.

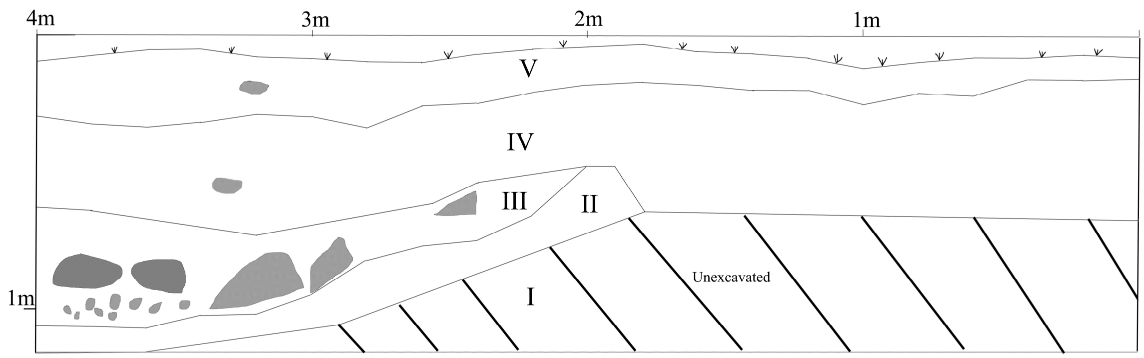

Figure 7. Profile of East Wall of Units 1 and 2

Stratum I. Stratum I is the base soil of the site. It is a very pale brown colored sand (10YR 7/3). This color is uniform and is distinctly lighter than the soils above it. There are no cultural or plant materials in this stratum. In eroded areas of the site, this is the topsoil. On the stream terrace, this stratum is located approximately 60 cm below ground surface.

Stratum II. Stratum II is a cultural layer that was dug into Stratum I. The soil composition is similar to Stratum I but the thermal feature on top of this layer has darkened it to a pale brown (10YR 6/3). In profile, the berm around the hole in which the feature was built is evident.

Stratum III. Stratum III is the soil that filled in the thermal feature after abandonment. By volume, this stratum was mostly rock from the feature. The carbon in the feature darkened the soil to brown (10YR 4/3).

Stratum IV. Stratum IV is the subsoil on the stream terrace and contains more silt than the lower strata. This stratum was deposited by erosion from the hill slope to the west. Stratum IV has been heavily disturbed by discing and contains most of the cultural material on the site. The presence of cultural material along with carbon from natural fires has darkened the soil to a dark grayish brown (10YR 4/2). The top of Stratum IV begins between 5 and 15 cm below the ground surface.

Stratum V. Stratum V is the topsoil of the stream terrace. This soil is significantly darker than the lower soils due to the high organic content and the recent fire. As the area had burned within weeks of excavation, this soil was very dark grayish brown (10YR 3/2). Stratum V is similar to Stratum IV in composition but is much darker.

AMS Dating Results.

Due to the intact nature of Feature 1, charcoal samples were collected and sent to DirectAMS for radiocarbon dating. The result of the assay reported that the carbon sample dates to 83 ± 31 years BP. Using the Calib 7.10 calibration software recommended by Direct AMS, the year with the median probability of being the correct age is AD 1844. Age probabilities as presented by Calib 7.10 are presented in Table 7. The calibration curve of this result is presented in Figure 8. Using other evidence to weigh the raw probabilities, the date probabilities are discussed in Chapter 10.

Table 7. Calibrated Age Probabilities of Carbon from Feature 1 (Stuiver 2016)

Calibrated AD Date Range	Relative Area Under Probability Distribution
1696-1725	0.304
1814-1836	0.217
1845-1847	0.016
1877-1917	0.463

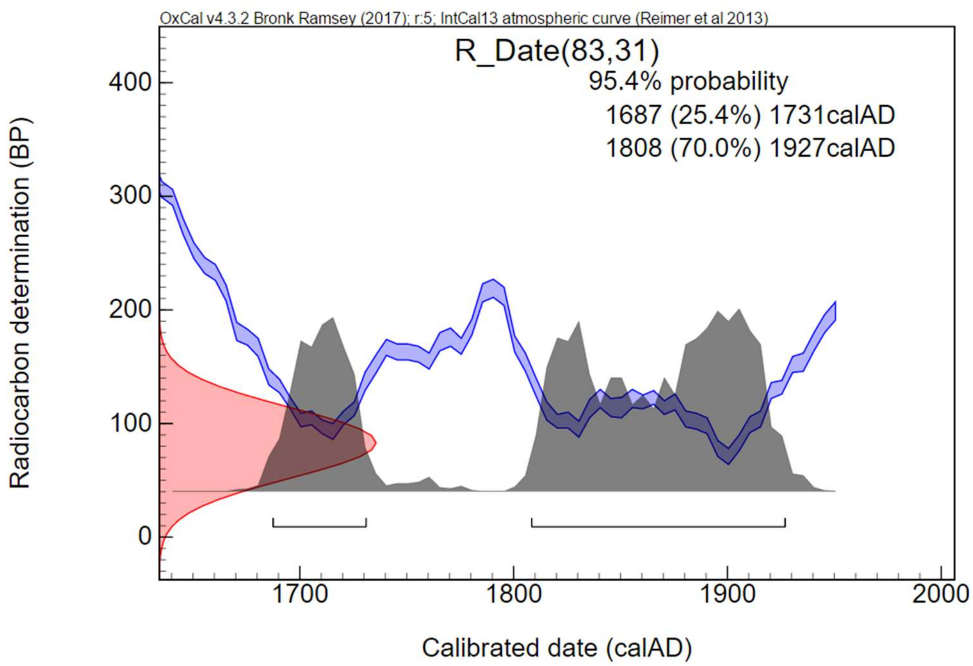

Figure 8. OxCal Calibration Curve

CHAPTER SIX

LITHIC ANALYSIS

Flaked Stone Analysis

The analysis of flaked-stone artifacts was designed to address some of the research questions posed at the outset of the project. Additionally, artifacts from the Blackburn collection have not been analyzed and a secondary goal was to reduce the number of unanalyzed artifacts in the SBCM collection. The total flaked stone collection contains 177 items, 53 collected by Blackburn (1983, 1984) and 124 recovered during the current project. For analysis purposes, these were divided into four classes: debitage, projectile points, tools, and cores. The most common class is debitage (n=126), making up approximately 70 percent of the collection. The collection also includes 18 unifaces, 12 projectile points, 8 bifaces, 6 scrapers, and 7 cores.

Analysis was conducted using Statistical Research Inc.'s Scalable Relational Integratable Database 2.0 (SRID) software in conjunction with the Statistical Research Lithic Analysis Manual (Statistical Research Inc. 2016). SRID was used to inventory the artifacts as well to input and analyze data regarding the individual artifacts. The lithic analysis manual was consulted for definitions of variables within the software and general lithic analysis principles. Analysis methods for each artifact type are discussed below.

Debitage. In this study, debitage includes all flaked-stone artifacts that were detached from a core and not utilized. Six attributes were recorded for each of the 126 pieces of debitage: (1) size class, (2) raw material, (3) raw material quality, (4) flake type, (5) presence or absence of cortex, and (6) location of cortex. The variables for these attributes are listed in Table 8.

Table 8: Attributes for Debitage Analysis Variables

Size class (mm)	Raw material	Raw material quality	Flake type	Corte x	Location of cortex
<10	Basalt	Glassy	Angular Debris	Yes	Platform
10-19	Chalcedony	Glossy	Biface flake	No	Dorsal
20-29	Chert	Coarse	Core flake		Platform/partial dorsal
30-39	Granite	Very coarse	Microdebitage		Platform/complete dorsal
40-49	Igneous (coarse)		Indeterminate		Absent
50-59	Igneous (fine)				
	Igneous (Ind.)				
	Indeterminate				
	Jasper				
	Metamorphic (ind.)				
	Quartz				
	Quartzite				
	Rhyolite				

Raw material and raw material quality were determined through a visual inspection of the material. Other lithic analysts were consulted when raw material could not be determined by the author. Raw material types were analyzed to address research questions about the availability of raw lithic materials and trade for exotic materials.

Size class was determined by measuring the flakes with Vinca DCLA-0605 digital calipers. Size class was analyzed to address research questions about lithic reduction strategies and the availability of raw lithic materials.

Flake type was determined in consultation with the Statistical Research Lithic Analysis Manual. Angular debris comprises lithic materials which were incidentally broken off of a core during flaking. Angular debris lacks identifiable flake characteristics such as a platform or clear distal/proximal ends. Biface flakes are removed from a bifacial core or retouched bifacial tool. They are generally very thin (<5 mm) with a curvilinear cross section and a weak platform. Core flakes are created during initial core reduction and have a distinct platform and bulb of percussion and are usually thicker than 5mm. Microdebitage is any piece of debitage with a maximum dimension of less than 10 mm. Microdebitage is generally a result of either shatter or pressure flaking. Indeterminate flakes were generally incomplete which made them difficult to categorize. Flake type analysis can offer insight into the type of tools being manufactured as well as the availability of raw materials.

Cortex is the naturally weathered surface of a rock before it is modified by humans. The presence and location of cortex was determined through visual inspection. Analysis of cortex amounts and location on artifacts was performed to address research questions regarding lithic technology and raw material availability.

Cores. In the practice of lithic analysis, “core” refers to a lithic object from which flakes are detached. Previous attributes including size, raw material, and raw material quality were recorded. Cores were also categorized as multidirectional or unidirectional. Cores were analyzed to address research questions regarding raw material availability and use, and lithic reduction strategies.

Bifaces. A biface is an artifact that has been flaked on both margins but presents no evidence of hafting such as notches or a stem. These artifacts may be broken projectile points, but without the features used for hafting, they cannot be confirmed as such. Seven attributes were recorded for each biface: (1) raw material, (2) length, (3) width, (4), thickness (5) element, (6) cortex and (7) edge morphology. Variables for attributes used in biface analysis are the same as listed above in Table 8. Variables for attributes not previously used are listed in Table 9 (dimensions were recorded to the nearest .1 mm).

Table 9. Additional Attributes for Biface Analysis Variables

Element	Edge Morphology
Complete	Continuous
Tip	Serrated
Base	
Midsection	
Margin	

Projectile Points. Projectile points are bifaces that exhibit an element used for hafting such as a stem or notches. Eight attributes were recorded for each projectile point: (1) raw material, (2) element, (3) point style, (4) length, (5) width, (6) thickness, (7) weight, and (8) edge morphology. Attributes for these variables are consistent with previous categories. Weight was measured to the nearest .1 gram. Point styles included desert side-notched, Cottonwood triangular, and indeterminate.

Groundstone Analysis

Ground-stone milling implements were widely used by southern California Native Americans, especially those that relied on grasses and acorns. With the oak and pinon groves nearby in the San Bernardino Mountains, it is likely that milling grains and nuts on ground-stone would have been a necessary component of everyday life. There is also evidence that small mammals were processed on ground stone (Padilla 2017). Ground-stone analysis for this report was based on data previously collected from the artifacts housed in the SBCM. The data were previously collected but had not been analyzed or reported. The ground-stone artifacts from the museum collection and the 2016 excavation are summarized below in Table 10.

Table 10. Ground Stone Artifacts Analyzed

	San Bernardino County Museum Collection	Grenda 2016 Excavation
Artifact type	**Count**	**Count**
Mano	27	3
Pendant	24	0
Pestle	9	1
Mortar	9	0
Shaft Straighte	9	0
Metate	5	4
Bowl	5	0
Discoidal	3	0
Miscellaneous	4	0
Stone ball	2	0
Total	**97**	**8**

Groundstone was analyzed to address research questions regarding site function, resource exploitation, and trade patterns. Variables included raw material, artifact type, artifact subtype, artifact condition, and dimensions. Artifacts were subjected only to macroscopic study as microscopic study was outside the scope of this analysis. Analysis methods for each artifact type are discussed below.

Manos. Manos are pieces of stone, generally either round or rectangular, which are shaped by flaking, pecking, or abrading. Manos are held in one or both hands and ground on a basal stone, such as a metate. Manos and metates are generally used for food processing but are also used for pigment grinding. Whereas manos and metates were traditionally thought to be used for grain production, studies at a small number of sites (Padilla 2017) have found protein residue from small animals on metates.

Manos fall into one of two categories: basin (round) and flat (rectangular). Basin manos are generally round and were probably used in a circular motion in a basin metate (Towner 1998) . This type of use results in convex use surfaces on the artifact. Flat manos were probably used in a reciprocal motion on flat metates. Flat manos have a flat use surface and use wear on only one surface.

Basal Stones. Basal stones include metates, grinding slabs, bowls, and mortars. Metates are large stones upon which manos are used. Basin metates have a convex use surface while flat metates have a flat, slab-like use surface. No complete metates appear in the artifact catalog of the site so it cannot be conclusively stated which type was preferred at the site. Metates may be manufactured to increase their functionality but may also acquire their shape through repeated use. Whereas bowls may be very similar in form, their function is very different. Mortars are used for grinding, crushing, and pounding while bowls are used for storage or mixing. Thus, mortars have much heavier use wear on their use surfaces.

<u>Ornament, Disk, and Miscellaneous Artifacts</u>. Many pendants have been recovered from the site. Most have at least one face ground to a smooth surface. Some are painted and some are incised. Many of them were collected during early work (Smith 1963) at the site and are unprovenanced.

Fragments of unperforated stone disks have been recovered from the site. These disks were ground into shape and are of similar sizes. Their function cannot be positively determined.

“Paint stones” were recovered from the site. These small, flat stones are of varying materials and sizes. The stones have been polished and some have pigment on them.

