Title
Cultural Markings on the Landscape: The PCN Pecked Curvilinear Nucleated Tradition in the Northern Coastal Ranges of California

Author
Gillette, Donna Lee

Publication Date
2011

Peer reviewed|Thesis/dissertation

Cultural Markings on the Landscape: The PCN *Pecked Curvilinear Nucleated* Tradition in the Northern Coastal Ranges of California

By

Donna Lee Gillette

A dissertation submitted in partial satisfaction of the

Requirements for the degree of

Doctor of Philosophy

in

Anthropology

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Margaret W. Conkey, Chair
Professor Kent G. Lightfoot
Professor Marian H. Feldman

Fall 2011

Abstract

Cultural Markings on the Landscape: The PCN *Pecked Curvilinear Nucleated* Tradition in the Northern Coastal Ranges of California

by

Donna Lee Gillette

Doctor of Philosophy in Anthropology

University of California, Berkeley

Professor Margaret W. Conkey, Chair

This dissertation explores the archaeological context of the PCN (Pecked Curvilinear Nucleated) tradition of marking boulders as it appears in the landscape of the Coastal Ranges of Northern California. Located on the over 2150 hectare property of the University of California Hopland Research and Extension Center (HREC) are five boulders or clusters of boulders that exhibit cultural markings, including some cupules, which were placed in the distant past on a specific type of boulder, in distinctive shapes and forms. By using a landscape archaeology and ritual theory framework, I explore the pre-historic activities that took place at the more than 30 identified pre-historic sites, through the archaeological context provided by more than 3000 catalogued artifacts excavated and collected from the sites. After subjecting the data to various technological methods, the results of various archaeological testing (obsidian hydration, chemical sourcing, AMS dates, soil testing techniques, and recording techniques) are reported, discussed and interpreted. A final objective and contribution of this study is to present a contextual model for application to similar archaeological sites.

My dissertation is dedicated to my families who have traveled my journey, at my side, with their love and support, especially my husband Garry, and knowing that our late daughter Dawn, always my cheerleader, was cheering from above.

Table of Contents

List of Figures

List of Tables

Acknowledgements

I am grateful for the opportunity to pursue my Doctorate degree at Berkeley and the support I have received from my committee, Meg Conkey, Kent Lightfoot, and Marian Feldman, and the rest of the archaeology faculty and staff who have supplied the tools to outfit my research.

To my field crew, David Cohen, Jason Coleman, Elyssa Figori, Mary Gerbic, Garry Gillette, Midge Gordon, Christine Gralapp, Dawn Johnson, Deborah Mclear-Gary, Bryan Much, Kathy O'Brian, Barbara Ostler, Lee Panich, Paula Reynosa, Anna Browne Riberio, Robert Robinson, Teresa Saltzman, Chuck Whatford, and Peggy Whitehead, thanks for your work, and apologies to any I have inadvertently omitted.

Many others have also contributed to and my research, including Justin Barton, Dr. Robert Bettinger, Dr. Christyann Darwent, Jason Coleman, Lisa Deitz, Douglas Frink, Erica Gibson, Bryan Gordon, Liz Guerra, Tom Guilderson, Jenny Huang, Richard Hughes, Linda Hylkema, Leigh Jordon and the staff of the Northwest Information Center, Jennie Lloyd, Cassandra Manning, Jessica Meadows, Tom Origer, Roy Ruddock, Steve Shackley, Robert Sickler, and David Whitley.

Thanks to the staff of the HREC, and especially Bob Keiffer, Shane Feirer, Steven Poor, Chuck Vaughn, and others, who have made my research at the HREC possible and helped in so many ways.

Many thanks to Shawn Padi, and the Hopland Band of Pomo Indians for assistance and allowing my research on their traditional lands.

And special thanks to Teresa Saltzman who has shared her knowledge of the PCN tradition, and to Breck Parkman who started and guided me on "My Journey".

And many thanks for the research funding through the SCA James A. Bennyhoff Memorial Fund Award, Dean's Dissertation Enhancement Grant, the Stahl Endowment, and the LowieOlson Endowments.

I. Introduction

> Archaeology is our voyage to the past, where we discover who we were and therefore who we are. (Paglia 1999:276)

Goals and Significance of Dissertation

During pre-historic times, a certain type of boulder was culturally modified or marked and is found scattered across the landscape of the Coastal Ranges of California. This dissertation is a study of these boulders and how they are to be understood in a contextual analysis. The marks on these boulders are known as PCN (Pecked Curvilinear Nucleated) elements, given this name as descriptive of the manufacturing technique that created the marks that were pecked into the rocks. These are cultural products and practices of native peoples of California and were done primarily during pre-historic times, although dating them is not easy or straightforward (Figure 1.1).

Figure 1.1: Example of a PCN element from CA-MEN-2213.

In this dissertation I will take the study of rock art (or cultural markings), bridge it into the study of an archaeological landscape, and add the pre-historic people, their movement and interactions with the landscape. Cultural activities, identified by recovered artifacts, will be placed in temporal periods; these will permit me to make inferences about possible settlement patterns, associated assemblages of artifacts, ethnography, the interactions within the landscape, and how these may be associated with the marked boulders. Through this contextual study perhaps more can also be learned about the roles that ritual may have played in the lives of past people, and how these people interacted with these special places (the marked boulders) on the landscape. Related disciplines, such as linguistics, will also inform this study about the spread of culturally related pre-historic peoples, in examination with the geographical distribution of PCN (Pecked Curvilinear Nucleated) sites. PCNs are elements that have been pecked into specific boulders at numerous sites in the coastal Ranges of California. Soil dating techniques have also been applied to determine if it is possible to establish the temporal period when the markings were placed on the boulders. This study is intended to provide a workable model and methodology for additional contextual research that can enhance the level of knowledge that is presently available to rock art studies.

The marked boulders are more than cultural phenomena to be placed in a temporal/spatial context, they are a critical part of the archaeological record, and need to be fully integrated into archaeological studies. Not just relics or epiphenomena of the pre-historic/historic past, the marked boulders are representations of meaningful social and cultural practices (or, as I will discuss, of rituals). Even today, they are material manifestations that evoke history, memory, and meanings. They are phenomena with life histories and biographies and, in particular, can perhaps be better understood as vital to a dynamic landscape of symbols and meanings as "players" or "participants" in the multiple ways in which relationships among people, places, spirits, histories, groups and practice may have been brought into being, reinforced, changed, forgotten or rejected. To be succinct, this study places marked boulders in a living landscape where pre-historic peoples lived their lives and interacted with the spaces around them.

The PCN Tradition and History of Research

Throughout this dissertation I will be referring to the PCN markings as a "tradition". By using the term tradition to refer to the phenomenon of what has been identified as the makings of PCNs, I mean to identify a specific "type" of petroglyph that covers a broad geographical distribution, is restricted to a certain type of boulder material, and transcends pre-historic tribal boundaries. (Figure 1.2) I have borrowed this specific use of the anthropological term from David Whitley (2000:47,126). For Whitley, the concept of a "tradition" in rock art studies is an intentional shift away from the concept of "art style" that was used as a classification by earlier rock art researchers in California and the west, such as Grant (1967), Heizer and Clewlow (1973), and Wellman (1979). While style is primarily defined in terms of formal and technical attributes, Whitley notes that it is also often identified with or used as a marker of an ethnographic group, region, or a specific period. Whitley was introduced to the "tradition" concept for rock art by Jim Keyser (1992), although the term has a long and varied history in Americanist archaeology. Willey and Phillips (1958:3440) discuss the use of the term "tradition" as a methodological tool, crediting its first use to a South American pottery "horizon". Credit for the first North American use of the term is given to John Goggin (1949), where Goggin used the term "to emphasize the importance of environmental factors in the shaping of traditions" and also giving "expression to cultureenvironment correlations" (Willey and Phillips 1958:37). Goggin's use of the term seems to fit nicely with the PCN phenomenon that can be identified with a probable ritual aspect and the consistent use of the same type boulder. I also personally prefer the term "tradition" as I feel that it gives a deeper meaning to the PCN phenomena. The term tradition also makes a conceptual link between the PCN manufacture and associated customs, ritual practices, and beliefs.

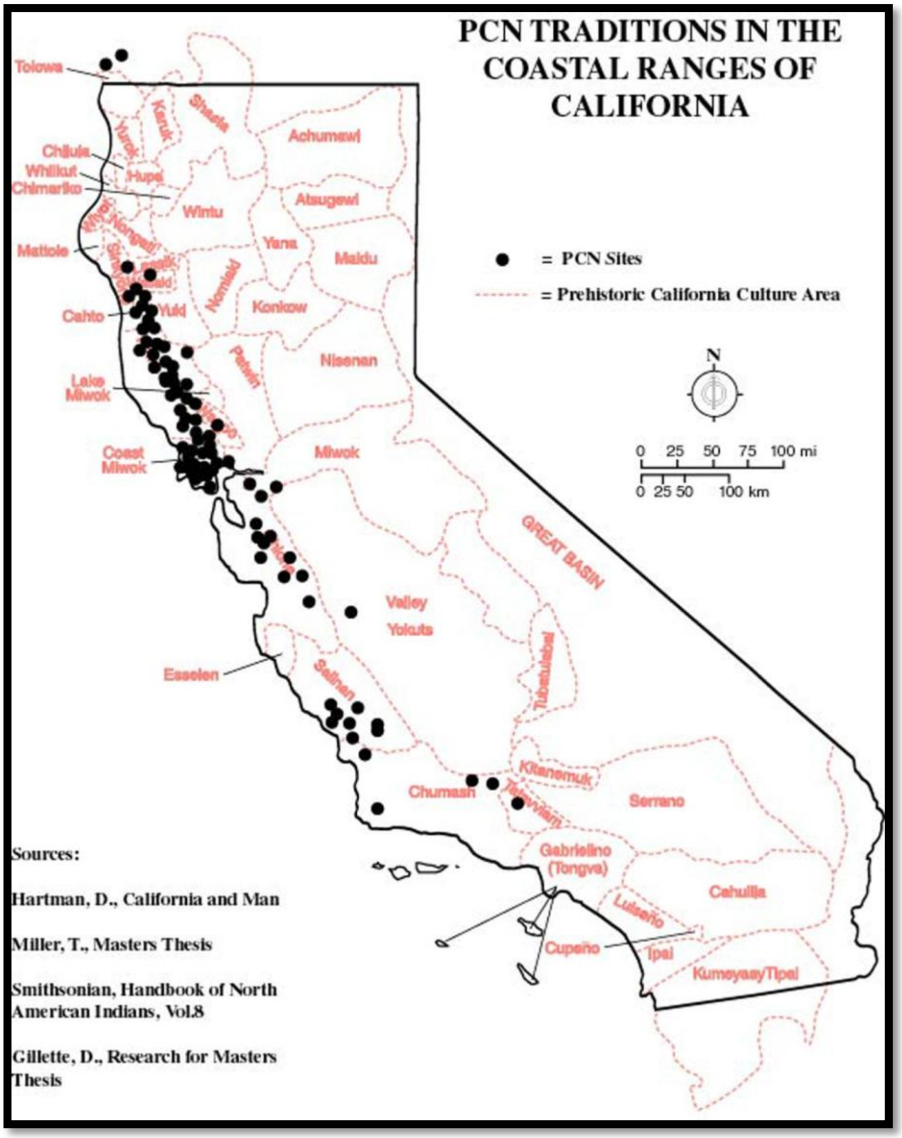


Figure 1.2: Distribution of PCN sites in the Coastal Ranges of California. The high concentration of site in the North Bay may be due to intense site identification during the 1970s research by Teresa Miller.

While Julian Steward (1929b) had included a few of what are now identified as PCN sites in his publication on the survey of known rock art sites in California and surrounding states, it was not until the 1970s that PCNs were recognized as part of a broader tradition, geographically. The elements were first noted on a boulder on Ring Mountain on the Tiburon Peninsula, Marin County, just to the north of the Golden Gate, by California State Division of Mines geologist Salem Rice in 1972 (Figure 1.3,4). He was obtaining geologic samples from a boulder when he thought he had observed what might be cultural markings. This boulder had been the destination of geology fieldtrips for many years and still bears the scars from tools where students had removed material with their pick axes, not realizing this was a cultural site.

Figure 1.3: CA-MRN-442 – Ring Mountain, the type site for the PCN tradition, with San Francisco visible in the background.

Figure 1.4: CA-MRN-442Ring Mountain, closeup of PCN elements at the site where PCNs were first identified in 1972, by Salem Rice and Virginia Hotz.

After Rice contacted anthropologist Virginia Hotz to confirm that the markings were made by humans and not natural, Hotz, along with archaeologist William Clewlow published their findings that identified 9095 oval elements on the boulder (1974). They suggested that the elements may be similar (but not necessarily culturally connected) to some found in the Sierra and they indicated a possible stylistic connection with the North Coast Petroglyph style. They suggested that the shape of the elements may represent female genitalia and fertility. Hotz and Clewlow also noted that the markings were placed on (what they identified) as a chlorite schist boulder, and, in this case, offered an excellent view of San Francisco Bay. This was the first petroglyph site reported in Marin County. In 1977, Teresa Miller (now Saltzman) received her M.A. degree from San Francisco State University with a study of PCNs that was based on a predictive model for locating additional sites utilizing geologic maps (identifying serpentine areas) and field survey. With assistant Reed Haslem, she identified 68 additional sites in the Coast Ranges (Miller 1977). Miller and Haslem had determined, working with Salem Rice, that there was a connection between the schist boulders and serpentine outcrops that are now recognized as occurring in fault zones. Previous to this time it was believed that there was no rock art in North Bay counties (Heizer and Clewlow Jr. 1973:9).
As described by Miller:

> "the basic elements are circles and ovals, which have nuclei that appear raised. They seldom occur in any discernable (sic) pattern. The elements are pecked into the surface of the rock (generally a chlorite schist boulder). The size ranges from 525 cm, in diameter (exterior measurements), with the nuclei from 2.5 to 20.5 cm. in diameter. The depth and the pecking and the width vary from .5 to 6 cm." (1977a:44).

It was Miller, in consultation with her advisor Michael Morrato, who gave the tradition the descriptive name P**CN** for **P**ecked **C**urvilinear **N**ucleated elements.

Since the 1970s PCNs have been the subject of, or a part of, several studies by Breck Parkman (1991, 1993b), Leigh Jordon (1995), Mark Gary and Deborah Mclear-Gary (Gary 1991; Gary and Mclear-Gary 1988; Gary and McLear 1986), Brett Rushing (2004), Kelly Larsen (2006) and others. Currently, M.A. research by Mary Gerbic has applied predictive model utilizing GIS (Global Information System) information, focusing on the identification of potential pre-historic trails (2009).

My Personal Journey

My personal journey into archaeology and PCN research began long ago (in the 1960s) as we took our young family on trips to the Southwest and were intrigued by the petroglyphs and pictographs that dotted the landscape. A professor of geology at California Lutheran University (in Thousand Oaks, CA) began taking interested members of our church on 'geology' trips to the Southwest. Needless to say, looking at rocks in the Southwest also included viewing petroglyphs. We also became aware of a group of like interested people who, every Easter vacation, embarked on the "Great American Rock Art Caravan", led by a Methodist pastor by the name of Gale Gaugh. We followed along on several of these trips. The group usually traveled to the Great Basin of California, including Death Valley with rock art sites as the destination. As our interest grew, we learned that there were weekend trips offered through California State University, Northridge, to visit rock art sites in the Bishop area. I was beginning to become captivated by rock art and wanted to know more about the people who had placed the markings on the rocks.