Table 11. Artifact Types by Raw Material

Raw Material	Biface	Core	Debitage	Hammerstone	Other	Projectile point	Scraper	Uniface	Bowl	Discoidal	Mano	Metate	Mortar	Pendant	Pestle	Polished Stone	Shaft Straightener	Total
Chalcedony			5			2		2										9
Chert	3		22		1	4		5										35
Igneous (coarse-grained)		2	7								2							11
Igneous (fine-grained)		2	11				3	2			1							19
Igneous (indeterminate)			1															1
Indeterminate/ Unknown			16	1					1		2		4	1			2	27
Jasper	1	1	5			1		2										10
Limonite																1		1
Metamorphic (indeterminate)			1															1
Quartz	1		6			4	1	1										13
Quartz (crystal)	1																	1
Quartzite	1	2	52			1	2	6			9					1		74
Rhyolite	1																	1
Diatomaceous Shale														7				7
Gneiss											3				4			7
Granitic			1								12	7		1	1	1		23
Sandstone										3			5				2	10
Schist											2	1		1	5			9
Steatite									5								5	10
Tuff											1			14				15
Wollastonite																1		1
Total	8	7	127	1	1	12	6	18	6	3	32	8	9	24	10	4	9	285

Results

Raw-Material Availability. Muscupiabit is in the Cajon Pass, between the San Bernardino and San Gabriel Mountains. These two mountain ranges were formed by uplift along the San Andreas Fault. Because of this tectonic activity, there are a wide variety of lithic raw materials available in the area. Erosion down the west slope of the San Bernardino Mountains would have made access to lithic raw materials especially easy for the inhabitants of Muscupiabit. The site is located at the confluence of Crowder Creek and Cajon Creek and both contain lithic materials from higher elevations.

The San Bernardino Mountains are primarily composed of Precambrian igneous and metamorphic rocks. The foundation of the mountains is composed of granite, schist, and gneiss (Grenda 1998). Overlaying this base are limestone, quartz, quartz crystal, and quartzite. These rocks all appear at the ground surface in various places in the mountains and would all have been available to the inhabitants of Muscupiabit. Whereas none of them is particularly high-quality stone for tool manufacture, they are widely available and were used at Muscupiabit.

The western Mojave Desert, located at the top of Cajon Pass, is a similar geologic environment to the San Bernardino Mountains. The Mojave is also made of Precambrian granite, schist, and gneiss (United States Geological Survey 2009). On top of this base are metasedimentary rocks such as chert, quartzite, and conglomerates. The Mojave differs from the San Bernardino Mountains in that it has had recent volcanic activity. This volcanic activity brought tuffs, rhyolite, and basalt to the surface. Sedimentary rocks such as sandstone are also widely available.

Exotic materials such as obsidian and steatite would require use of trade to acquire. While obsidian is available just 80 miles (129 km) from Muscupiabit, this source (Bristol Mountains) made up only 2 percent of the obsidian sourcing sample from Yukaipa't. The next closest sources are the Coso volcanic field and Obsidian Butte near the Salton Sea. Coso obsidian was the commonly used source (53 percent of the sample) at Yukaipa't and is 120 miles (193 km) from Muscupiabit. Obsidian Butte was the second most commonly used source (26.6 percent of the sample) and is 100 miles (160 km) from Muscupiabit. It is possible that inhabitants of Muscupiabit walked to these sources, but the presence of only four artifacts and no debitage makes it very unlikely. It is more likely however, that the artifacts were acquired through down-the-line trade. It is possible that the four artifacts were acquired in a single transaction.

Steatite would also require a wide trade network to acquire. Small pieces of steatite are available at Sierra Pelona just 83 kilometers from Muscupiabit. This source does not produce the large pieces of steatite required to create the bowls present at Muscupiabit. Steatite bowls would have to be created from steatite quarried on Santa Catalina Island. This would require a 20 mile (32 km) crossing to the mainland then a 60 mile (96 km) journey over land to Muscupiabit. As with obsidian, this would likely be the result of down-the-line trade.

Raw-Material Exploitation. The distribution of artifact types by raw material is shown in Figure 9. Findings clearly indicate a preference for locally available materials, especially quartzite. Quartzite makes up 26 percent of the lithic collection whereas no other material makes up more than 12 percent. This is likely due to quartzite having a good balance between availability and utility as an expedient tool stone. An interesting part of this collection is that there is no obsidian. Even when the collection is expanded to include all unanalyzed test units, there have only been four obsidian artifacts recovered from the site (approximately 0.27 percent of lithics). For comparison, the lithic assemblage at the Yukaipa't village site contained nearly 17 percent obsidian. With the exception of quartzite, material types were generally used exclusively for either ground stone or flaked stone. Granite, schist, gneiss, sandstone, and steatite were used only for ground stone whereas the other common materials were used only for flaked stone. This is likely due to the properties of the individual rocks. Granite, schist, and gneiss are poor materials for flaked stone and materials such as chert, jasper, and chalcedony are unavailable in large enough pieces to be useful as ground stone. It appears that chert was a rare, and perhaps preferred resource as there are no chert cores but 22 pieces of debitage and 9 tools. Overall, the analyzed collection demonstrates a clear preference for quartzite. Granite is the preferred material for metates with seven out of nine metates being granite. Manos however were made of a variety of materials which suggests that the very coarse surface of granite was only necessary for one part of grinding whereas a variety of materials could be used as a mano. Steatite was used but primarily for bowls. Access to steatite would require the previously discussed use of a trade network that included Santa Catalina Island.

Flaked-Stone Analysis

Debitage. Debitage is the most common flaked-stone artifact class (n=127, 44.5 percent) in the lithic collection. This quantity of lithics can be used to address several research issues. In addition, because debitage generally has little utility, it is often discarded at or near the place of tool manufacture. Therefore, debitage may be present in similar frequencies to the materials used by the inhabitants of a site.

Raw Materials. Raw materials in the debitage collection shows that both local and nonlocal lithic sources were used for tool manufacturing. Quartzite was likely used opportunistically as it is widely available in the areas around Muscupiabit. Igneous materials, both fine and coarse grained also appear in the debitage collection. Both materials are readily available in the San Bernardino Mountains. On the other hand, chert and jasper are available in the San Bernardino Mountains, but these rocks only form in limestone formations (Marshall 2017) . The largest of these formations are near Big Bear Lake but there may be smaller undocumented sources closer to Muscupiabit. Other raw materials such as granite and rhyolite appear in small numbers in the debitage, likely due to their poor flaking quality.

Flake Size

Flake size is a product of multiple factors including size of the raw material, distance from the raw material source, and reduction technology. The distribution of size classes suggests that acquisition methods and reduction strategies were used differently between raw materials.

Widely available materials should be associated with larger flake size whereas exotic or rare resources should be used until the raw material is nearly exhausted. Although the data tend to skew towards smaller size classes, the data show a significant difference between local, and semi-local or exotic materials.

The materials with the smallest flakes are the materials with the best flaking quality, which in this case are also semi-local materials (Figure 9). Chalcedony (100 percent), quartz (83 percent), and chert (54 percent) all have a majority of their flakes smaller than 20 mm. On the other hand, quartzite (74.5 percent), igneous fine-grained (60 percent), and igneous coarse-grained (100 percent) have a majority of flakes larger than 20 mm. This divide shows a difference between local, low quality raw materials, and semi-local/exotic high flaking quality raw material. The raw materials that generated the small size classes are rarer and much more desirable when making small tools such as a projectile point. The inhabitants of Muscupiabit would be more conservative when flaking these materials compared to quartzite. Quartzite is widely available in the immediate area but can be used for larger and more expedient tools such as a scraper.

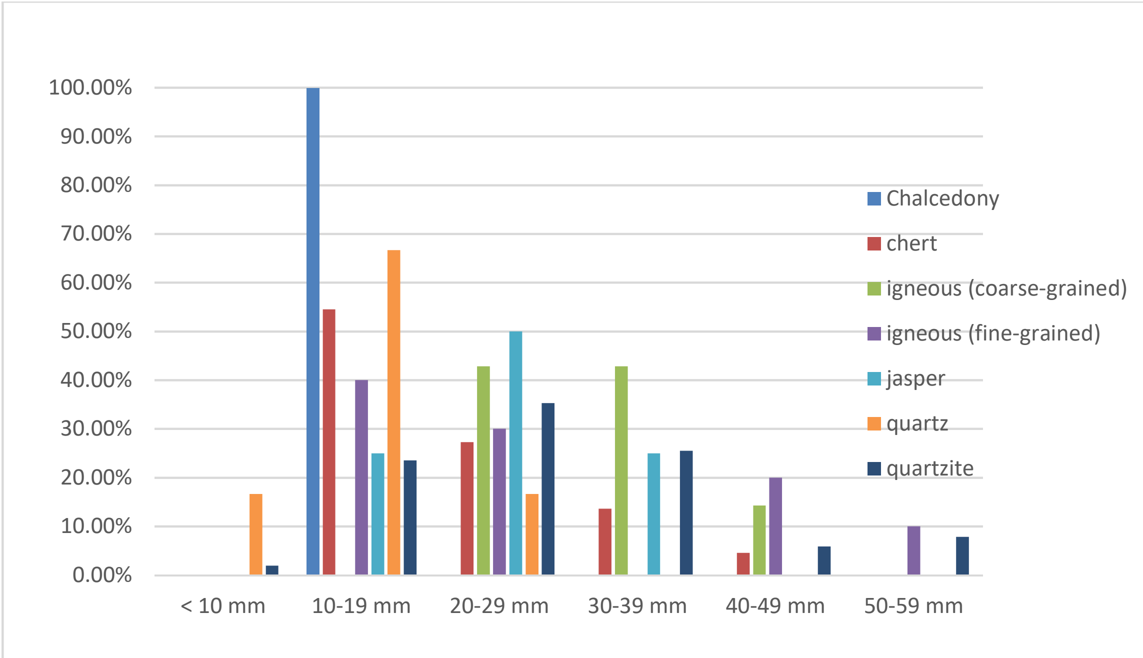

Figure 9. Debitage Size Distribution by Raw Material

Flake Type. Each piece of debitage was assigned a flake type. Flake type is based on the size, shape, and cortex amount of a flake. Based on flake type distribution, one can draw conclusions on the goal of flaking activity at the site. Indeterminate flakes and material types with only a single occurrence were excluded and thus 120 flakes were used in this analysis.

Based on the flakes in this collection, there is one clear trend. Tool production at the site was limited to large tools with little work put into tool maintenance activities. If tools such as projectile points or bifaces had been produced, there would be a significant amount of microdebitage and biface flakes. Instead, the collection is composed of mostly core flakes and angular debris. These are evidence of expedient tool production especially when combined with prevalence of quartzite at the site. Quartzite core flakes or angular debris dominate the collection (40.8 percent of debitage). Only 8 percent of analyzed flakes are microdebitage or biface flakes. Microdebitage is associated with pressure flaking which is used to make fine edges on formal tools such as projectile points. Biface flakes are produced when thinning bifaces and should be present in greater numbers if there was biface production at the site. Flake types sorted by raw material are displayed in Table 12.

Table 12. Flake Type by Raw Material.

Raw Material	Angular debris	Biface flake	Core flake	Microdebitage	Total
Basalt			1		1
Chalcedony	2	2			4
Chert	12	2	6		20
Igneous (coarse-grained)	2		5		7
Igneous (fine-grained)	5	1	4		10
Igneous (indeterminate)	1				1
Indeterminate	12		1	2	15
Jasper	1		4		5
Metamorphic (indeterminate)			1		1
Quartz	3	1	1	1	6
Quartzite	20		29	1	50
Total	58	6	52	4	120

Cores. Only seven cores are present in the collection. Two each of fine-grained igneous, coarse-grained igneous, and quartzite. These cores are all relatively large, multidirectional, expedient use cores which is expected based on the flake types present in the collection. The one exceptional core is a small, exhausted, jasper core. This core is battered on one side, suggesting that it was placed on an anvil for bipolar flaking. This technique is used to extract as many useful flakes as possible from a rare raw material. The overall lack of cores at the site is further evidence that most tools were made quickly and little work went into refining them. With only seven total cores, it is difficult to say much about lithic core use at the site.

Bifaces. Eight bifaces were identified in the lithic collection. Four of these are similar in size and shape to projectile points in the collection but, absent a hafting element, they cannot be positively identified as projectile points. Overall, fine grained materials were preferred for biface manufacture. The only biface that was not fine grained was one quartzite biface. Again, this is likely due to quartzite's availability at the site. Whereas the four previously mentioned artifacts are clearly formal tools, it is possible that the other artifacts were bifacial cores.

Projectile Points. Twelve projectile points were identified in the lithic collection (Table 13). A selection of complete points is displayed in Figure 10. Ten points were identified as Cottonwood Triangular, one was identified as a Desert Side-notched, and one was unidentifiable. Cottonwood points are common at sites of this age and in this area (60 percent of projectile points at Yukaipa't) and date from approximately A.D. 1200 to the historical period (Grenda 1998). Desert Side-notched points are also found in this region and they postdate AD 1300. Of the 12 points, six are complete. There is no clear preference for serrated or continuous edge morphology, with six of the points being serrated and four being continuous. As was the case with bifaces, fine-grained materials were preferred by the inhabitants. The points are all made of either quartz, chert, jasper, or chalcedony except for one quartzite point. This suggests that when exotic raw materials were available they were prioritized for projectile point production. This is expected because projectile points are generally the tool that requires the finest flaking and therefore requires the highest quality material.

Figure 10. Selected Projectile Points (scale in cm)

Table 13. Descriptive Data for Projectile Points

Point Type	Edge Morphology	Material	Maximum Length (mm)	Maximum Width (mm)	Maximum Thickness (mm)
Cottonwood Triangular	Continuous	Chert	15	10.9	3.5
Cottonwood Triangular	Continuous	Quartz	13	10	3
Cottonwood Triangular	Continuous	Quartzite	18.5	11.5	3
Cottonwood Triangular	Indeterminate	Chert	8	14.5	2.5
Cottonwood Triangular	Serrate	Chert	20	12	5
Cottonwood Triangular	Serrate	Jasper	23.5	13	4
Cottonwood Triangular	Serrate	Quartz	12.4	8.8	1.4
Cottonwood Triangular	Serrate	Chalcedony	19.4	12.8	2.7
Cottonwood Triangular	Serrate	Chert	19.4	8.7	1.8
Cottonwood Triangular	Serrate	Quartz	16	12.5	3.4
Desert Side-notched	Indeterminate	Chalcedony	12.4	12.7	2.3
Indeterminate	Continuous	Quartz	9.7	12.9	3.2

Ground-Stone Analysis

The ground-stone collection at Muscupiabit contains a variety of artifact types including bowls, discoidal, manos, metates, mortars, pendants, pestles, polished stones, and shaft straighteners. The collection consists of 106 artifacts, 98 from the SBCM collection and 8 recovered during the 2016 excavation. Analysis of artifacts was conducted using previously collected data housed at SBCM (Jertberg n.d.). All ground stone from the site is presented in this section of the analysis.