In the late 1980s, as a member of the Volunteer League of the San Fernando Valley, I became involved in a program sponsored by the Natural History Museum of Los Angeles, entitled *Moveable Museum.* We traveled to local schools presenting enrichment programs through slides and replicated artifacts to elementary school classes. The mandated California History topic for 4th graders caught my attention, and after spending much time revising the presentation, I was "hooked" on learning all that I could get my hands on about the Native Americans of California. This led to an introduction to a program at University of California, Los Angeles that offered a Certificate in Archaeology through the Extension program. One of my first classes in archaeology was the last class taught by Clement Meighan, one of California's premier early rock art researchers, before his retirement. I feel very privileged to have had this opportunity. I also took a one day class offered by JoAnn Van Tilburg, well known for her extensive rock art research in the Pacific, where I wrote my first rock art paper – a study on the Kokopelli motif and figure of the Southwest. I was fortunate in being able to attend the first John P. Harrington Conference, in 1992, at the Santa Barbara Museum, which revealed to me the value of ethnographic literature in archaeological studies. A move to the Bay area interrupted completing the Certificate course, but I enrolled in the Archaeology M.A. program and undertook graduate work at California State University, Hayward.

This is where my path became solidified. I attended a Society for California Archaeology meeting in Ventura and inquired of several archaeologists and some Native Americans as to suggestions for a Master's project that would include rock art. After listening to several ideas, the one that really intrigued me was one offered by Breck Parkman, California State Archaeologist with the Parks and Recreation Department. He had recently written a paper (1993b:351366) on *The PCNStyle Petroglyph* for inclusion in a publication entitled *There Grows a Green Tree: Papers in Honor of David A. Fredrickson* (Parker 1993). He suggested that I look into the subject of PCNs and evaluate the current research and what contribution I could make to this literature. After several years of research, inspired initially by Parkman's paper, followed by consultations with Teresa Miller and many others, and by trips to many sites with Miller, Haslem, Parkman, and others, I received my M.A. from California State University Hayward (now East Bay) with a completed thesis entitled PCNs *of the Coast Ranges of California: Religious Expression or the Result of Quarrying* (Gillette 1998a). I focused on the ideological/technological aspect of what I now refer to as a tradition and also established the geographical distribution of PCN sites.

Until my research, the geographical extent of the PCN practices and sites was not fully understood. Previous research by several others had identified similar markings, referring to the marks in descriptive names such as "horse tracks" (Steward 1929b), "bowl necks" (Pilling and Drake 1950) "doughnuts" (Baldwin 1971a, b), "pecked ovals" (Lee 1981), and "grooved ovals" (Gary, et al. 1994). My study on the ideological/technological aspect of PCNs investigated a current thought held by some researchers at the time (Elsasser and Rhode 1996; Rhode 1991) that some of the nucleated PCN centers had been removed to make charmstones. This would have changed the PCN tradition from a trace of a ritual practice (and possible of religious significance) to a quarrying process, even though the quarrying was intended to produce an object (charmstone) that may itself have had ritual or spiritual use(s). Applying Middle Range Theory (Binford 1977), my replication experiments for the MA thesis convinced me that the socalled center of a PCN could usually not be removed intact, and that most PCNs did not provide a piece of schist thick enough to produce a charmstone.

With my M.A. in hand, I was seeking out an association with which to affiliate to continue my research on PCNs. This part of my journey led to University of California, Berkeley, to inquire about being accepted as a Research Associate of the Archaeological Research Facility (ARF). Meeting with Dr. Margaret (Meg) Conkey (now my Committee Chair), she suggested that I apply for the PhD program, going through the regular channels, with no guarantee of acceptance. Meg also suggested that I might want to start the next semester by enrolling through the Extension. A year later I found myself sitting in the 229A & B core seminars of the PhD program in Anthropology and thinking about my dissertation project.

Research Questions

This project has developed into a study of several PCN boulders located on the Hopland Research and Extension Center (or HREC) which is in the Northern Coastal Ranges of California, in Mendocino County, east of Hopland (Figure 1.5). The HREC is an environmental research station owned by the University of California, and administered by the University of California, Davis. The research questions being addressed in this dissertation can most simply be stated as:

- What activities can be identified as taking place on the landscape of the HREC?
- What role did the people play in a symbolic landscape?
- To what temporal period can activities be assigned?
- Can the pre-historic peoples whose activities are represented on the HREC be temporally identified as the same people who left the markings on the boulders?

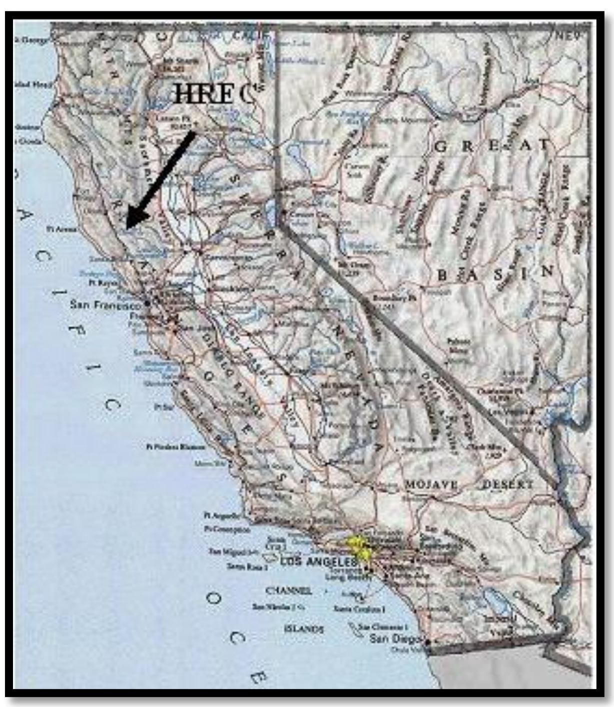


Figure 1.5: California map showing location of the HREC.

Overview of Dissertation

This dissertation will be organized into the following chapters that will address the PCN tradition through a multifaceted contextual approach. To do this, I will present the research questions, historical background information, method and theory for the study, and discuss the analyses and results of scientific testing. **Chapter 1** begins with describing the goals and significance of the research and presenting an historical background of PCN research beginning with Steward's initial citing of what he called 'horse tracks" (1929b) to the first formal study of PCNs that labeled them with the descriptive acronym (Miller 1977). Following Miller's extensive field research that culminated in a predictive model for locating additional PCN sites, to the point where most California archaeologists now no longer ask "What's a PCN?, current research has progressed to more multifaceted studies that now address PCN research from multiple directions, incorporating state of the art technology.

Chapter II will outline the theoretical and conceptual approach that frames my dissertation, primarily focused on landscape studies. The chapter will begin with a discussion of theory and its place in archaeological studies. As a contextual study I will present both geographical and cultural aspects, as well as considering the conceptual frameworks offered by the anthropology of ritual. I will also offer a few comments on Native American perspective to ritual and the inclusion of the Native participation in my research.

Understanding the need for Native American participation in an archaeological study, I will include my contact with the Hopland (Shokawa) Band of Pomo Indians and their involvement with my research.

In **Chapter III** I will review chronologically the history of California archaeology before moving to previous research on California rock art. This chapter will also include a discussion of the use of the terms "rock art" and the acronym "PCN". While worldwide researchers recognize the term "rock art", not all agree, including me, that this term is appropriate, especially given the nature and context of the boulder markings in this research. Since the early days of my PCN research, many fellow researchers have asked if I could find a "better" word for these unusual markings. I will discuss and explain my decision to continue the use of the acronym in this chapter.

A comprehensive examination of the PCN tradition will be the subject of **Chapter IV**, identifying the tradition and discussing its relationship within the broader context of "rock art" in California. I will briefly address the geographical distribution of PCN sites and review known data on these sites.