Manos. Thirty-two manos were identified in the collection with thirteen of them being fragments. Twenty-seven of the manos are from the SBCM collection and five are from 2016 excavations. Nine of the manos are basin manos and eighteen are flat manos. Fifteen of the manos are rectangular, seven are round, and ten were fragments that could not be identified to a shape.

The manos in the SBCM collection were not distinguished as either basin or flat manos. Of the manos from the 2016 excavation, three are flat manos, one is a basin mano, and one is indeterminate. Raw materials (Table 14) are overwhelmingly local. Only the gabbro and tuff manos would not be available in the immediate area surrounding Muscupiabit. This suggests local materials were sufficient for the ground-stone manufacturing needs at Muscupiabit. Manufacturing does not appear to have been an intensive process. Seven of the manos are pecked on their grinding surface but shaping is minimal. This fits into the pattern of expedient lithic tool manufacture that was evident in the flaked-stone collection.

Five of the manos recovered during 2016 excavations were removed from a thermal feature. They were burned and mixed in with approximately 75 other rocks. The data from the SBCM do not mention burning on any of the twenty-seven manos.

Five of the manos show secondary use as hammerstones, six show secondary use as anvils, and one shows secondary use as both a hammerstone and anvil. These artifacts may have been used for shelling acorns prior to grinding the meat of the acorn.

Seventeen of the manos are bifacially abraded while fifteen are unifacial. This divide is in similar proportions to Yukaipa’t (14 bifacial, 10 unifacial). On sites with a long occupation period, this may indicate a change in subsistence strategies (Mauldin 1990). Muscupiabit does not appear to have been occupied for a long enough time for fundamental changes in subsistence strategies to occur. The variation in manos may have been a technique difference between individuals or could be a choice made based on raw material quality and/or shape. There could also be an unknown functional difference.

Table 14. Manos by Raw Material

Raw Material	**Number of Manos**
Granitic	12
Gabbro	1
Gneiss	3
igneous (coarse-grained)	1
igneous (fine-grained)	1
indeterminate	2
Quartzite	9
Schist	2
Tuff	1
Grand Total	**32**

Metates. Eight metate fragments have been recovered from the site. Four are in the SBCM collection and four were recovered during the 2016 excavation. The fragments are relatively small with only one of them being larger than 20 cm. Of these metates, three can be identified as flat metates. All but one of the metates are granite, the remaining one is schist. This demonstrates that as was previously discussed, local lithic materials were sufficient for ground-stone production at Muscupiabit. One of the metate fragments was recovered from the thermal feature discovered by the 2016 excavations. No other fragments were found in the feature, suggesting that the metate was broken before it was put into the pile of rocks.

Bowls. Five steatite bowl fragments are recorded in the SBCM collection. These likely originated on Santa Catalina Island. One of the pieces has an incised rim and one of the broken edges was ground smooth. This piece is also burned. Another piece was used as a shaft straightener. These are surely bowls and not mortars because they are made of steatite which is a soft material not suitable for battering or grinding.

Shaft straighteners. Nine shaft straighteners are recorded in the SBCM collection. Five of these are made of steatite, two of sandstone, and two are unidentified. Two of the steatite artifacts have incised lines at right angles to the central groove. These incisions are common on shaft straighteners in the region (Koerper 2009).

Ornaments. Twenty-four pendant fragments are recorded in the SBCM collection. Fourteen are made of volcanic tuff, seven of diatomaceous shale, one each of aplite and schist and one is unidentified. These fragments range from 1.4 to 5 centimeters wide and are between 0.3 and 0.9 centimeters thick. Four of them have traces of red paint. Ten of them are incised with three of those have incising on both sides. Diatomaceous shale in southern California likely originated in the Monterey Formation. The Monterey Formation is a Miocene marine deposit which runs along the coast of California (Piper 2001).

Discoidals. Three discoidal artifacts are recorded in the SBCM collection. All three are fragments and are made of sandstone. They range from 8.1 to 10.9 cm in diameter and from 3.5 to 6.2 cm in diameter. Two of the discs have a central depression on both sides while the third has the depression on only one side. The discs are narrower toward the center but do not have a hole that goes through the artifact. There is no use wear on these artifacts and though they are regularly found in southern California, their function is unknown (Moratto 1984).

Conclusions

Lithic analysis at the site has shown that in general, local materials were used to produce expedient tools. There are very few tools made from exotic materials and even fewer exotic raw materials. What exactly this means will be discussed in Chapter 10. In terms of dating the site, lithics are not particularly useful as both projectile point styles recovered at the site were produced for over 500 years.

CHAPTER SEVEN

FAUNAL ANALYSIS

Faunal Analysis

The 2016 excavation at Muscupiabit yielded 935 pieces of animal bone. Analysis of these bones was conducted with the goal of studying subsistence practice. The Blackburn (1983) collection had not been previously analyzed so the faunal remains from selected units were chosen for analysis to compare with the 2016 collection. The selected units were chosen because they provided a sample of different areas of the site and a sufficient sample to draw conclusions from. Because of the possibility of differing excavation and collection methods, the results of the current excavation sample and the Blackburn units are presented separately. Faunal analysis was conducted by Pamela Ford, a faunal analyst with extensive experience throughout the western United States.

Methods. Methods used in the faunal analysis were reported as follows (Ford 2017):

> Contents of each bag were weighed prior to sorting. Any lithics, plants or other materials were removed. Bones were counted and weighed according to taxonomic categories. Number of elements that were burnt or calcined was also recorded.
>
> Identifications used comparative specimens in the collection of the author. One element, the *Ursus* phalanx, was compared to an image in an on-line museum collection since the author only has a

juvenile *Ursus* specimen for comparison. Descriptions of identified taxa below describe this further.

Since the research project focuses on food and cultural remains, the small rodents were mostly ignored.

The number of burnt bone fragments (brown or blackened, even if partial) and the number of calcined bone fragments (grey, white or blue) were recorded. If a fragment had both characteristics of burnt and calcined bone, it was recorded as calcined since that would be evidence of the harshest treatment.

The 2016 Sample. During the 2016 excavation, 935 pieces of bone were recovered. Of these 935 bones, 174 (18.6 percent) were identified to a taxon more specific than class. Identification was hindered by the high level of fragmentation in the sample. Minimum number of individuals (MNI) was not calculated due to time and budgetary constraints. No bones in this collection had visible signs of butchering.

Table 15. Identified Faunal Remains from the 2016 Excavation

Taxon	Common Name	NISP	Burned	Calcined	Weight (g)
Rodentia	Rodents	59	5	1	5.8
Leporidae	Rabbit/Hare	39	3	2	9.4
Microtinae	Voles	17	-	-	2.9
Small artiodactyl	Deer/sheep/goat	16	3	4	72.5
Sylvilagus	Cottontail	15	3	-	3.1
Lepus	Jackrabbit	11	1	-	6.3
Odocoileus	Deer	7	1	1	28.2
Canis spp.	Domestic dog/coyote	2	-	-	6.4
Canidae	Domestic dog/coyote/fox	2	-	-	1.6
Mustelidae	Weasel	1	-	-	0.5
Sciuridae	Squirrel family	1	-	-	0.2
Lagomorpha	Lagomorph	1	-	-	0.1
Spermophilus	Ground squirrel	1	-	-	0.1
Dipodomys	Kangaroo rat	1	-	-	0.1
Ursus spp.	Bear	1	-	-	1
cf. *Odocoileus*	Deer	3	-	-	-
Mammalia (Small)		6	-	-	0.1
Mammalia (Small-Medium)		438	53	64	121
Mammalia (Small-Large		298	34	43	111.6
Mammalia (Medium-Large)		16	1	4	11.2
Total		935	104	119	382.1

Identified Taxa in the 2016 Sample

Class Mammalia. A majority of the bones (81.4 percent) was identified only as mammal. This is likely due to the high degree of fragmentation in the sample. When possible, these were identified to a size of mammal. A significant number of mammal bones are to be expected at the site as almost all economic species in the area are mammals.

Class Mammalia (Rodents)

Rodentia. The single largest taxon identified was the order Rodentia (n=59, 6 percent). This includes voles, rats, squirrels and other small mammals. This taxon was sampled to identify which species were present but it was not fully speciated. Most of these bones were cranial bones or long bones. Smaller bones may not have been captured by 1/8-inch-mesh.

Microtinae. Within order Rodentia, the subfamily of Microtinae (also known as Arvicolinae) was identified. Microtinae includes voles such as the California vole (*Microtus californicus*). Bones in this taxon were not identified to a more specific taxon.

Sciuridae. Sciuridae is the family that contains squirrels and chipmunks. A single element was identified to this family level.

Spermophilus sp. A single ground squirrel mandible was identified to confirm the presence of ground squirrels in the sample.

Dipodomys sp. A single kangaroo rat mandible was identified to confirm the presence of kangaroo rats in the sample.

Class Mammalia (Small Mammals)

Lagomorpha. A single unburned element was identified as belonging to order Lagomorpha. This order includes rabbits, hares, and pikas. Based on the large number of bones identified to Leporidae, it is likely that this bone also belongs in this taxon.

Leporidae. The second most numerous taxon was family Leporidae (n=39, 4.2 percent). This family includes rabbits and hares. Most of the elements in this taxon were cranial or long bones. This is possibly due to differential preservation based on the size of bones or due to the processing strategy. As no other rabbit species were identified in the collection, it is likely that these bones are either *Sylvilagus* or *Lepus*.

Sylvilagus sp. The species with the most identified elements (n=15, 1.6 percent) in the 2016 collection was the cottontail rabbit. These could be from the Audobon cotton tail (*Sylvilagus audobonii*) and brush rabbit (*Sylvilagus* bachmani). Most of the identified cottontail elements were either skull elements or long bones of the 15 identified bones, three were burned. It is likely that the cottontail was an economic species as it can be used for meat as well as for hides.

Lepus californicus. Eleven jackrabbit elements (1 percent) were identified in the collection. One of these was burned. Like the cottontail collection, the jackrabbit bones were composed of long bones and skull elements. The jackrabbit was probably exploited in a similar way to the cottontail. The jackrabbit bones that were recovered were, on average, much larger than cottontail bones (0.2 grams vs 0.57 grams).

Mustelidae. A single unburned element from the family Mustelidae was identified. Mustelidae includes weasels, minks, and ferrets.

Class Mammalia (Medium-Sized Mammals)

Canis spp. Two unburned canid elements were identified. It was not possible to determine if these elements belong to the coyote (*Canis latrans*) or domestic dog (*Canis familiaris*). An additional two unburned elements were found that belonged to family Canidae which includes the previous two species as well as foxes. These four bones were all elements of the foot or lower leg which is a low meat area of the body. It is possible that these are from a domestic dog associated with Historic-period ranching.

Class Mammalia (Large-Sized Mammals)

Order Artiodactyla (small). The greatest taxon by mass was small members of Artiodactyla which includes deer, sheep, and goats. 16 elements (1.7 percent) were identified, which weighed a total of 72.5 grams. These bones were primarily long bones and cranial elements. Three of these bones were burned and four were calcined. Mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginicus*) are common in the area. It is also possible that the bones belonged to bighorn sheep (*Ovis Canadensis*) or goats and sheep associated with ranching.

Odocoileus sp. Seven elements were identified as belonging to genus *Odocoileus* (Mule deer or white-tailed deer). One of these was burned and one was calcined. These are also primarily lower leg bones and cranial elements. An additional three unburned bones were identified as likely belonging to *Odocoileus*.

Ursus spp. A single element belonging to a bear was identified. The bone is the 3rd phalanx which is the bone that attaches to a claw. As no other bear bones have been recovered from the site, it is possible that this was part of an ornament. It likely belongs to a grizzly bear (*Ursus arctos californicus*) because black bears (*Ursus americanus*) were not introduced to the San Bernardino Mountains until the 1930s (California Department of Fish and Wildlife n.d.).

<u>The Blackburn 1983 Sample</u>

From the selected units in the Blackburn collection, 5,022 pieces of bone were identified. Of these bones, 379 (7.5 percent) were identified to a taxon more specific than class. Identification was hindered by the high level of fragmentation in the sample. Minimum number of individuals (MNI) was not calculated due to time and budget constraints. No bones in this sample showed signs of butchering.

Table 16. Identified Faunal Remains from the 1983 Excavation

Taxon	Common Name	NISP	Burned	Calcined	Weight (g)
Leporidae	Rabbit/Hare	149	15	5	43.5
Small artiodactyl	Deer/sheep/goat	95	13	8	150.2
Rodentia	Rodents	89	11	2	7.8
Odocoileus	Deer	14	1	1	28.2
Reptilia	Reptile	10	-	-	-
Canis spp.	Domestic dog/coyote	4	3	-	7.3
Canidae	Domestic dog/coyote/fox	4	1	1	6.2
Sylvilagus	Cottontail	4	1	-	0.6
Aves	Bird	4	-	-	-
Large artiodactyl	Cow	1	-	-	4.5
cf. *Odocoileus*	Deer	5	-	-	4.8
Mammalia (Small-medium)		1117	254	158	202.7
Mammalia (Small-large)		3518	959	319	773.7
Mammalia (Medium-large)		6	-	6	3.7
Mammalia (Large)		2	-	-	15.8
Total		5022	1258	500	1249

Identified Taxa in the 1983 Sample

Class Reptilia. Ten unburned reptile vertebrae were identified in the Blackburn collection. These were found dispersed throughout three of the four units and were not identified further.

Class Aves. Four unburned bird bones were found in Pit S1 E2. Only one was below the plow zone. These bones were not identified further.

Class Mammalia. A majority of the bones (92.2 percent) was identified only as mammal. This is likely due to the high degree of fragmentation in the sample. When possible, these were identified to a size of mammal. A significant number of mammal bones is to be expected at the site as almost all economic species in the area are mammals.

Class Mammalia (Rodents)

Rodentia. Rodent bones made up 1.8 percent of this sample. Eleven of the bones were burned and 2 were calcined. These bones were all long bones or cranial elements.

Class Mammalia (Small Mammals)

Leporidae. The most numerous taxon in this collection was family Leporidae (n=149, 3.0 percent). Most of the elements in this taxon were cranial or long bones. As no other rabbit species was identified in the collection, it is likely that these bones are either *Sylvilagus* or *Lepus californicus*.