Chapter V explores the geographical and geological context of the North Coast Ranges, including their formation. The PCN tradition is recognized by researchers as appearing on schist or schistlike boulders. What is the significance of this? PCNs are also thought to be found in fault zones. Is this a determining factor for predicting their presence? Was this a factor in the selection of the boulders for human activities that are clearly patterned and repetitive?

The Pomo people of the North Coast Ranges who live in and are associated today with my study area, are some of the most intensely studied pre-historic people from an ethnographic and ethnolinguistic perspective (Knunkel 1974:11). **Chapter VI** will review what we know about the Pomo culture as a result of these early writings based on interviews with Native consultants in the early 20th century, who were still familiar with "the old ways" (i.e. pre-contact), having lived through the early contact years. Several researchers undertook ethnographic field work and have left this documentation for future scholars. These key ethnographers in the Pomo area were Aginskys (1939), Barrett (1904, 1906, 1908a, b; 1952), Loeb (1926), Kniffen (1939), Stewart (1943), Gifford and Kroeber (1937). Additional ethnographic information exists in unpublished form, and will be presented in this chapter. In this dissertation I will review both the published and unpublished ethnographic writings. Myths, or what I prefer to call Oral Traditions, inform much of what we know about the belief systems of these early people and will also be discussed.

In this chapter I will also present an argument for the use of ethnographic analogy in deep time discussing ethnographic accounts of the use of powder from certain rocks in indigenous fertility rituals that may inform us about the PCN tradition. The hypothesis that the use of powder, ritually extracted from the PCN boulders for fertility ritual is fundamental to my research. Much of the interpretive weight of the dissertation draws from the ethnographic suggestion that links the ideas that pre-historic peoples obtained powder from the boulders through the peckings on the rocks that were not random but in prescribed forms and shapes that, in turn, were visually associated with concepts of fertility and that the powders so extracted were then used in further activities and ritual practices concerning issues of fertility. The pre-historic belief of power existing in boulders will also be addressed. Michael Moratto had referred to the languages of California, at contact, as being likened to the Tower of Babel of ancient American languages (2004:530). Can linguistics inform our understanding of the geographical distribution, and validate the antiquity of the PCN boulders?

In **Chapter VII** I will present and discuss the pre-historic use of the HREC (Hopland Research and Extension Center) landscape informed by previous extensive research through survey and archaeological investigation. Thirty archaeological sites have been identified on the landscape within this study area and indicate the activities that took place in the past. Nearby archaeological sites, including obsidian sources, also add to the available data. While recent research has identified many trails in the Central Pomo geographical area, little work has addressed the ancient trails in the study area. These trails served as a kind of connective tissue that bridged together the activity sites on the HREC, and led early peoples through the landscape as they procured material and traded with others.

Chapter VIII details the research and testing methods applied in this study and the available collections that were used to understand the archaeological context of the HREC landscape. Two collections provided the artifacts for analysis – over 2400 catalogued bags of artifacts gathered during three years of a field school and never analyzed, and a collection of over 300 artifacts that have been picked up and provenienced and catalogued by staff of the HREC over more than 50 years. In addition, a minimal amount of excavation under my direction was undertaken at two of the PCN sites. The PCN site that was the focus of most of my research provided a rare opportunity that I identified at my first visit to the site. A culturally marked boulder had split into two pieces, bisecting a PCN element, and opening up opportunities to investigate methods of determining a date for the break in the boulders, and thus, a youngest possible date for the placement of the PCN on the surface of the rock. This chapter will also discuss recording methods including 3 D scanning that have been used in the recording of the PCN sites.

The analysis and results of my research will be presented in **Chapter IX**. The results of the obsidian hydration, chemical sourcing (XRF), radio carbon dating, faunal and lithic analysis, soil dating, and other methods will be reported and discussed. In **Chapter X** I will present the conclusions of my research, including a review of my research questions, a discussion of the significance of the research and the contributions that my study has made to the archaeological record, and offer suggestions for future research that can continue to build on this foundation. The reported results begin to shed light onto the antiquity of the PCN tradition.

II. Theoretical and Conceptual Approach

> Theory is a very difficult word to define.
> (Johnson 1999:2)

Introduction

The previous chapter introduced my study and laid out the organization of this dissertation. This chapter will discuss the theoretical setting for my research, introducing the primary theoretical concepts and their application. This approach has been chosen because I believe that it will enable a fuller understanding of the PCN tradition and its role in California archaeology, and in general, help to provide a more comprehensive perception of the past.

Several theoretical approaches are brought to bear in this research about the PCN tradition, its context, and especially about the connections of PCNs to the landscape of the HREC (Hopland Research and Extension Center). I am primarily drawing upon what may be called landscape theory. A landscape approach is one in which objects of archaeological inquiry in this case the PCN marked boulders that are the focus of my study, are considered within the wider cultural and natural landscapes the natural settings, the archaeological evidence of human activity and culture, the relationships between the PCNs and other traces of human activity. This contextual approach provides a way of considering together the archaeological components with the insitu objects such as the PCN marked boulders. As I will show, a landscape approach helps to understand the activities that have taken place on the HREC, over the millennia, and requires the incorporation of what we consider both the physical or "natural" and "cultural" landscapes (see David and Thomas 2008). I am assuming here and will later discuss the basis for the idea that the PCN tradition is one that involves ritual, and has been identified ethnographically as cultural practices surrounding the quest for or assurance of fertility. Thus, this study as well requires an understanding of the theoretical underpinnings of ritual theory, with some consideration of gender, since the ethnographic reports of the rituals indicate the role of women in the tradition. Because actions need a way to be implemented, agency will also be briefly discussed, asking the question as to how the knowledge of the fertility performance appears to be so widespread with such an extensive geographical distribution.

What is Theory?

To embark on this section on theory, I believe it is first necessary to understand what theory is and what role it plays in archaeological reasoning. As Johnson has stated, theory is not easy to define (1999:2). In fact, he purposefully obfuscates the definitional issue in the opening chapter of his introductory text on theory (ibid.), referring his reader to the last chapter, where he again fails to define the word (or concept) in a concise wording. This is not without design! Johnson argues that we need to justify what we do (and why), to the public, and we need to evaluate interpretations to discern the best application of theoretical frameworks that drive our research. Perhaps Johnson sums up the use of theory in distinguishing us, as archaeologists, from collectors, as "the set of rules, we use to translate those facts into a meaningful account of the past," (p.7). That set of rules, is theoretical, by nature. Theory has also been described as "a statement that accounts for causes or relationships between phenomena" (Darvill 2008).

Garth Bawden, in his introduction to a reader on theory (2003), a selection of articles that have appeared in past *American Antiquit*y issues, characterizes some recent theoretical debates, reminding us that "theory permeates practice and guides its goals, methods, and strategies" (p.v.). He continues that theory "transcends dry philosophical polemic to ensure that archaeology as a vital discipline is grounded in ideas that are carefully and constantly examined, assessed, and challenged in the practice of material investigation" (ibid).

After consulting several readers and texts on theory (Barrett 1996; Hodder 2001; Renfrew and Bahn 1991; Trigger 1989; Whitley 1998b; Willey and Phillips 1958), I found reluctance by authors to offer a clear definition, but rather to set the historical development of the field and explain the applications of various approaches. Conkey (2007:29-68), also recognizing the perceived abstract nature of theory, argues that theory can be defined or be thought of in "at least" two distinct ways, the first, being the traditional belief that theory is foundational. Citing the work of Jonathan Culler, an important figure in the structuralism movement of literary theory, Conkey suggests that the second view of theory, and her preferred view, and "much more suited to the nature of most archaeological inquiry", is the view of theory as "revelatory". She sees this as "opening up new spaces, as challenging assumptions so as 'to conceive of our own thinking… in new ways'" (from Culler 1992:203; Culler 1994:13). To synthesize Conkey's view, based on Culler, theory is not guidelines that can be applied, but rather theory refers to how people's views are framed that results in the way they structure and carry out their research. Citing the Americanist trend in archaeology to remain in the practice of processual ideas, with a strong emphasis on methods as if they were theory, Conkey (2007:299) argues that there is still less explicit use of theory in archaeology as our field requires.