Sylvilagus sp. Four cottontail bones were identified in the Blackburn collection. One of them was burned. All four were cranial elements.

Class Mammalia (Medium-Sized Mammals)

Canis spp. Four canid elements were identified in the collection. Of these four, three were burned. It was not possible to determine if these elements belong to the coyote (*Canis latrans*) or domestic dog (*Canis familiaris*). An additional four elements were found that belonged to family Canidae which includes the previous two species as well as foxes. Of these four, one was burned and one was calcined. All eight of these bones were either long bone or cranial elements.

Class Mammalia (Large-Sized Mammals)

Order Artiodactyla (small). As was the case with the 2016 sample, the greatest taxon by mass was small members of Artiodactyla which includes deer, sheep, and goats. A total of 95 elements (1.9 percent) was identified, which weighed a total of 150.2 grams. This collection has a significant number of teeth as well as long bones. Thirteen of these bones were burned and eight were calcined. Mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginicus*) are common in the area. It is also possible that the bones belonged to bighorn sheep (*Ovis Canadensis*) or goats and sheep associated with ranching.

Odocoileus sp. Fourteen elements were identified as belonging to genus *Odocoileus* (Mule deer or white-tailed deer). One of these elements, an antler tip, was burned. Twelve of the fourteen elements in this collection are teeth. An additional five unburned elements were recorded as likely belonging to *Odocoileus*.

Order Artiodactyla (large). A single element from a large artiodactyl was identified. Large artiodactyls include cattle and bison. This mandible likely belonged to a cow associated with historic ranching or the rancho period.

Conclusions

Based on the faunal analysis, it appears that the primary economic species at the site were rabbits and deer. None of the bones showed signs of butchering and many were longitudinally split. This is a sign that there was limited protein available and that every ounce of nutrition was being recovered through grease rendering (Heinrich 2014).

CHAPTER EIGHT

SHELL ANALYSIS

Both worked and unworked shell fragments were recovered from CA-SBR-425 during the 2016 excavations. During the 1983/84 Blackburn excavation, only worked shell was recovered. The presence of shell demonstrates access to a coastal trade network and the extent of this trade is explored below.

Unworked Shell

The 2016 excavation yielded three pieces of unworked shell. Two are of the phylum Mollusca and one could not be identified to a taxon. These shell fragments were clearly brought from the coast but as they are non-economic species; their function is unclear. It is possible that they are associated with shell bead manufacturing.

Worked Shell

Worked shell was recovered during both the 1983/84 and 2016 excavations. Nine pieces of worked shell were recovered in 2016 and 213 during the 1983/84 excavation. Of the worked shell artifacts, all but two are beads. Beads were classified and dated using the Bennyhoff and Hughes (Bennyhoff 1987) shell bead typology. The majority of these beads (73 percent) came from a single unit, Blackburn's S1E2. The distribution of beads by type is presented in Table 17. The two pieces of worked shell appear to be products of bead manufacturing. One is an *Olivella biplicata* with a hole drilled into the edge of it. The other is a relatively thick Mollusca shell with one of the edges ground flat. These pieces demonstrate that raw shell materials were reaching Muscupiabit through a trade network. The ages of the beads (Table 17) suggest that they were brought at different times, meaning that they were not brought by a single movement of people. Whether these shells were obtained through down-the-line trade or direct contact is difficult to determine. No worked shell tools were recovered and no tools used in shell bead production, such as lithic drills or metal needles were recovered.

Table 17. Shell Bead Type Count and Temporal Significance

Bead Type	Count	Temporal Significance
Rough Disk	28	Terminal Mission (1816-1834)
Bushing	2	1150-1834
Tiny Saucer	111	600 BC - Historic Period
Fragment	12	-
Semiground Disk	43	1771-1816
Cupped	1	1150-1800
Cylinder	1	Phase 2 of Late Period (1650-1782)
Wall Disk	1	Late Period to 1816
Spire	1	No temporal significance
Indeterminate	20	-
Total	220	

The dates of the bead types (Cannon 2016) all fit within the timeframe suggested by other temporal evidence at the site. Whereas some of the beads have time ranges extending much earlier than the earliest proposed habitation at the site, they were all produced until at least the time of occupation. Beads were typically worn as a visible personal adornment and probably signified status or importance within the group. The concentration of beads in Unit S1E2 suggests that this area was probably a habitation area such as a house or common area.

CHAPTER NINE

CERAMIC AND NON-NATIVE ARTIFACT ANALYSIS

The 2016 excavation recovered two sherds and the comparison units from Blackburn (1984) contained eighteen sherds, for a total of twenty. In the collection, the following ceramic types were identified: Black Mesa Buff Ware, Colorado Buff Ware, Colorado Red Ware, Palomas Buff Ware, and Palomas Red on Buff Ware.

Methods

Sherds were identified using Michael Waters's (1982) "Lowland Patayan Ceramic Tradition" typology. Attributes recorded for ceramics included ceramic type, vessel part (body or rim), or if the piece was not a part of a vessel. To aid in identifying paste and temper, a small piece of each sherd was broken off to expose a clean surface.

Results

Nineteen of the twenty sherds were identified to a type. The results of this analysis are displayed below in Table 18

Table 18. Ceramic Types Identified

Unit	Level	Ceramic Type	Vessel Part	Comment
1	3	Palomas Red on Buff	Body	
2	6	Palomas Red on Buff	Rim	
3	2	Colorado Buff	Rim	
8	2	Colorado Red	Body	
8	3	Colorado Buff	Body	
8	3	Unidentified	Body	
8	5	Black Mesa Buff	Body	
8	5	Black Mesa Buff	Body	
8	5	Colorado Buff		Spindle whorl
8	8	Colorado Buff	Body	
8	8	Colorado Buff		Rounded edges
S1E2	1	Colorado Red	Body	
S1E2	3	Palomas Buff	Body	
S1E2	3	Palomas Buff	Body	
S1E2	5	Colorado Buff	Body	
S1E2	7	Colorado Red	Body	
S1E2	7	Colorado Red	Body	
S1E2	10	Colorado Buff	Body	
S1E2	10	Colorado Buff	Body	
S1E2	10	Colorado Buff	Body	

Colorado Buff. The most common ceramic type is Colorado Buff, making up nine of the twenty sherds. Colorado Buff is found across southern California and western Arizona. Colorado Buff is identified by its scum coat and very fine sand temper. This type was most common during the Patayan III period which spanned from AD 1500 to the Historic period. One of these pieces has ground edges making the piece almost round. The reason for this edge treatment is unclear.

Colorado Red. Four Colorado Red sherds were identified. This type is most common in western Arizona but the range extends to the western Mojave

Desert. This type dates to the Patayan I period which spans from A.D. 700 – A.D. 1000.

Black Mesa Buff. Two sherds were identified as Black Mesa Buff. This type has a distinct dark blue/black color. Black Mesa Buff was produced along the Colorado River but is found in the western Mojave Desert. Black Mesa Buff dates to the Patayan I period (A.D. 700-1000).

Palomas Buff. Two sherds were identified as Palomas Buff. Palomas Buff is identified by its gray color and soft fracture. The Waters (1982) typology states that this type is confined to Arizona and dates from A.D. 1000 to the Historical period.

Palomas Red on Buff

Two sherds were identified as Palomas Red on Buff. This type is the decorated version of Palomas Buff. Waters (1982) says that this type has an even smaller range than Palomas Buff and dates from the same period.

Conclusions

Southern California ceramic chronologies are relatively imprecise, with some types in production for 800 years (Montgomery 1998). The types at Muscupiabit mostly fit within the proposed time frame of the site. The sherds that would have been 800 years old at the time of Muscupiabit's occupation are out of place but the unreliability of ceramic types and chronologies may explain this. Additionally, the small ceramic types may have been misidentified. Also, Cajon Pass had already been traveled for thousands of years by the time Muscupiabit was occupied. Ceramics can remain intact on the ground surface for long periods of time and it is possible that these pieces were dropped on the site prior to the main occupation period. These small pieces may have also been collected by the inhabitants and moved to the site.

The ceramics that do fit into the time frame of Muscupiabit's occupation demonstrate a trade network that stretched to the Colorado River area. While the obsidian trade appears to have slowed or stopped, the ceramic trade was still active. Beyond that conclusion, the small sample size makes it difficult to say much more about the ceramic collection.

CHAPTER TEN

SYNTHESIS/CONCLUSIONS

Previous chapters presented the results of fieldwork and analyses of the data recovered. This chapter combines those analyses and attempts to interpret them. Answering any questions about the physical layout of the site was difficult because formation processes have profoundly changed the upper 50 cm of the site.

Chronology

From the onset of the project, a primary goal of the project was to determine the date of initial occupation of the site and a date of abandonment by the Native population. It appears from the evidence that the site was occupied by a Native population from the late Protohistoric period through to around AD 1825. The evidence supporting these dates includes historic accounts, a radiocarbon date (discussed below), shell bead types, the presence of glass beads, and projectile point styles. There is no conclusive evidence for an occupation preceding the Protohistoric period. While there are diagnostic artifacts that could date from an earlier time, there is no supporting evidence to believe these artifacts are from a different time than the artifacts in the same context. The site was certainly abandoned by Natives by the turn of the 20th Century (when a ranch occupied the site) but an earlier abandonment date cannot be definitively determined.

The exact number of people at Muscupiabit can be investigated using California mission records. These records were digitized and indexed by the Huntington Library as part of their Early California Population Project. Using the mission records (Figure 11, Appendix D) it can be determined that small numbers of people left Muscupiabit between 1791 and 1806. During this period, a total of 17 people listing their origin as Muscupiabit were baptized by the Spanish. Spanish recruiting efforts at Muscupiabit were increased in 1809. Between 1809 and 1815, 39 people from Muscupiabit were baptized at Mission San Gabriel. This displacement of such a large number of people would be enough to essentially destroy a village. After 1815, only one more baptism of a person from Muscupiabit was recorded, in 1819. Of the 60 people who entered the mission system between 1791 and 1819, 43 were dead by 1837. Of the remaining 17, the youngest remaining person born at Muscupiabit would have been 28. Interestingly, in this child's baptism record (#4691) is a note that his father was the "capitan de la rancheria de Amuscopiabit." It appears that the final person born in Muscupiabit to survive to adulthood, given the Spanish name "Rustico," was the son of the last chief of Muscupiabit.

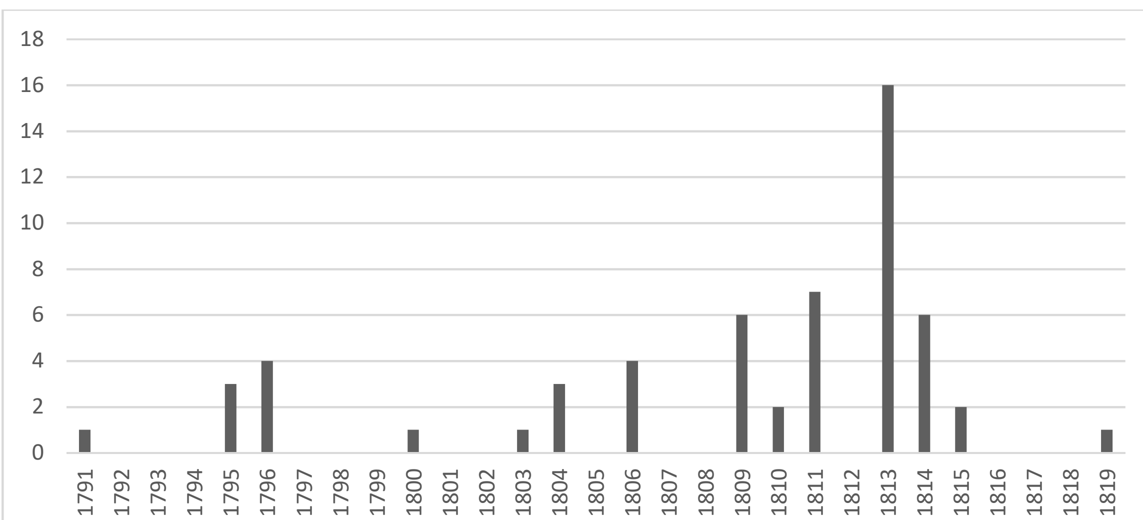

Figure 11. Baptisms of Muscupiabit Inhabitants

Using this information, the calibrated age probabilities in Table 7 can be analyzed further. The age range with the greatest probability, 1877-1917, can be disregarded. This is far too late for the bead styles found at the site, and by this time (being well after the founding of San Bernardino) there would have been significant amounts of non-Native goods at the site. The next greatest probability is the 1696-1725 range. This range is unlikely due to a lack of any beads which definitively date to this period. The next greatest probability, is the period from 1814-1836. Based solely on the radiocarbon date, this period was given a 21.7% chance of being correct. However, when the population data and bead styles are included, this period seems significantly more likely to be accurate. Finally, the date range from 1845-1847 was given only a 1.6% chance of being correct. This date can be discounted mainly for its low probability.

There is no evidence of a hiatus in occupation prior to the final abandonment of the site. The site may have been seasonally abandoned but it appears to have been regularly used for approximately 100 years. Occupation in the Cajon Pass region likely began more than 7000 years ago at the San Sevaine site (Grenda 1998). The Blue Cut site (Sutton 2009), approximately one mile south of Muscupiabit, was occupied about 4000 years ago. Finally, Guapiabit, located at the top of the Cajon Pass was occupied in the 1800s (Douglas 2008). While the area was occupied for at least the preceding 6500-7000 years, Muscupiabit apparently was not occupied until the Protohistoric period.

Settlement and Subsistence

Due to its age and size, it is likely that Muscupiabit was a small, permanent occupation site, with some association to Guapiabit. Schiffer (Schiffer 2002) would classify Muscupiabit as having an "extended occupation" as it was occupied for between ten and 100 years. The site's permanence is suggested by people listing it as their origin in Mission records. There is no evidence for seasonal occupation and abandonment but again, the site seems too small to be self-sustaining on a long-term basis. Spanish marriage records support this with evidence of intermarriage between Muscupiabit and Guapiabit. The well-documented house pits and full range of habitation-associated cultural material demonstrate that people were living on the site, but the political independence of the site is yet to be determined. There is evidence for ritual activity based on the presence of steatite pipes, pendants, and polished stones

The presence of mortar and pestle technology can be linked to acorn processing. Manos and metates may have been used to process seeds, grasses, and even small mammals. The presence of shaft straighteners and projectile points demonstrate the use of the bow and arrow. This technology would likely have been used to hunt deer.

Due to site conditions heavily affected by both natural and cultural formation processes, any detailed attempt to reconstruct the subsistence pattern at the site through faunal analysis would be highly speculative. Remains above 50 cm have been churned and dragged across the site by discing and land-levelling activities during the middle of the 20th century. The location of the 2016 unit on top of a thermal feature demonstrates that this unit was dug through fill that was deposited after the site was abandoned by Native peoples. Blackburn's unit S1E2 encountered a house floor. The matrix above the floor was fill that was likely pushed into the depression after Smith recorded the house pits in the 1930s. Only broad statements about the faunal collection as a whole (i.e., site wide) can be made at this time.

Based on the faunal collection, it appears that rabbits were the most important economic taxon at the site. Rabbits make up 39 percent of the total identifiable bones at the site. Rabbits are relatively easy to hunt and were common prey among southern California native populations. Rabbit bones were also burned more frequently than those of other taxa.

While some of the rodent remains are likely intrusive, it is possible that some were eaten. The intrusive species can be distinguished from economic species by the amount of fragmentation and burning. Intrusive species are far less fragmented and have a lower occurrence of burning. There is documented evidence of small mammal processing on groundstone in the region (Padilla 2017), and animals such as ground squirrels could easily be processed this way. Without further identification of the rodent bones, it is difficult to interpret the dietary contribution of rodents.

During the period of Native occupation at Muscupiabit, the only large mammals in the area were deer and grizzly bears. The prevalence of small artiodactyl remains (25 percent of the total identifiable remains) makes it likely that deer were taken for food.

Large bone appears to have been mainly disposed of by burning. The bones most commonly present in the faunal collection were cranial and lower leg elements, demonstrating that other bones were generally pulverized. The high fragmentation of bones is a strong indicator of grease rendering (Heinrich 2014, Morin 2017). This activity is commonly found in southern California archaeological sites.

Site Structure and Organization

The site is located on a stream terrace located on the south bank of Cajon Creek. The occupation area is much smaller than was recorded in previous reports; however, it is consistent with the 1938 account of Gerald Smith. The site appears to have had a relatively brief occupation, possibly spanning two successive cultural periods. The site was first occupied in the waning years of traditional Native American lifeways and despite the initial influx of Spanish influence, the site was occupied into the Mission period.

The abandonment of Muscupiabit is interesting in that it can likely be seen happening in the historic record. Mission records show the population of the site slowly leaving (willingly or otherwise), with a single large displacement event happening in 1813. Schiffer details this process of slow abandonment, which he calls “draw down.” Schiffer lists four things that happen during draw down which effect the archaeological record. First, people stop replacing items that are broken or at the end of their use life. If a person expects to move within a short time, they can replace the item at their next location. Second, the availability of manufactured goods decreases. As a population shrinks, it is likely that some skills will no longer be present in that population. Third, as the population decreases, people become less inclined to do social activities. Finally, with fewer people in a society, comes less social differentiation (Schiffer 2002).

The local. expedient tools at Muscupiabit may be a sign of these first two components of draw down. Well aware of the effect the Spanish were having on Native society, there may have been little effort put into tool production as people may have believed that they had only a short time left at Muscupiabit. Second, there may not have been anybody capable of producing more advanced tools. After 1813, only 9 people were baptized at Muscupiabit. It is possible that none of these people were skilled at producing tools.

Determining strict temporal boundaries is difficult due to early 20th century impacts on the site. A combination of impacts from the Mormon Trail, Camp Cajon, the railroad, and historic ranching activities has thoroughly mixed the upper 50 cm of the site both laterally and vertically. House pits were filled in with surrounding site matrix and artifact concentrations were dispersed across the site. A lack of intact metates and bowls indicates that large pieces of groundstone were broken and moved by discing. It is also possible that large, identifiable artifacts were collected by the early ranch owners. The hill to the west of the site is depositing soil while the east face of the terrace is eroding into the dirt access road. This process is slowly causing soil and cultural material to wash into the lower areas of the site. The site may also be deflating due to wind, since the Cajon Pass consistently encounters very high wind conditions.

Determining discrete activity areas is difficult due to the movement of artifacts. House pits would indicate habitation areas, but no further statements can be made about the site. Extramural features are present at the site, as evidenced by the thermal feature discovered during this project. It is also likely there are a number of buried house pits and additional hearths present, but whether the stratigraphy of these is intact is difficult to know. If these features are buried more than 50 cm it is likely that they are intact.

Religion and Ideology

There is no direct evidence for burials at the site. The area mentioned by previous land owners and the caretaker as a burial area was found to be eroded/deflated with very little topsoil and few prehistoric/protohistoric artifacts. There is no evidence for cremations either. Not a single human bone was found in the faunal sample. High concentrations of beads, however, are commonly found in association with burials (Stanton 2016). The dense bead concentrations at Muscupiabit appear to be associated with house pits.

Items such as incised pendants may be indicative of religious activity. Along with other items such as a steatite pipe, pendants and discoidals, these may be indicative of ceremonial activity at the site. Whether the site was especially religious or a ceremonial location cannot be determined at this time. Towards the end of Muscupiabit's occupation, ceremonial activity may have decreased as a part of draw down. With only a small number of people remaining at the site, it is possible that there was little time for non-essential activities.

Technology

Lithic technology at the site was very basic. Most tools were expediently made from minimal flaking of local materials. More technologically advanced tools such as projectile points have been recovered but there is no evidence of their manufacture or maintenance at the site. Groundstone was also basic, with very little effort being put into the manufacture of manos and metates.

Even though trade with the desert was occurring, as demonstrated by the presence of ceramics (there is no evidence of ceramic production at the site), the site relied almost entirely on local or semi-local lithic resources. Most tools are made of quartzite which is available in the immediate area of Muscupiabit. Four obsidian tools were recovered by Blackburn (1983, 1984) but there is no sign of obsidian flaking. The only exotic lithic resource imported in significant quantities appears to have been steatite. Steatite bowls, pendants, shaft straighteners, and a pipe have been recovered, suggesting at least occasional interaction with a coastal trade network. This decline in exotic lithic trade suggests that lithic resources may have been replaced by European goods such as metal. However, these goods would have been rare and expensive, so basic tasks such as scraping and rough cutting could have been performed using the expedient lithic technology. One metal knife was recovered by Blackburn.

Conclusion

When asked about Muscupiabit, many people refer to it as a “village.” But what a village entails is never defined. This project made it a goal to define exactly what

Muscupiabit was, and what the inhabitants were doing there. In review, Muscupiabit appears to have been occupied by approximately 50 people (based on 60 total being removed from the village), for less than 100 years. Based on mission records, the site was probably abandoned or nearly abandoned by 1815. Despite Muscupiabit's proximity to a trade route, there is no evidence that inhabitants were controlling trade or producing any type of good for trade. There appears to have been little trade with desert locations but some trade with coastal areas.

Muscupiabit had contact with Guapiabit, evident through intermarriage between the groups. Other Serrano villages intermarried with Muscupiabit; however, none to the extent of Guapiabit. This intermarriage, along with the record of a chief of Muscupiabit, suggests that it was an independent entity from Guapiabit and not an outlying camp from it. Muscupiabit's downfall appears to begin with the arrival of the Spanish. In just five years, the Spanish managed to remove basically the entire population from Muscupiabit. From 1809 to 1813, 31 people were removed from Muscupiabit, leaving very few people at the site. This remaining population appears to have been a relatively old group, with most of them over 45. In the end, Muscupiabit likely died with a whimper. The aging population probably died slowly until the remaining population was absorbed into another Serrano settlement or a Spanish rancho.

While much was learned through this research, many questions remain about Muscupiabit. One area that could be investigated with no further fieldwork is a more in-depth analysis of mission records. The marriage links between

Muscupiabit and other places may reveal more information about Muscupiabit's place in the Serrano system. To further investigate population size, more investigation into the number of house pits at the site could be conducted. While many of the inhabitants were buried at Mission San Gabriel, it is possible that some of those who were not taken to the mission were buried at the site. However, none has been found. Further investigations could reveal information about burial practices at Muscupiabit. Using existing collections, the source of exotic lithics at Muscupiabit could be determined, revealing the trade connections available to the inhabitants. The museum collections at San Bernardino County Museum could also be studied more extensively. A pollen sample was taken from Feature 1 during the 2016 excavations. This sample may reveal the botanical resources exploited by the inhabitants. Finally, more excavations could uncover an *in-situ* house pit, this would provide valuable insight into daily life at Muscupiabit. If a radiocarbon date could be recovered from a house pit, it could give a more definitive date of occupation. Through future research, more can be learned about the story of the end of traditional Native American lifeways in the San Bernardino Mountains.

APPENDIX A

FAUNAL ANALYSIS REPORT

Faunal Analysis for CA-SBR-425
March 7, 2017

By Pamela Ford

METHODOLOGY:
Contents of each bag were weighed prior to sorting. Any lithics, plants or other materials were removed. Bones were counted and weighed according to taxonomic categories. Number of elements that were burnt or calcined was also recorded.

Identifications used comparative specimens in the collection of the author. One element, the *Ursus* phalanx, was compared to an image in an on-line museum collection since the author only has a juvenile *Ursus* specimen for comparison. Descriptions of identified taxa below describe this further.

Since the research project focuses on food and cultural remains, the small rodents were mostly ignored.

IDENTIFIED TAXA:

Class Aves

There are very few bird bones recognized within this fauna. They were not identified further.

Class Reptilia

There are very few bones from Reptiles identified in this fauna. They are vertebrae recognizable by the shape of the articular surfaces between vertebrae. Most of them are large enough to be from snakes.

Class Mammalia

Mammal bones unidentifiable to a finer classification are recorded as Mammal. The description indicates whether they are all small in size, small to medium sized, or if the element is from large sized mammals. The bulk of those identified as Mammal are fragments and they are without identifying or diagnostic characteristics. However, one can usually distinguish between various sized mammals. The distinction was made in order to help to describe the overall condition of the deposits at this site. It should be noted that in most faunal samples examined, the bones appeared to be splinters from larger bones.

The number of burnt bone fragments (brown or blackened, even if partial) and the number of calcined bone fragments (grey, white or blue) were recorded. If a fragment had both characteristics of burnt and calcined bone, it was recorded as calcined since that would be evidence of the harshest treatment. One could compare each deposit's ratio of burnt + calcined to non burnt+calcined bone if interested.

I found no tool or "cut" marks on any of the elements.

Order Lagomorpha includes the family Leporidae. (the hares (jackrabbits), cotton tails, and domestic rabbits).

Lepus sp. *Lepus californicus* (Black-tailed hare or Jackrabbit) is the jackrabbit that inhabits most of California, including this region. The specimens identified at CA-SBR-425 are most likely this species, however, the cursory identifications do not at this time support that statement based on the faunal evidence alone.

Sylvilagus spp. Both *Sylvilagus audobonii (*Audobon cotton tail) and *S. bachmani* (Brush rabbit) inhabit the region (Ingles 1965). No attempt was made to distinguish the species of elements of this genus. *Oryctolagus* cuniculus is the domesticated rabbit species. Although not specifically identified here, it is possible that some of the elements identified as Leporidae could be from the domesticated animal given the time period and history of the site.

Order Rodentia, Many Small Rodents were recognized in this fauna. They represent voles, kangaroo rats, squirrels and others. They were not generally examined for species identification but the diverse kinds of small rodents are noted. Sciuridae represents one or two elements that could be identified as a member of the family but not further. Sciuridae includes *Spermophilus* (*Citellus* in Ingles) represents ground squirrels, almost ubiquitous in California and in archaeological sites. *Dipodomys* sp. Represents Kangaroo rats. Microtinae represents the voles that are present, but not examined to distinguish species.

Order Carnivora: Among the carnivores, Canids, *Canis* spp., *Ursus* spp. and a single mustelid were identified. The taxon Canidae includes the wolves, coyotes, foxes and domestic dogs. If the size of the element made it impossible to distinguish the kind of canid, then the family label was applied. *Canis* is the genus name for both coyotes and for domestic dogs. All of the elements identified as *Canis* spp. were of coyote size. Since many domestic dogs are the same size, the elements could not be distinguished based upon size. In addition, none of the elements were those which are useful for determining whether domestic dogs are present. Therefore, they are labeled as *Canis* spp. reflecting the fact that these elements could be indicators of two species of the genus.

Ursus spp.:There is one element from a bear. This is labeled as *Ursus* spp since it is possible that it would represent either a black bear or a grizzly (this is a site in California, after all.) If the site pre-dates 1924, grizzly is possible and black bears are still in the region today. Note that the element is the 3rd phalanx but it was not possible to determine which foot or which digit it is from. The 3rd phalanx is the one that fits into the claw on the animal. It should be noted that this could have been attached to a bearskin obtained elsewhere and is not necessarily evidence of bear-hunting activity at this site.

Mustelidae: The single mustelid bone is a clue that martens, minks and/or weasels were part of the environment used by the people at this location.

Order Artiodactyla: The artiodactyls include both domesticated and wild animals. Some of the tooth fragments may be so small or so undiagnostic that they can only be identified to the order. Large Artiodactyl is the category that includes elk, moose, bison and cattle. If an element is so large that it does not appear to be from one of the small size artiodactyls, it was assigned to this category. There are no large size artiodactyls that inhabited the region surrounding this site, however, cattle and bison may have been part of the resources that the ranch depended upon. Small-size Artiodactyl is a classification that includes deer, antelope, sheep (wild and domestic) and goats (wild and domestic.) *Odocoileus hemionus* (mule deer) and *Ovis canadensis* (Bighorn sheep) are both familiar in the region and are known to be important to the prehistoric occupants of the area. The identification of elements as Small size Artiodactyl is used if the species of these two wild taxa, and domestic goat and sheep are not distinguishable. The label Small size Artiodactyl cf. *Odocoileus* sp. is used if the element is more like *Odocoileus* than any other small artiodactyl but the identification is still uncertain. The genus label *Odocoileus* sp. represents deer. Only one species of deer (*Odocoileus hemionus*) has ever been known to this region, however the identification to the species level based on bone or teeth alone requires detailed examination of extensive collections of bones of all deer species. To make distinctions between all of the small-size artiodactyls, well-researched references were used (Ford 1990, Lawrence 1951).