One area that I have pondered is where does theory end and methods begin? Is it more than the difference between thinking how something was done in the past, and determining what was done, and with what? Is it as Binford suggests (as cited in Conkey 2007:269) that theory should "derive" from our archaeological data, and our attention should be on researching the archaeological record? Do archaeologists today confuse theory with method, as suggested in Conkey's discussion on the "conflation of method and theory" (p. 2989)? Perhaps it is for the reasons discussed above that there is the lack of clarity in a discussion of archaeological theory. As I move toward a discussion of the 'theoretical direction" of my research, I propose my own concise definition of a theoretical approach as the skillset applied to convert data to meaningful interpretation.

Landscape Theory

Landscape studies to frame archaeological research have made great strides in the last two decades in understanding the role of landscape evidenced on part by the publication of *The Handbook of Landscape Archaeology* (David and Thomas 2008) the first of a series of handbooks produced by the World Archaeology Congress (WAC). The editors view landscape studies as an "aspect of archaeology" that can fit into all major theoretical frameworks, whether they be evolutionary theory, ecology, Marxism, feminism, and other approaches. This "handbook", containing 719 pages with 65 contributing authors, was written as a "manual" of different approaches to landscape archaeology. Thus, it goes without saying, that the field is diverse and varied.

It has even been suggested that the concept of landscape in archaeological research can also be considered as an umbrella concept that draws together many "disparate approaches" that may even be contradictory and radically distinct (Whittlesey 1997:20). In other words, landscape archaeology draws together the cultural (human) and physical (geographical) elements, and challenges the perceived barriers between culture and nature, with the physical landscape being created by human activity and with human activity being framed by the landscape.

Simplistically, landscape studies include attention to both the geographical and cultural landscape, and many different directions have been developed through the years. The earliest written description of landscape can be traced to the 2nd century A.D. (Pausanias 1913), with Bradley (2000:20), calling the Greek traveler and geographer the first field archaeologist. His writings indicate that he was intrigued by "ancient" relics and cultural icons. Pausanias' writings concerning 5th, 4th, and 3rd century B.C. archaeological sites and their placement on and within the landscape have proved considerably accurate, and have contributed to contemporary archaeological investigation of sites that are no longer visually evident. His writings are considered important because they "illustrate the significance of natural features" (Bradley 2000:25) during a period in Greece that stressed monumental architecture. The writings of Pausanias provide a guidebook to ancient ruins.

The study of cultural landscapes has close ties with the field of cultural geography, with cultural landscape studies having their core in the work of American geographer Carl Sauer in the 1920s when he first formulated the idea of cultural landscape being fashioned from the "natural" landscape" (Ashmore and Knapp 1999:3). It has been suggested by Norton (1989:3637) that Sauer's 1925 writings, which are referred to by geographers as the Landscape School or Berkeley School, was influenced in part by Sauer's anthropological associations with his Berkeley colleagues Alfred Kroeber and Alfred Lowie. It has been specifically stated that Sauer "sought to stress the agency of culture as a force in shaping the visible features of delimited regions on the Earth's surface" (Cosgrove 1993:115).

The "fluidity" of the term landscape led cultural geographer Lester Rowntree (1996) to assert that "landscape is all things to all people" (p. 146), in his historical review of the concept of cultural landscape studies. As an ambiguous term, one that lacks "conceptual clarity", he suggests its broad appeal is because it "embraces whatever we ask from our curiosity about humanenvironment interactions" (p. 147). In my research I will combine the study of both cultural and geographical landscapes, while I identify how people were moving around and utilizing the landscape and also how the physical landscape attracted early people to create cultural markings throughout the Coastal Ranges of California.

Native American View of Landscape

Before moving to a discussion of how anthropologists and archaeologists have incorporated the study of landscapes into their research, I believe it is important to be cognizant of some native views of landscape, rather than just viewing studies from a western epistemological standpoint. Other perspectives would include such quotes as that in Whittlesey (1997:23), referring to concepts of Navajo sacred geography:

> The earth is not just a series of dramatically poised topographic features that incite the wonder of man or beckon for exploitation, but rather a living, breathing entity in an animate universe. The land with its water, plants, and animals is a spiritual creation put into motion by the gods in their wisdom. These elements are here to help, teach, and

> protect through an integrated system of beliefs that spell out man's relationship to man, nature, and the supernatural. To ignore these teachings is to ignore the purpose of life, the meaning of existence. (McPherson 1992:11)

Another native view of landscape can be seen in the sacred geography of the Wintu of northern California (Theodoratus and LaPena 1994). Citing the religious cosmology of the Wintu and its interconnectedness with the environment, the authors note the sacredness of the topographical features on the landscape that give further insight into their mythology. The concept of a native landscape has also been discussed with Otis Parrish, a Kashaya Pomo Elder, from Northern California (personal communication 2004). Parrish has argued that to understand the native perspective it is necessary to view the landscape through a native 'lens'. One additional insight into the native view of landscape is presented in a short story by Barbara Kingsolver (Clarkson 1998:121). Entitled 'Homeland', it relates the story of a Native family preparing to travel to Great Grandmother's birthplace in the Cherokee nation.

> Papa unfolded the Texaco map on the table and found where Tennessee and North Carolina and Georgia came together in three different pastel colors. Great Mam looked down at the colored lines and squinted, holding the sides of her glasses. "Is this the Hiwassee River?" she wanted to know. "No, now those lines are highways," he said. "Red is the interstate. Blue is river." "Well, what's this?" He looked. "That's the state line." "Now why would they put that on a map? You can't see it" Contrary to popular opinion, "facts" do not speak for themselves.

We cannot take for granted that the ancient and Native perceptions of the landscape and its uses or meanings match our Western ideas, and I believe it is important to keep this in mind as we apply landscape method and theories to our archaeological studies.

How Landscape Studies are Being Applied to Archaeology

Whether the current surge of interest in landscape studies is just a new name to an old approach, settlement patterns, as suggested, (Whittlesey 1997:19), or presents a new epistemology, a landscape approach is an integral part of much archaeological research. One of the wellknown advocates and inspirational interpreters of landscape archaeology is Barbara Bender, in her studies on Stonehenge (Bender 1993, 1998; Bender and Winer 2001). Much of Bender's work focuses on the contested landscape, landscape as a political issue, and how 'created' landscapes hold different meanings to different stakeholders.

The work of Patrick Kirch in Oceania draws on an historical ecology epistemology – an "interdisciplinary approach combining the perspectives and methods of both the natural sciences and anthropology" (1997:1), which has close ties to landscape archaeology. Historical ecology studies past ecosystems by charting the changes in the landscape over time. Kirch's edited volume (Kirch and Hunt 1997), is the outcome of a 1991 Symposium on "man's place in the island ecosystem", which focused on the role that indigenous peoples played in shaping island landscapes and environments.