Note: Counts in this report frequently disagree with the counts originally recorded. There are several reasons, but mainly reflect the removal of plant and stone materials from the samples. Increases may be due to breakage since original cataloging.

SAMPLES FROM THE CURRENT GRENDA EXCAVATION

Feature 1 Level 2

Weight 0.4g, Count 1
Sylvilagus spp.: Maxillae RL + palatine + 3 molars

TP 1 Level 1

Weight 1.7 g, Count 10
Mammal, Small- medium (Count 8, Weight 1.3g)
Of these, 1 is burnt, 3 are calcined)
Leporidae: distal humerus R
Small Rodent: tibia shaft fragment burnt

SHELL: 1 small fragment: Mollusca (no diagnostic characteristics, could be a snail or a bivalve.)
*Lithic in sample

<u>TP 1 Level 2</u>

Weight 16.7g, Count 36
Mammal, small – large sized (Count 29, Weight 3.9g)
    Of these 3 are burnt, 3 are calcined
Small size Artiodactyl cf. *Odocoileus* sp.: distal metapodial fragment
Odocoileus sp.: carpal L calcined, distal tibia R

SHELL: 1 small fragment. *Olivella biplicata*. This is worked and has characteristics of bead-making.

<u>TP 1 Level 3</u>

Weight 37.6g, Count 66
Mammal, Small – medium size (Count 51, Weight 13.2g)
Leporidae: proximal radius L; radius fragment calcined
Leporidae cf. *Sylvilagus* spp.: mandible fragment R, mandible fragment + M3 R
Small Rodent: 3 incisor fragments, 1 molar fragment, metapodial, long bone fragment
Microtinae: mandible fragment L, 2 molars
Small size Artiodactyl: scapula fragment calcined, tibia shaft L
Odocoileus sp.: proximal metapodial

* Lithic in sample
**Note that although most of the bones in this sample are small pieces, there is one large tibia shaft whose weight is half the sample weight. It was not subjected to the same processes as the other bones.

<u>TP 1 Level 4</u>

Weight 25g, Count 57
Mammal, small-large sized (Count 42, Weight 11.7g)
    Of these, 4 are burnt, 4 are calclined
Leporidae: carnial fragment with optic foramen, mandible fragment R, femur shaft fragment L
Small Rodent: cranial fragment L, innominate L, innominate R, femur L
Dipodomys sp.: mandible with incisor fragment R
Small Artiodactyl: mandible fragment R, mandible fragments (broken in processing) R
Odocoileus sp.: lower molar 3 R

*Lithic in sample

TP 1 Level 5

Weight 7.4g Count 32
Mammal: small – medium size (Count 26, Weight 4.2g)
Of these 2 are burnt, 11 are calcined
Leporidae: mandible fragment with molar fragments, humerus shaft R burnt, distal tibia R burnt
Small Rodent: mandible fragment
Small Rodent cf Sciuridae: innominate
Odocoileus sp.: naviculocuboid fragment L

TP1 Level 6

Weight: 4.4g Count: 17
Mammal, small – medium (Count 14, Weight 3.5g)
Of these, 4 burnt, 2 calcined
Sylvilagus spp.: maxilla + malar L
Small rodent: innominate L, tibia R

TP2 Level 1

Weight 11.2g Count 16
Mammal: Medium – large size (Count 16, Weight 11.2g)
Of these, 1 is burnt, 4 are calcined.
**Most of the bones are small fragments but one is distinctively large---6.5 cm long.

TP2 Level 2

Weight: 25.1g, Count 55
Mammal: small-large size (Count 55, Weight 25.1)
Of these 3 are burnt, 5 are calcined.
**One long bone fragment is significantly larger than the rest: 9 cm)

TP 2 Level 3

Weight 19.8g Count 67
Mammal: Small – medium size (Count 58, Weight 12.3g)
Of these, 7 are burnt, 6 are calcined.
Leporidae: frontal R, mandible fragment R, mandible fragment + 3 molars L, incisor, radius shaft L calcined

Small Rodent: mandible fragment + molar R, mandible fragment, innominate fragment calcined, innominate fragment
Small size Artiodactyl: distal metacarpal calcined, astragalus fragment calcined

TP2 Level 4

Weight 55g, Count 72
Mammal: Small to medium size (Count 59 Weight 15.3g)
Of these, 7 are burnt, 15 are calcined
Leporidae: maxilla+palatine L, mandible fragment R, temporal fragment R, incisor fragment, 2 mandible fragments L, distal humerus L, femur fragment R
Small Rodent: mandible fragment L burnt, mandible fragment + incisor R, mandible fragment R, 2 incisor fragments, 2 molars, ulna fragment, femur fragment L
Canidae: radius fragment L, distal metapodial
Mustelidae: mandible fragment R
Small artiodactyl cf *Odocoileus* sp.: distal metacarpal R
Cervidae cg. *Odocoileus* sp.: parietal fragment (antler base) calcined
Odocoileus sp.: distal tibia fragment R burnt

TP2 Level 5

Weight 13.4g, Count 56
Mammals: Small- medium sized (Count 47, Weight 11.4)
Of these, 2 are burnt, 6 are calcined
Leporidae: 2 molar fragments, mandible fragment R burnt, distal tibia R
Lepus sp.: maxilla + palatine L
Small Rodent: maxilla R, incisor, mandible fragment + molars
Spermophilus spp.: mandible fragment R
Small Artiodactyl: distal phalanx #2 fragment

SHELL: 1 small fragment. Mollusca. This has the nacreous characteristics of abalone, turban shell, mussel, and others. More interestingly, it has straight edges demonstrating that it has been cut by humans.

TP2 Level 6

Weight 36.1, Count 36
Mammals, Small –medium size (Count 26, Weight 4.6g)
Of these, 2 are burnt, 4 are calclined
Leporidae cf. *Oryctolagus cuniculus*: innominate L
Leporidae cf.*Sylvilagus* spp.: mandible fragment R burnt, distal tibia L
Small Rodents: mandible L burnt, mandible fragment R, tibia fragment burnt
Small Artiodactyl: naviculocuboid L burnt, naviculocuboid fragment R calcined, metacarpal shaft fragment burnt, tibia shaft fragment R

TP2 Level 7

Weight 6.4g Count 7
Mammal: small size (Count 6, Weight 0.1g)
Odocoileus sp.: naviculocuboid R

UNIT 3 Level 1

Weight: 15.5g Count: 41
Mammal, Small – large sized (Count 39, Weight 15.2)
Of these, 9 burnt, 6 calcined
Lepus sp.: distal humerus L burnt
Microtinae: mandible R

Unit 3 Level 2
Weight: 22.1 Count 47

Mammal, Small – large sized (Count 40, Weight 20.7)
Of these, 2 are burnt, one is calcined.
Leporidae: distal radius L
Sylvilagus spp.: temporal L, distal tibia R, dital tibia L burnt
Microtinae: mandible fragment R, mandible fragment + incisor +M2 R (2)

SHELL: 1 small fragment. Mollusca. (No diagnostic characteristics. Could be a snail or a bivalve.)

TP3 Level 3
Weight: 53.4g Count: 125
Mammal, Small – large sized (Count 91, Weight 36.5g)
Of these, 11 are burnt and 25 calcined.
Note: one of the larger-sized bones (from a medium-large sized animal) has evidence of rodent-gnawing on the edges.
Lagomorpha: 1 tooth fragment
Lepus sp.: malar+maxilla R, radius fragment L burnt, distal femur L, femur shaft R
Sylvilagus spp.: 2 malar + maxilla R, mandible fragment R, innominate R
Small Rodents: radius fragment R, distal metapodial
Canis spp.: 1 metapodial
Small size artiodactyl: radius fragment R, distal metapodial

Unit 3 Level 4

Weight 25.6 g, Count 79
Mammal, small-medium sized (Count 62, Weight 18.1g)

Of these 11 are burnt, 6 are calcined
Leporidae: occipital, premaxilla R+L, mandible fragment R, mandible fragment L, Lower incisor,
radius, femur fragment R, tibia shaft L, distal tibia fragment R
Lepus sp.: mandible + molars R
Small Rodent: incisor, 2 distal humerus, ulna, radius, 2 innominate fragment, 3 tibiae
Microtinae: mandible R, mandible + incisor fragment R, mandible + incisor fragment L, mandible f ragment L
Canis spp.: distal metapodial burnt
Small size Artiodactyl: scapula fragment L

* Lithics and plants in sample

Unit 3 Level 5
Weight 16.1, Count 51
Mammal, small-large sized (Count 39, Weight 14g)
Of these, 5 are burnt, 5 are calcined)
Sylvilagus spp.: mandible fragment R, scapula fragment R
Small Rodent: 2 incisor fragments, 1 premaxilla + Incisor fragment, 1 mandible fragment, 1 innominate fragment
Microtinae: 1 mandible R, 1 mandible L +M1M2, 1 molar
Small size Artiodactyl: Lower Incisor 4 R

* Lithic in sample.

Unit 3 Level 6
Weight: 10.1g, Count: 25
Mammal, Small-medium sized (Count 18, weight 7.2g)
Of these, 1 is burnt, 2 are calcined.
Lagomorpha: molar fragment
Lepus sp.: mandible fragment L, scapula fragment L, innominate fragment R, tibia fragment R
Sciuridae: proximal femur L
Ursus spp.: 3rd phalanx

Unit 3 Level 7
Weight: 15.9, Count: 34
Mammal, Small-medium sized (Count 32, weight 13.8g)
Of these, one is burnt

Microtinae: mandible R, molar
Small size artiodactyl: metatarsal shaft fragment burnt

SAMPLES FROM EARLIER EXCAVATIONS (all catalog numbers begin with SBCM-2)

<u>2064 Unit B1 Level 1</u>

Weight: 19.0g, Count 73
Mammal: Small – medium (Count 64, Weight 13.3g)
Of these 18 are burnt and 23 are calcined.
Leporidae: incisor fragment L, distal humerus fragment R, proximal tibia fragment R
Small Rodent: molar, mandible + incisor R, distal humerus fragment calcined, calcaneus burnt
Small Artiodactyl: tibia fragment L burnt, distal 3rd phalanx fragment calcined

*Lithics in sample

<u>1154 Unit B1 Level 1</u>

Weight: 59.4, Count: 3
Mammal: Large (Count 2 Weight 15.8g)
Small Artiodactyl: tibia shaft L (Note this is 22.5 cm in length)

NOTE: these three bones are white and flaky. They look like bones that have been exposed on the surface for a very long time.

<u>2115 Unit B1 Level 2</u>

Weight: 74g, Count: 427
Mammal: Small – medium size (Count: 402, Weight 65g)
Of these, 106 are burnt, 46 are calcined
Leporidae: maxilla fragment calcined, mandible fragment R, mandible fragment L burnt, ulna fragment L, innominate L, tibia fragment R, tibia fragment L
Small Rodent: 3 cranial fragments, mandible L, scapula fragment, humerus fragment, 2 innominate fragments, distal femur, 3 tibia fragments
Canidae: lower M2 L
Small Artiodactyl: 2 molar fragments, distal metacarpal burnt, metatarsal shaft fragment calcined, distal 1st phalanx fragment

*Lithics and plants in this sample

<u>1155 Unit B1 Level 2</u>

Weight 3.7g, Count 6
Mammal: Medium to large (Count 6 Weight 3.7g)
All are calcined.

2421 Unit B1 Level 3

Weight 61.1g Count 395
Mammal: Small – large size (Count 667 Weight 48.9g)
Of these 98 are burnt, 31 are calcined)
Leporidae: maxilla fragment R, premaxilla + incisor L, distal maxilla fragment burnt, maxilla fragment calcined, auditory bulla L, mandible fragment L, distal radius R, proximal metapodial fragment, distal tibia R, patella
Small Rodent: mandible R, 2 humerus, 2 ulna burnt, radius, innominate, tibia burnt
Small Artiodactyl: 3 tooth fragments, proximal metacarpal fragment R, metacarpal shaft fragment, distal metapodial condyle

2319 Unit B1 Level 4

Weight: 78.6g Count: 402
Reptile: vertebra
Mammal: small – Large size (Count: 354, Weight 64.4g)
Of these 146 are burnt and 15 are calcined)
NOTE: there are 2 long bone fragments that are 11 cm long, significantly larger than any others in the sample)
Leporidae: premaxilla R calcined, maxilla L, temporal R, 2 temporal L, palatine, molar, lower incisor fragment, scapula fragment l, scapula fragment R, distal humerus L, femur head R, tibia fragment R, distal tibia R, proximal metatarsals
Leporidae cf *Sylvilagus* spp.: premaxilla R, premaxilla L, palatines, temporal fragment burnt, innominate fragment R (rodent gnawed)
Small Rodent: maxilla l burnt, 2 maxilla R burnt, 2 molars, mandible 2 mandible fragments, 2 humerus fragments, radius fragment, 2 femur fragments, tibia fragment, 2 phalanges
Small Artiodactyl: 2 metatarsal fragments burnt, metatarsal fragment
Small Artiodactyl cf. *Odocoileus* sp.: 4 upper molar fragments, temporal R (auditory bulla)
Odocoileus sp.: lower premolar 1 L, lower incisor 4 L, upper molar 3 R

Note: One of the Leporid innominates had evidence of rodent gnawing around the edges.

*Materials that are not bone are in this sample.

2324 Unit B1 Level 7

Weight: 60.2 Count: 387
Reptile: vertebra (small)
Mammal: small-large sized (Count 358, Weight 36.1g)
Of these 62 are burnt, 17 calcined.

Leporidae: auditory bulla L, molar, premaxilla R, 3 mandibles R, 2 mandibles L burnt, scapula fragment R, distal humerus L, distal radius R, distal tibia R
Small Rodents: maxilla, mandible L, mandible R, scapula fragment, innominate fragment, 2 femurs, 4 tibiae
Canidae: temporal L burnt
Small Artiodactyl: premolar and molar fragments, 2 metapodial condyles
Odocoileus sp.: calcaneus R

*Plant and stone in this sample

<u>1571 Unit B5 Level 1</u>

Weight 11.3g Count 25
Mammal: Small to large size (Count 25 Weight 11.3g)
Of these 6 are burnt and 8 are calcined.