The European attention to landscape studies has been noted by Layton and Ucko with a flurry of interest in studies in the late 1990s in the United Kingdom, as several new Master's programs in landscape archaeology were introduced. They argue that landscape archaeology differs from other disciplines in its "practical aspects (laboratory and field techniques, instruction in the recognition of elements of ancient activity in the landscape), its theoretical aspects (which include a history of the 'subdiscipline') and its philosophy and politics" (1999:15). They further suggest that the "current popularity of landscape studies coincides with a desire to 'populate' the past – to humanize it" (p. 16). Layton and Ucko also take note of how the thencurrent focus on landscape studies has led to a more interdisciplinary approach to research that frees the previous boundaries and opens up the linking of "the strictly scientific with the historic, ethnographic and even artistic" (ibid.). This introduction is but one paper in a volume of 29 chapters from diverse perspectives on the archaeology and anthropology of landscape. European contributions to landscape studies and rock art will be discussed in the following section. However, the work of two other European archaeologists should be mentioned. Richard Bradley (2000) has directed some of his research to natural and unaltered features in the landscape, focusing on why caves, mountains, springs and rivers, and other natural places on the landscape held a special place in European prehistory. Scottish archaeologist, Tim Ingold, has taken an interesting approach to studies where he views the landscape from what he refers to as a "dwelling perspective", where he sees the landscape as a story told to both the archaeologist and the "native dweller" (1993).

A more specialized focus on the landscape is an edited study of *Landscapes of Movement* (Snead, et al. 2009), where trails, paths, and roads are examined with an anthropological perspective. Through crosscultural examples, with a span of temporal periods, the authors argue that understanding human movement through the landscape is a reflection of a culture's traditional knowledge, worldview, memory, and identity. Sidsel Millerstrom, in her dissertation (2001) bridges her landscape approach to rock art research with her contextualization of rock art images in French Polynesia showing how such studies can contribute to an understanding of cultural process and changes. Millerstrom's settlement pattern research used a landscape approach with an "extensive field survey, archaeological test excavations, and mapping and recording of rock art, architecture and abandoned agricultural systems" (p. 2) to examine the cultural context of the rock art.

Before moving to the next section on landscapes studies and rock art, I would like to mention what is perhaps the most significant tool in landscape studies, the development and application of GIS software for archaeological research projects. The term GIS (Global Information Systems) was coined for the Canadian Government by Roger Tomlinson in the early 1960s. He defined GIS as "a computer application designed to perform certain specific functions" (Wright, et al. 1997:346). In the field of archaeology, these functions include such process as the digitizing of maps that allows for the layering of data, determining leastcost trail routes, and other graphical depictions. It is a system of computer software, hardware, and data, combined with the human element to help manipulate, analyze and present spatial information. Some of the popular GIS programs for archaeology are ArcView, ArcExplorer, and ARCInfo. These new technological tools have greatly enhanced studies of settlement patterns, as indicated by Robert Sharer & Wendy Ashmore (Sharer and Ashmore 2003:507) who, as an example, referred to the work of Carol L. Crumely and her colleagues in Burgundy, France. Through their intense use of GIS applications they have gained a wealth of insights into the regional changes in the settlement and society. One of the current catchwords in landscape studies is viewshed. Viewshed is the area visible from a particular point of view. Viewshed modeling (utilizing GIS software) is based on the following principle: "From a particular point on the landscape, line of sight calculations are made to every other point within the region to determine whether or not those 'target points' would be visible from the 'source point' given the intervening topography" (Holm 2003:15) . Viewshed studies add a new dimension to landscape studies that may link ethnographic information and oral traditions to the landscape, when places on the landscape are visually linked to traditionally known places.

How Landscape Studies are Being Applied to Rock Art Research

My initial exposure to the application of a landscape approach to rock art studies was the first paper I heard presented at the 2003 World Archaeological Congress (WAC 5), in Washington, D.C. Tilman LessenErz, a German archaeologist working in Namibia, presented his theoretical approach that he branded "mental mapping" (2003). Adapted from the work of Downs and Stea (1977), this contextual study visually placed rock art sites in relation to significant 'places' on the landscape – other rock art and archaeological sites, pre-historic trails, ecological zones, etc., literally through a birdseyeview (preGoogle Maps). His presented paper has been expanded and recently published (LenssenErz 2008) with other papers from the session that place world rock art in a temporal and geographic context (Sanz, et al. 2008). LessenErz has elaborated on his landscape approach in another publication (2004), where he applies the name *Gestaltung*, which he defines as the "physical acts which bring about tangible change on a landscape endowed with meaning" (p. 131). He has employed this approach to understand what "human decisions" led people to place certain (rock art) elements in a specific place in the landscape.

European archaeologists have been among the leaders in linking a landscape epistemology to rock art studies, with Christopher Chippindale and George Nash leading the way (2004). This collection of papers (including the LessenErz paper mentioned in the previous paragraph), gives a worldwide perspective on the placement of rock art panels in the landscape. Paul Taçon has joined Chippendale in editing a publication, *The Archaeology of Rock Art* (1998a), which includes the research of David Whitley (1998a) which looks at rockart, landscape symbolism and the supernatural, and Sven Ouzman's (1998) paper that deals with the "forager's" perception of the landscape in South Africa. Ouzman has also authored several other articles, either as the single author or in collaboration with others on rock art and landscape studies in South Africa and Australia (such as Ouzman 2003; Taçon and Ouzman 2004). George Nash has also edited a British Archaeological Reports (BAR) publication that gives world perspectives of rock art and the landscape (2000). Nash uses his definition of landscape (as related to rock art) as "spaces that become places". He sees the intentionality of landscape/place as important to the artist (or creator of the marks in the case of PCNs), as the images that result.

A 1997 publication, a collection of papers resulting from two symposia on *Pleistocene Art* (1993 and 1995), which brought together world renown specialists, was published by the California Academy of Sciences (Conkey, et al. 1997). In the concluding chapter, Conkey (1997) argued for a contextual approach searching for a "visual culture" in the "social" geography of the French decorated caves, by looking literally "between the caves". "Between the caves" has taken on a new meaning in this landscape archaeology project, where she and her team are literally looking archaeologically on the landscape for openair evidence left by those who painted the Pleistocene "art" in the caves of the MidiPyrénées region of southern France. The project has used digital terrain models, and new geopetrographic analyses of flint raw materials that were moved around the region, with the goals of generating various lines of evidence from which to infer why the "marked" caves might have been significant and how connectivity's were generated between people and places. My research, to a degree is modeled after this approach by using archaeological evidence to indicate what activities were taking place on the landscape and how this may (or may not) relate to those who left the marks on the boulders.

North American based studies that link landscape approaches and rock art range from the study of Hohokan images at South Mountain Park, in Phoenix Arizona (Bostwick 2002), where dissertation research has merged ethnographic and landscape studies while searching for potential meaning by placing the images in the context of the environment, to a search for borders and boundaries of the major urban Midwest U.S. site of Cahokia, based on the geographical distribution of birdman and suncycle petroglyphs (O'Brien 1994). Master's research (Shepard 1996) has examined regional rock art site distribution in late pre-historic and protohistoric southern California (Luiseño culture area) from a perspective of landscape symbolism and cultural matrix. Through his study of 32 sites (10% of the eligible rock art sites in the culture area) Shepard, using a landscape approach, demonstrated that a complex symbolic and ideological framework governed the site selection and placement of the rock art.

Several rock art researchers have begun to incorporate GIS methods into their research (Ebert 1996; Fletcher, et al. 2003; Hall and Sale 1994; Hartley and Vawser 1997; Sells 2005). Many of these studies have made GIS applications as a part of their research, and others are totally focused on GIS as a rock art research tool.

A landscape theoretical approach encompasses the total landscape, with equal attention to the "spaces between places" – a contextualization – with emphasis on the interplay of what we tend to define as "culture" and "nature". This next section will highlight the specific landscape approach that I have drawn on to better understand the PCN tradition and its relationship to the landscape of the HREC.