<u>2078 Unit B5 Level 2</u>

Weight 13.8, Count 27
Mammal: small – large (Count 27, Weight 13.8)
Of these 10 are burnt
*NOTE: 15.1g of material was removed from this sample because it was not bone. It is unusual: it looks like coal.

<u>1545 Unit B5 Level 3</u>

Weight: 1.4g Count: 7
Mammal: Small – medium (Count 5 Weight 0.2g)
Small Artiodactyl: molar fragment, naviculocuboid fragment

<u>2410 Unit B8 Level 1</u>

Weight: 7.4g Count: 29
Mammal: Small – medium (Count 27, Weight 5.8g)
Of these, 7 are burnt, 6 are calcined
Leporidae: distal humerus burnt
Small artiodactyl, tooth fragment

<u>2311 Unit B8 Level 2</u>

Weight: 53.7g Count 239
Mammal: Small to Large (Count 221 Weight 53.7)

Of these 37 are burnt and 6 are calcined
Leporidae: distal humerus L burnt, radius shaft fragment, distal tibia R burnt
Leporidae cf. *Sylvilagus* spp.: calcaneus R
Small Artiodactyl: 8 tooth fragments, distal humerus shaft fragment L
Odocoileus sp.: upper premolar 3 fragment R, upper molar 3 fragment R, upper molar 3 fragment R, upper molar 1 fragment L

2113 Unit B8 Level 3

Weight: 67.4, Count 215
Mammal: Small – large size. (Count 205, Weight 50.8g)
Of these 35 are burnt and 15 are calcined.
Leporidae: nares fragment R, palatine + maxilla fragment L, mandible fragment R, scapula fragment R, distal humerus L
Artiodactyl: auditory bulla R (size between deer and elk)
Large size Artiodactyl: mandibular condyle R
Small Artiodactyl: incisor L, molar fragment, metapodial condyle, metapodial shaft fragment burnt, metapodial shaft fragment R, 2nd phalanx distal
Odocoileus sp.: 2 molar fragments, upper premolar 3 R
*Plant and stone in this sample

2080 Unit B8 Level 4

Weight: 26.2g, Count: 96
Mammals: Small – medium size (Count 87 Weight 17g)
Of these 21 are burnt and 4 are calcined.
Leporidae: mandible fragment L, mandible fragment R, scapula fragment R, distal radius L, distal tibia R
Small Rodent: mandible frag + incisor R (2 of these)
Canidae cf. *Canis* spp.: 2nd phalanx
Small Artiodactyl: metacarpal shaft fragment immature burnt

1485 Unit B8 Level 5

Weight: 42.9g, Count 218
Mammal: Small – large size (Count 201, Weight 39.6g)
Of these 27 are burnt and 9 are calcined.
Leporidae: molar fragment, temporal fragment R, 2 mandible fragments R, 2 mandible fragments L, innominate fragment, distal tibia R burnt
Small Rodents: incisor fragment, molar, mandible fragment L, mandible fragment R burnt, scapula fragment R, tibia fragment L
Artiodactyl: 3 tooth fragments

2057 Unit B8 Level 6

Weight: 11.4g, Count 43
Reptile: 2 vertebrae (snake size)
Mammal: Small – large size (Count 38, Weight 8.6g)
Of these 7 are burnt and 3 are calcined
Leporidae: mandible fragment L, distal femur L
Small Artiodactyl: mandible fragment L

<u>2068 Unit B8 Level 6</u>

Weight 15.5g Count 40
Mammal: Small – large size (Count 39, Weight 15.3g)
Of these 10 are burnt and 3 are calcined
Leporidae: mandible fragment L

<u>2054 Unit B8 Level 8</u>

Weight: 33.1g, Count: 161
Mammal: Small – large size (Count 155, Weight 31.2g)
Of these 38 are burnt, 14 are calcined.
Leporidae: 2 molars, scapula L
Small Rodent: molar
Canis spp.: tarsal
Small Artiodactyl: tooth fragment

<u>2107 Unit B8 Level 9</u>

Weight: 70g, Count: 262
Mammal: Small to large size (Count: 247, Weight: 55.8g)
Of these, 107 are burnt and 17 are calcined.
Leporidae: 3 molars, premaxilla, maxilla + palatine R, temporal R, mandible + premolar and molar R, radius shaft L burnt, distal radius L
Leporidae cf *Sylvilagus* spp. (based on size): maxilla + palatine R
Small Rodent: mandible fragment L, mandible fragment R
Small Artiodactyl: incisor fragment, metacarpal fragment burnt, distal metacarpal burnt
*Plants and lithics in this sample.

<u>2279 Unit B8 Level 10</u>

Weight: 12.5g, Count: 57
Reptile: 1 vertebra
Mammal: small to large size (Count 47, Weight 9.6g)
Of these 14 are burnt and 3 are calcined.
Leporidae: maxilla + palatine L, lower incisor, 4 molars

Small Rodent: incisor fragment, mandible R, innominate fragment
Canidae: proximal metapodial fragment

<u>1568 Unit S1E2 Level 1</u>

Weight: 3.2g, Count: 21
Mammal: Small to medium (Count 21, Weight 3.2g)
Of these 4 are burnt and 11 are calcined.

<u>1565 Unit S1E2 Level 2</u>

Weight: 50.6g, Count: 176
Aves: 3 elements
Mammals: Small – medium size (Count 160 Weight 47.7g)
Of these, 29 are burnt and 33 are calcined.
Leporidae: maxilla + palatine R, 2 molars, lower incisor, scapular fragment R, 2 proximal metatarsals burnt
Small Artiodactyl: 3 molar fragments, scapula fragment L, ulna fragment R, metatarsal shaft fragment, naviculocuboid fragment L

<u>1566 Unit S1E2 Level 2</u>

Weight: 4.0g Count: 15 (all tooth fragments)
Small Artiodactyl: 13 molar and premolar fragments
Odocoileus sp.: 2 incisors

<u>2061 Unit S1E2 Level 2</u>

Weight: 16.3g, Count 73
Mammal: Small – medium size (Count 59, Weight 11g)
Leporidae: temporal L burnt, mandible L, molar, distal humerus L, distal tibia L
Small Rodent: molar, maxilla +2 premolars + 2 molars
Small Artiodactyl: molar + premolar fragments (6)

*Lithic and charcoal in this sample.

<u>1558 Unit S1E2 Level 3</u>

Weight: 45.5g, Count: 129
Mammal: Small – large size (Count 122, Weight 43g)
Of these 28 are burnt and 20 are calcined.
Leporidae: maxilla fragment, molar, radius shaft calcined, tibia shaft R
Small rodent: incisor fragment, innominate fragment burnt
Small Artiodactyl: metapodial fragment calcined

*Material that is not bone is in this sample

<u>1559 Unit S1E2 Level 3</u>

Weight: 1.5g, Count: 4
Leporidae cf Sylvilagus spp.: mandible frag L
Small Artiodactyl: molar fragment
Odocoileus sp.: upper first premolar fragment R, lower first premolar fragment R

<u>1581 Unit S1E2 Level 4</u>

Weight: 40.5, Count: 301
Reptile: 4 vertebra (snake size)
Mammal: Small – medium mammal (Count 292, Weight 39.3g)
Of these, 50 are burnt and 17 are calcined.
Leporidae: maxilla fragment, mandible fragment L
Small Rodent: auditory bulla fragment, mandible fragment R, tibia fragment burnt

*Plant and concretion in this sample

<u>1583 Unit S1E2 Level 4</u>

Weight: 2g, Count: 13
Leporidae: mandible fragment L
Small Rodent: maxilla + molars L, molar, molar burnt, mandible L
Small Artiodactyl: 3 tooth fragments
Odocoileus sp.: upper second premolar L

<u>2196 Unit S1E2 Level 4</u>

Weight: 25.8g, Count: 94
Mammals: Small – large size (Count 85, Weight 24.5g)
Of these 22 are burnt and 9 are calcined.
Leporidae: mandible fragment R, distal tibia L burnt
Small Rodent: molar fragment, femur L, tibia
Small Artiodactyl: 4 tooth fragments

<u>2349 Unit S1E2 Level 5</u>

Weight: 4.5g, Count: 14
Mammal: Small – large (Count 14, Weight 4.5g)
Of these, 1 is burnt.

2403 Unit S1E2 Level 6

Weight: 65.5g, Count: 196
Mammals: Small – large size (Count 187, Weight 55.5g)
Of these 23 are burnt, and 10 are calcined)
Leporidae: palatine L, mandible fragment L burnt, mandible fragment R burnt
Canis spp.: distal humerus L burnt (3 fragments of same bone)
Small Artiodactyl: incisor fragment, 2 distal metapodial condyles

*Plant and lithic in this sample

2341 Unit S1E2 Level 9

Weight: 87.6g, Count; 360
Reptile: 1 vertebra
Mammal: small – large size (Count 347, Weight 77.7g)
Of these 112 are burnt and 50 are calcined.
Leporidae: mandible fragment L, mandible fragment R, scapula head L, innominate L
Small Rodent: molar, mandible fragment R calcined, innominate fragment L
Artiodactyl: tooth fragment
Small Artiodactyl: tooth fragment, mandible fragment R burnt, scapular fragment burnt L, proximal metacarpal fragment R, distal metapodial condyle burnt

2316 Unit S1E2 Level 10

Weight: 111.4g Count: 393
Mammal: Small – large (Count 369, Weight 93g)
Of these 120 are burnt and 59 are calcined.
Leporidae: 2 molar fragments, incisor fragment, maxilla+palatine L, temporal fragment R, distal humerus L, proximal radius L calcined
Small Rodent: mandible fragment R, innominate fragment, distal femur
Canidae: mandible fragment L calcined
Small Artiodactyl: molar fragment, 2 metacarpal shaft fragments burnt, a metatarsal shaft fragment, metatarsal fragment L calcined, 4 metapodial condyle fragments calcined

*Lithic and concretions in this sample.

2383 Unit S1E2 Level 11

Weight 31.5g, Count 111
Aves: 1 element
Mammal: Small – large sized (Count 107, Weight 28.1g)

Of these 66 are burnt and 21 are calcined.
Small Artiodactyl: femur fragment L, 2nd phalanx fragment

<u>277</u>

Weight: 0.2g, Count: 1
Odocoileus sp.: antler tip

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APPENDIX B

SBCM-2 GROUNDSTONE REPORT

MORTARS

1. A64-208: Basket mortar. 14 cm. diameter, 6.4 cm. deep. Traces of asphaltum remain on the rim.

2. A616-1: Basket mortar fragment. 14.5 cm. diameter, 7.5 cm. deep. Concave surface damaged. Traces of asphaltum on rim.

3. No acc. #: 34 cm. in diameter by 22 cm. in height. Bottom broken out but pieces are with it.

4. No acc. #: Three rim fragments.

5. #2: Sandstone. Probable unfinished mortar, fragment. 9 cm. diameter x 5.5 cm. high. Tapered end has been battered and is slightly concave. Broad surface is irregular and not worn smooth.

6. A64-211: Sandstone. Egg-shaped. 8.2 cm. diameter x 7.6 cm. high. Battering scars on the bottom, central indentation pecked on opposite surface. Circular indentation is 2.7 cm. diameter.

7. No Acc. #: Sandstone. Egg-shaped. Probable paint mortar. 11.0 cm. long x 7.7 cm. wide x 6.7 cm. high. Marked concave depression is 5.0 cm. wide x 5.5 cm. long. Worn at the small tip from battering.

8. No acc. #: Sandstone. Small "paint" mortar. 4.4 cm. diameter x 4.6 cm. high. Grinding bowl is 3.5 cm. diameter.

9. No acc. #: Sandstone. "Child's " mortar. 2.9 cm. diameter x 1.8 cm. high. Convex surfaces are smooth; pecked marks near rim.

DISCOIDALS

1. A64-177: Sandstone conglomerate. Fragment. 10.9 cm. diameter; 6.2 cm. thick. Both faces have bowl-like concave depressions, narrower in the center. No apparent hole that went all the way through.

2. 115E: Sandstone. Fragment. 8.1 cm. in diameter; 3.5 cm. thick at thickest point, .6 cm. at narrowest point. Both faces have a flat rim (2.5 cm.) surrounding central depression (3.2 cm. diameter).

3. 115F: Sandstone. Fragment. 9.2 cm. wide; 5.0 cm. thick at thickest point. One face has a flat rim (2.0 cm. wide) around a central depression (4.0 cm. diameter). On center of edge, with rim, there is a large chunk missing.

METATES

1. A64-182: Granitic fragment. 5.2 cm. long x 4.1 deep. One grinding surface.

2. A64-182: Granitic fragment. Grinding surface 6.5 x 5.0 cm. Fragment is 3.8 cm. thick.

3. A64-159: Schist, fragment. 10.7 cm. long x 8.7 cm. wide. Slightly concave grinding surface.

4. No acc. #: Granitic fragment. 27.3 cm. long x 13.5 cm. wide. Slightly concave grinding surface.

5. No acc. #: Steatite bowl. 8 pieces glued together. Pieces found approximately 10 yards apart and from 14"-18" deep. Probable diameter 10.5 cm. and 8.4 cm. deep.

MANOS

BIFACE

"A" 1. No acc. #: Fine-grained volcanic porphery. Fragment. 7.7 cm. wide, 6.5 cm. thick. A few deeply pecked scars on one side.

2. No acc. #: Quartzite. Fragment. 4.3 cm. wide x 6.0 cm. thick.

3. A64-184: Gneiss. Fragment. 4.3 cm. wide x 3.0 cm. thick.

4. 11_D: Aplite. Fragment. 9.0 cm. wide x 3.8 cm. thick.

5. A_81: Granitic. Fragment. 8.7 cm. wide by 3.3 cm. thick.

"H" 6. No acc. #: Granitic. Fragment. 10.5 cm. wide x 3.7 cm. thick. Fire marked.

7. 102: Schist. 11.0 cm. wide, 3.5 cm. thick. One surface is pecked.

"A" 8. No acc. #: Gabbro. Almost perfectly round. Diameter, 10.3 cm., 4.4 cm. thick. Two pecked holes in one face.

9. 104: Quartzite. 13.0 cm. wide, 3.9 cm. thick at thickest point. Both surfaces are very smooth.

10. No acc. #: Quartzite. 9.6 cm. wide, 4.7 cm. thick. Worn smooth on two sides as well as both faces. Worn in a band-like pattern.

11. 115I: Quartzite. 10.8 cm. wide, 3.5 cm. thick. Both faces have central depressions. Secondary use as anvil. Depression area is 3.0 cm. diameter, 2.5 cm. Fire-marked.

"A" 12. No acc. #: Quartzite. 11.8 cm. wide, 3.8 cm. thick. One face has a depression which is poorly defined.

13. 115-A: Quartzite. 10.9 cm. wide, 3.5 cm. thick. Bifacial depressions 2.8 cm. in diameter and 2.8 cm. Some wear on edge surface.

14. 103: Quartz ite: 10.4 cm. wide, 2.9 cm. thick. Bifacial depressions, pecked. Diameter of depressions 3.3,

at widest point, 7.0 cm. at narrowest. Tip has a few scars from battering, cylinder surfaces are smooth from grinding. Fire marks.

5. #113: Schist. Cylindrical. 20.0 cm. long, 5.5 cm. diameter at widest point, 4.5 cm. diameter at narrowest. Grinding wear on cylinder surface.

6. No acc. #: Schist. Irregular cylindrical. 25.6 cm. long x 5.7 cm. diameter for whole length. Grinding wear on both ends.

7. A64-185: Schist. Cylindrical fragment. 11.2 cm. long x 3.5 cm. wide. All rounded surfaces show grinding wear.

8. A64-165: Schist. Cylindrical. 10.3 cm. x 3.2 cm. wide. All surfaces worn smooth; narrow end has been battered.

9. No acc. #: Schist. Cylindrical. 14.4 cm. long x 5.1 cm. wide at widest and 4.0 cm. at narrowest point. Has been used for hammering as well as grinding. One end is flattened on one side.

MANOS

UNIFACE

1. A64-210: Granitic. Round, uniface. 9.8 cm. in diameter, 5.7 cm. thick. Central, pecked depression in grinding face. Depression 2.8 cm. in diameter. Firemarked on concave surface. Battering on edges.

2. 109: Aplite. Round. 9.0 cm. in diameter, 4.6 cm. thick.

3. 115C: Aplite. Oval. 11.0 cm. wide, 4.5 cm. thick. Slight depression in center of grinding surface. Depression 2.7 cm. in diameter.

"H" 4. No acc. #: Quartzite. Fragment. 9.3 cm. wide, 4.2 cm. thick. Edges also ground. Outer curve is battered.

5. 115 8: Quartzite. Oval. 10.5 cm. wide, 4.2 cm. thick. Outer edges battered, grinding surface is fire marked.

"A" 6. No acc. #: Aplite. Uniface, oval. 10.1 cm. wide, 4.4 cm. thick. Concave surface has a central battered depression

7. A64-178: Granitic. Fragment. 10.5 cm diameter, 7.7 cm. thick.

"H" 8. No acc. #: Aplite. Oval. 10.5 cm. wide, 7.8 cm. thick. The two ends are battered.

9. No acc. #: Aplite. Oval. 9.9 cm. wide, 5.0 cm. thick.

10. A64-173: Gneiss. Oval. 9.0 cm. wide, 5.4 cm. thick. Concave face is very rough.

11. No acc. #: Porphoritic tuff. Fragment. Unable to distinguish whether uniface or biface. 7.9 cm wide, 5.0 cm. thick.

12. No acc. #: Volcanic porphery. Fragment. Unable to determine whether uniface or biface. 9.5 cm. wide x 3.9 cm. thick.

"H" "A" 13. No acc. #: Gneiss. Quadralateral trapezium. 7.8 cm. wide, 5.3 cm. thick. Pecked and worn depression on face opposite grinding surface; battered on tapered end. Secondary usage as anvil and hammerstone.

14.

MEASUREMENTS

MANOS

Width
(Side view)

Thickness
(Side view)

Diameter
(Top view)

HAMMERSTONES

1. 105: Quartzite. Oval cobble. 9.7 cm. wide, 5.2 cm. thick. Battering on one end.

2. No acc. #: Quartzite. Oval cobble. 8.3 cm. wide, 4.7 cm. thick. Battering on one edge surface in a small area.

3.

Other manos which show battering and may have served as hammerstones:
A64-210
115-8
Four others without accession numbers are marked with "H", left of the appropriate entry.

ANVILS

1. 130: Gneiss. Oval. 8.9 cm. wide; 2.5 cm. thick. Both faces have pecked depressions; one side more than the other.

2.

Other anvils, catalogued under manos, which show secondary anvil usage:
A64-210
102
115I
115A
103

Five other possibles without accession numbers are marked with "A", left of the appropriate entry.

PENDANTS

1. A64-167: Rectangular corner fragment. Red paint traces on one face. Traces of red paint lin es on the other. 2.2 cm. wide, .7 cm. thick.

2. No acc. #: Diatomaceous shale. Fragment. 3.2 cm. wide, .6 cm. thick. One edge has been rounded, one face is smooth, the other face is smooth. The other face does not appear to have been finished.

3. 155C: Diatomaceous shale. Fragment. Larger end of pendant is 5.0 cm. wide, .5 cm. thick. Well worn all over. Faint bertical incising on both faces.

4. 156a: Diatomaceous shale. Fragment, large end corner. 3.2 cm. wide, .6 cm. thick. Unifacially smooth. Faint vertical incising.

5. No acc. #: Volcanic tuff. Large end fragment. 4.4 cm. wide, .8 cm. thick. Both faces smoothed, traces of red paint all over. Faint incising on both faces. Two crosses on one face.

6. No acc. #: Diatomaceous shale, from the coast. Corner, end fragment. 3.5 cm. wide, .8 cm. thick. Three crosses on one face; incising on the other.

7. No acc. #: Volcanic tuff (tuffaceus siltstone). Midsection fragment. 1.9 cm. wide, .6 cm. thick. Pinkish color, traces of red paint. Incising on one face, unfinished on the other.

8. 152: Volcanic tuff (reworked tuff). Large end fragment. 3.4 cm. wide, .4 cm. thick Pinkish blue in color. Smooth on both faces and edges. Faint traces of red paint. Wide end is curved.

9. No acc. #: Volcanic tuff (reworked tuff). Mid-section fragment 1.8 cm. wide, .5 cm. thick. Pinkish in color, traces of red paint. Edges rounded and horizontally incised on one face.

10. 156i: Volcanic tuff. Wide end fragment. 4.0 cm. wide, .7 cm. thick. Pinkish color. Random incising on one face.

11. No acc. #: Volcanic tuff. Narrow end fragment. 2.7 cm. wide, .5 cm. thick. Pinksih color, traces of red paint. Very worn.

12. No acc. #: Volcanic tuff. Tip fragment. 1.4 cm. wide, .4 cm. thick. Painted red/brown.

13. No acc. #: Volcanic tuff. Narrown end fragment. 1.9 cm. wide, .4 cm. thick. Pinksih gray. One face is incised; the other has been too damaged to tell.

14. No acc. #: Volcanic tuff. Mid-section fragment. Tan. 1.9 cm. wide, .3 cm. thick. Edges are rounded and smooth. Unifacial smoothing with incising. The other side is rough.

15. A64-171: Diatomaceous shale. Narrow end fragment. 4.4 cm. wide, .8 cm. thick. Fire marked on both faces and edge. Both faces incised.

PENDANTS (cont)

16. No acc. #: Diatomaceous shale. Fragmetn. 2.4 cm. wide, .4 cm. thick. Beige. Curved end edge is rounded and smooth.

17. No acc. #: Diatomaceous shale. Narrow-end fragment. Gray. 2.0 cm. wide, .4 cm. thick. Unbroken edges are rounded and smooth.

18. A64-169: Volcanic tuff. End fragment. Gray 3.5 cm. wide, .6 cm. thick. One face has horizontal incising.

19. No acc. #: Welded tuff. Midsection fragment. Gray. 2.5 cm. wide, .3 cm. thick. Unbroken edges are rounded and smooth.

20. No acc. #: Volcanic tuff. Midsection chip. Wheat colored. One edge appears to be slightly rounded.

21. No acc. #: Biotite tuff. Wide-end fragment. Gray. 3.5 cm. wide, .3 cm. thick. Firemarked all over; traces of red paint. Edges (unbroken) are rounded and smooth.

22. No acc. #: Aplite. Round end fragment. Tan. 2.6 cm. wide, .4 cm. thick. Unbroken edge is rounded and smooth.

23. No acc. #: Schist. Round end fragment. Dark gray. 3.6 cm. wide, .9 cm. thick. Unbroken edges are rounded and smooth.

24. 155: Diatomaceous shale. Fragment of one edge. TAn color. 1.5 cm. wide, .7 cm. thick. One edge smoothed.

Width= widest point

COBBLES

1. No acc. #: Sandstone. Round ball. 3.6 cm. diameter.
2. No acc. #: Sandstone. Oval. 3.5 cm. wide, battered and pecked on one end.
3. No acc. #: Sandstone. Round ball. 2.9 cm. in diameter.

ARROWSHAFT STRAIGHTENER

1. A64-132: Steatite. 8.6 cm. long x 4.4 wide. Unifacially grooved. One groove is 1.5 cm. wide by 4.4 long; one groove is .3 wide x 2.4 cm. long. Large groove marked by 3 incised grooves at right angles.

2. No acc. #: Steatite. Bowl fragment. 18.0 cm. long x 1.3 cm. wide. Unifacially grooved. Groove is 1.3 cm. wide x 4.2 cm. long. Groove is marked by incised lines at right anles to groove.

3. A64-135: 4.5 cm. long x 2.8 cm. wide. Unifacially grooved fragment. Groove is 1.0 cm. wide x 2.8 cm. long.

4. A64-131: 10.6 cm. long x 3.3 cm. wide. Brifacially grooved. Groove is .7 cm. wide x 3.0 cm. long and .5 wide x 3.0 long. Latter groove is poorly defined and marked by pecking/battering. All faces are battered.

5. No acc. #: Sandstone. 10.9 cm. long x 7.1 cm. wide. Unifacially grooved at a slight slant. Groove is 1.1 cm. wide and 7.1 cm. long

6. A64-163: Sandstone. 5.9 cm. long x 6.3 cm. wide. Fragment. No groove. May have been fractured before groove. Remaining shape suggests a shaft straightener.

7. A64-196: Steatite. 2.8 cm. at widest point, .6 cm. thick. One edge is polished smooth and looks like groove piece of shaft straightener. One surface is smooth and etched.

8. A64-130: Steatite. Complete item. 15.0 cm. wide, 4.9 cm. thick. Flat on the bottom; rounded edges; polished surface. Pecked markings on side edges have been worn smooth. Rounded ends have been rubbed or ground smooth.

9. A64-133: Steatite. Oval shaped. 6.8 cm. wide, 2.5 cm. thick. Pecked marks on flat bottoms and a few on concave top surface.

APPENDIX C

DIRECTAMS RADIOCARBON DATE RESULTS

Report: **1755-021756** 15 March 2017

Customer: 1755
Robert Grenda

Samples submitted for radiocarbon dating have been processed and measured by AMS. The following results were obtained:

DirectAMS code	Submitter ID	Sample type	Fraction of modern		Radiocarbon age	
			pMC	1σ error	BP	1σ error
D-AMS 021756	03006DB26	charcoal	98.97	0.38	83	31

Results are presented in units of percent modern carbon (pMC) and the uncalibrated radiocarbon age before present (BP). All results have been corrected for isotopic fractionation with an unreported $\delta^{13}C$ value measured on the prepared carbon by the accelerator. The pMC reported requires no further correction for fractionation.

APPENDIX D

EARLY CALIFORNIA POPULATION PROJECT DATA

Baptism #	Age at Baptism	Baptism Date	Burial Date
1609	8	6/18/1791	10/27/1815
2113	51	4/9/1814	
2652	6	12/27/1795	1/9/1796
2653	6	12/29/1795	
2654	2	12/31/1795	
2665	3	1/9/1796	12/18/1807
2682	14	2/1/1796	
2703	6	2/28/1796	4/11/1802
2780	5	12/3/1796	5/14/1811
3217	1	12/26/1800	12/29/1800
3596	2	11/28/1803	6/14/1804
3680	45	2/10/1804	4/19/1809
3682	50	2/10/1804	
3700	7	2/13/1804	10/14/1823
4054	8	1/28/1806	6/19/1822
4055	1	1/18/1806	9/12/1809
4056	6	1/28/1806	
4057	8	1/28/1806	10/19/1811
4381	18	6/16/1809	1/8/1820
4443	7	10/22/1809	2/16/1816
4444	5	10/22/1809	
4461	1	11/12/1809	4/25/1828
4472	5	12/6/1809	7/9/1821
4475	12	12/22/1809	5/27/1837
4492	8	2/4/1810	1/17/1822
4547	12	6/9/1810	1/31/1826
4549	13		
4650	25	3/21/1811	8/18/1831
4669	35	3/21/1811	
4691	2	4/12/1811	
4952	9	5/9/1811	12/15/1827
4953	6	5/9/1811	4/30/1812
4956	2	5/9/1811	10/9/1827
4957	6	5/9/1811	5/6/1812
5269	60	5/13/1813	10/16/1814
5296	18	5/14/1813	1/6/1816
5300	36	5/14/1813	8/28/1822

5304	36	5/14/1813	
5306	28	5/14/1813	5/21/1822
5310	28	5/15/1813	3/11/1826
5311	20	5/15/1813	
5312	26	5/15/1813	2/25/1815
5316	40	5/15/1813	
5317	46	5/15/1813	7/7/1825
5320	28	5/15/1813	7/6/1819
5333	68	5/15/1813	2/21/1825
5349	12	5/17/1813	10/25/1814
5416	1	8/28/1813	8/19/1814
5443	64	11/6/1813	8/19/1822
5444	66	11/6/1813	1/3/1827
5525	42	4/22/1814	8/31/1835
5526	50	4/22/1814	
5527	47	4/22/1814	12/19/1832
5531	44	4/22/1814	12/17/1826
5584		5/15/1814	11/23/1815
5653	26	1/7/1815	
5659	32	1/14/1815	
5858			7/8/1817
6001			6/14/1817
6279	52	3/2/1819	

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