Landscape Approaches Used in my Research

As demonstrated in the studies summarized above, a landscape approach can take one of many directions, or a combination of directions. My research will draw from several approaches. As will be discussed in Chapter VI, several ethnographic accounts may be linked to the PCN tradition. The concept of the ethnographic landscape is covered in detail in the Petroglyph National Park Ethnographic Landscape Report (Anschuetz, et al. 2002). While this study was designed to determine the "stakeholders" concerned with the monument, they included the National Park Service (NPS) definition of an ethnographic landscape as one type of cultural landscapes, and their note that it includes "sacred religious sites" is a good fit for my research (Anschuetz and Scheick 2002:2.1). A portion of the NPS definition of ethnographic landscape reads: "…a relatively contiguous area of interrelated places that contemporary cultural groups define as meaningful and traditionally linked to their own …". I see the ethnographic accounts of the PCN tradition, if I am correct in the analogy of the PCN use for fertility ritual, as falling within this definition. The explicit use of ethnographic information in the interpretation of archaeological landscapes is also covered in a paper by Paul Evans (2008). And the application of ethnographic accounts is the basis for the entoptic and shamanistic papers by David LewisWilliams, David Whitely and others (LewisWilliams and Dowson 1988; LewisWilliams 1995; Whitley 1994, 1998a). I will be using ethnographic accounts to inform my research, as defined as the "informed" method of Chippendale and Nash (2004:1417), to gain insight into the PCN tradition.

The concept of a cultural landscape was introduced into ethnographic Pomo literature early in the 20th century (Kniffen 1939:358366, 384385). Kniffen used this term to refer to places that the Native people considered to be significant. An example of a "significant" place on the landscape would be the PCN boulders where powder may have been obtained for ritual use. These boulders were viewed as imbued with power that was definitely significant to those who sought fertility or cures for sterility. This was a practice that was a part of their culture, and as Strang sees this cultural landscape a "useful bridge between anthropology and archaeology" that brings together the social and material worlds (2008:51), observing, also, that peoples "engagement with place over time have created a material record" that is meaningful to landscape studies (p. 55). It is this "engagement with place", the making of marks on the boulders as powder was removed, that have created this "material record" that produces the list of more than 107 PCN sites both on the HREC, and beyond. Due to the inherent nature of ethnographies, the cultural landscape can only be defined during a "snapshot" in time. The cultural landscape can only be informed through the oral history and ethnography of the Native groups.

What can be learned about the PCN tradition by studying the geographical landscape? As was stated in the introduction of this dissertation, I am applying a landscape approach to determine what was taking place on the HREC landscape through the millennia, and to determine if there is a connection to identified activities and the PCN marked boulders. Where are they located on the landscape? Does the proximity of so many of the archaeological sites adjacent to Parson's Creek and other drainages give insight into why only certain areas of the HREC contain identified cultural material? The PCN boulders seem to be located in the southwestern quadrant of today's defined research district. What does this tell us? What role do pre-historic trails play, and what can we infer regarding the physical location of the chert quarries in relation to the PCN marked boulders? A study of the geography of the HREC may reveal information about movement of these early people around the landscape. My work on understanding the trails as a kind of connective tissue between people and places is being augmented with recent GIS and ethnographic research by Mary Gerbic, a graduate student at California State University, Sonoma.

Whittlesey (1997:27) has stated: "Perhaps the most important use of landscape theory in archaeology is that it permits us to reconstruct the intangibles of culture and ideology that otherwise are invisible in the archaeological record". Many of these "intangibles of culture and ideology" are found in the rock art left behind by pre-historic peoples. By applying a landscape approach to rock art studies, with the knowledge of the intimate relationship that pre-historic huntersgatherers had with the land, and the symbolism that it held, archaeologists will come closer to understanding past cultures. I offer the following quote as a summary:

> By contextualizing rock art with the landscape and incorporating the dimensions of movement, sound, touch and other states of consciousness into our interpretations, we move closer and closer to recreating the world of the huntergathers, and thereby closer and closer to understanding the messages they left behind. And perhaps through the process of understanding these ancestral messages and their contexts, we may even adopt some of these contexts and dimensions to enliven and enrich our own modern lives. (Ross 2001:547)

Ritual Theory

My reason for reviewing how anthropological approaches to ritual studies are pertinent to my research is founded in my hypothesis that the repeated production of PCNs (and other related marks such as cupules and incised lines), both in space and repetitively on the same boulders can be best understood as ritual acts. Ritual behavior has been a longstanding interest of anthropologists (Bell 1992, 1997; Joyce 2001; LeviStrauss 1969; Lewis 1980; Rappaport 1979; Rappaport 1999; Turner 1969), although, there is yet to be developed a singular theory of ritual, if that is even possible or desirable, nor even a universal definition of ritual. For the purpose of this dissertation, I will be drawing specifically on the work of several key anthropological studies with the understanding that human groups and individuals engage in what we call ritual practices or behaviors in a wide variety of settings for various purposes. Rappaport (1979; 1999) has discussed the idea that the development of ritual behavior – at least in the sense of it being agreed upon, repetitive and unquestioned practices linked to ideas about how the world is put together and what needs to be done for the social group – was crucial in the course of human evolution. While there is a wide variety of anthropological material on ritual behavior, the writings of the following authors are particularly useful as applied to my research.

During her lifetime, Catherine Bell was one of the world's leading experts in the field of ritual studies, recognizing that ritual could only be understood in relation to other activities (1997:vii). Bell authored two classic works on religion and ritual (1992, 1997), with her main contribution, as stated above, in developing a new framework defining relational aspects of ritual. Believing that a simple definition of ritual (in use for over a hundred years) was in the best interests of archaeology, Bell wondered why others wanted to complicate the issue, citing Colin Renfew's "very adequate version" – "rituals are those activities that address the gods or other supernatural forces" (Bell 2007:278). Bell's insistence on a straightforward, simplified definition fits well with my research assumptions, derived as noted above, from ethnographic research, that the people we think were responsible for the PCN markings were seeking an intervention in their quest for fertility and were performing an activity to request an action depending on the supernatural powers of boulder.

Rappaport, an anthropologist, was a cultural materialist whose field work was with the Maring people of New Guinea, and how ritual regulated the pig population based on environmental capacity, and warring events (1979). In a later publication, he defined ritual as "the performance of more or less invariant sequences of formal acts and utterances not entirely encoded by the performers" (1999:24). Whether or not there were "utterances" accompanying the ethnographic fertility rituals, obviously this was a repeated act, with some explicitly laid out order, present in the oral tradition as related to the ethnographers. I am thinking specifically of Loeb's (1926:247) account of the repetitive prescribed list of actions that needed to take place in the marking of boulders.

Victor Turner, known for his lifelong work with the Ndembu tribe of Zambia, focused his study on ritual and rites of passage, and his concept of *communitas,* viewing all members of an unstructured community as equals. I believe that Turner's definition of ritual also fits well into my research: "A ritual is a stereotyped sequence of activities ... performed in a sequestered place, and designed to influence preternatural entities or forces on behalf of the actors' goals and interests" (1973:1100). In the performance of the ritual evidenced with the PCNs, the couple went off alone, as indicated in the ethnographies. This was not a group activity or ritual, and they were attempting to influence the outcome by performing a certain ritual process, accompanied by the prescribed method of the use of the powder.

In a recent publication, Evangelos Kyriakidis (2007b:1) states that the lack of a definition for ritual has served as a 'barrier to scholarship". The definition that he arrives at is that "ritual is an etic category that refers to set activities with a special (not normal) intentioninaction which are specific to a group of people" (p. 10). Citing that implicit theories all agree that "ritual" is a special activity, they do not differentiate from the fact that there are other "special activities", and, thus, Kyriakidis, a specialist in Bronze Age Aegean archaeology, states that archaeology could benefit from "a greater focus on the development of theory and its study of ritual" (p. 3). While he disagrees with Bell on the need for a developed theory, they do agree on the need to study ritual in its proper social and material contexts (p. 1). I tend to accept Kyriakidis's definition in my research concerning fertility ceremonies. Kyriakidis's statement that rituals are identified with a specific group of people (2007a:294), works well with the ethnographically identified Pomo.

Colin Richard & Julian Thomas (1984), in their study identifying ritual activity in large henge monuments in southern Wessex, identified life crisis (individual) and calendrical rites (social group) as underlying ritual events. They argue that ritual activity can be identified by understanding the formal structure of the ritual action, which involves repetition, and leaves material symbols in the archaeological record – in other words, structured deposition. This theoretical approach is pertinent to my research, in that the repetitiveness of the same' ritual act' is found in a very similar form at over 100 sites.

Rosemary Joyce (2001:13371) identifies ritual as "repetitive sequences of actions related to beliefs", and emphasizes the importance of contextual analysis which allows the identification of types of artifacts that can serve as evidence of ritual action. Again, these ideas fit well with my assumptions and interpretive frameworks for research on the PCN's.

In his study of early huntergatherers in Mesoamerica, Drennan (1983) agrees with Rappaport's argument that ritual activities (especially those that communicate certain kinds of socially important information) are of prime importance to religious beliefs. Drennan also identifies two types of ritual performance that are of particular interest to the archaeologist – repetitiveness and rigid patterning.

I can now return to Bell (1992), who saw ritual as action, as practice and as a performance, but who considered that ritual acts are not a clear and closed category of social behavior. Definitions of ritual must go on to suggest, explicitly or implicitly, the nature and relation of nonritual activity and various degrees of nearlybutnotquiteritual behavior. As Bell has so aptly stated, the notion of ritual has "been integral to the mutual construction of both an object for and method of analysis" (1992:14).

As identified above, most theoretical concepts of ritual practice rely on a defined method of accomplishing the desired end result – in the case of the Pomo, a successful pregnancy which would insure the continuance of their culture. As will be discussed in Chapter IV, the marks that were made on the boulders were probably representative of a female vulva, and the act of marking on the boulders was what produced the material (talc powder), as prescribed in the ritual. The powder was used in a prescribed manner.

A Native American's Thoughts on Ritual Practice

Otis Parrish, Kashaya (Southwestern Pomo) Elder shared the Kashaya Pomo cultural views on ritual (personal communication 2004). Parrish explained all rituals in the Kashaya cosmos as being a formal practice. He defined a segmented ritual system that functioned on a series of levels, citing ceremonials as the backbone of the ritual system and the need for them to be performed in a specific prescribed sequential order. The sequential order consists of 1) prayers; 2) a set of four songs (four is a sacred number in their culture); 3) performance of dance in a prescribed choreographed order; concluding with 4) another set of four songs. If this prescribed order is not followed, the ceremony must begin again. This is an example of Bell's act of ritualization, and Drennan's arguments of the need for an activity conducted in a precisely defined manner. Can rituals be changed? According to Parrish, some content and the performance can change *(the ongoing process of ritualization)* when there is a change in the Spiritual Leader (dreamer/healer). When his mother, Essie Parrish, the last dreamer/healer of the Kashaya, took over the role on the death of her predecessor, she dreamed of a new order (performance) – a change in the ritual. Thus, the Kashaya rituals consist of order, sacredness and prescribed activities. These same procedures are consistent with some of the fertility practice accounts found in the Pomo ethnographies written many decades ago.

Other Theoretical Approaches

While I am drawing my primary theoretical framework from concepts of landscape studies in archaeology and from theories of ritual practice, it is important to acknowledge that other theoretical frameworks also play a role in this study. The ethnographies have identified that the fertility rituals included both the partners, male and female, which indicated and identified a role played by women. Identifying women in the archaeological record has not always been attended to, as brought to our attention beginning with the groundbreaking publication on gender by Conkey and Spector (1984). Those people who left their marks on the boulders also served as active agents in creating and sustaining their worlds. Sauer as well saw culture as an agent (Cosgrove 1993:115). A question can also be posed regarding the transference and perpetuation of the PCN tradition over such a vast geographical space and perhaps over considerable temporal distribution. Who and what were the agents in this process? Was it a common language (Hokan or pre-Hokan based, or perhaps Yuki?), similar cultural practices, or the same nonsedentary people who traversed the landscape of what is now California that continued to practice a ritual act to insure their continuance and that of their world? While we will never know the complete story, examining their culture through a theoretical framework will inform what is known of these early people.

Native American Participation

Inclusion of the Native voice in this chapter also implies the use of an inclusive Indigenous theoretical approach to my studies. In the last several years, great strides have been made in collaborations between archaeologists and Native Americans. The Native voice is now being heard as a stakeholder in both the planning and the carrying out of archaeological research and projects in the professional realm (both academic and cultural resource management), in the United States and worldwide. This "new climate" is evidenced in the recent publications (Lilley 2007; Ross, et al. 2011) focusing on the claims of indigenous peoples to both land and cultural heritage and how this is affecting the practice of archaeology. This same "new face" of archaeology is evidenced by many related articles in *American Antiquity* and in Native American contributions in the 75th anniversary publication of the Society for American Archaeology, *Voices in American Archaeology* (Ashmore, et al. 2010).

This new cooperative relationship, with seeds in the National Historic Preservation Act of 1966, and 'fueled" by NAGPRA (Native American Graves and Protection Act) in 1990, has set American (and worldwide) archaeology on new footing. The Native voice has gained new ground with the 1992 inception of the THPO (Tribal Historic Preservation Officers), individuals, officially designated by a federallyrecognized Indian tribe to assume some or all of the functions of State Historic Preservation Officers, but on Tribal lands. This new role has led local THPO's and archaeologists to engage in collaborative relationships in gaining knowledge in relation to the local physical and cultural landscape.

One of my first trips to Hopland was to meet with the Hopland Rancheria Tribal Chairperson at the time, Wanda Balderama, to present my research design to some of the Tribal Elders, and to basically ask their blessing for my research in their ancestral tribal lands and culture. I was warmly welcomed and Shawn Padi was given the task of working with me. At the time, Shawn was their Environmental person and has since completed his training and is now an official THPO for the Hopland Rancheria. Shawn has participated in many of my field visits to the HREC and has demonstrated interest in my research. Raised by a blind aunt in Hopland, he learned many of the old ways and particularly the oral traditions of his people, which, while unable to see to read to him, she was able to share and educate him in the traditional knowledge of their people. His Greatgrandfather was Jeff Joaquin, one of the consultants for Omer Stewart's early 20th century California ethnographic fieldwork (1943:31). Shawn's involvement with my research has greatly enriched my work, drawing on his traditional knowledge about his people and culture.

Conclusions

This chapter has discussed the theoretical framing of my research, introducing the key theoretical concepts and their relevance. The application of a landscape theoretical approach, considering both the geographical and cultural aspects, has been chosen to provide the foundations for my contextual study of the PCN tradition. It is the landscape that serves as a visual and an invisible backdrop for the performance of fertility rituals. These rituals, as suggested both by ethnography and the repetitiveness of the act, are best understood through the lens of those who have made lifelong studies of the ritual process. While landscape and ritual theory serve as the backbone of my research, other theoretical approaches were also discussed. The importance of the Native voice was also included. The next chapter will review the history of archaeology in California and its intersection with rock art, identifying some of the key players and the documents that have mobilized and structured California archaeology. In addition the terminology that is used in rock art research will be presented that will include a consideration of and justification for the use of the acronym PCN to refer to the pecked cupules and nucleated elements marked on boulders.

III. History of Archaeological Studies in California and their Intersection with Rock Art

> For generations, rock art specialists have dwelt somewhat on the margins of archaeology, not because some of them are not excellent scholars, but simply because "dirt" archaeologists have found it hard to relate the images on rock faces with the artifacts and other natural remains in the ground. (Fagan 2003:193)

Introduction

This chapter will introduce the literature concerning archaeological studies in California, their chronological development how the subdiscipline of rock art studies has developed, and the status of rock art studies today. I will conclude this chapter with a discussion of rock art terminology, including my use of the term "cultural markings", and defense of the designation of the acronym "PCN" to identify the tradition being studied.

At the time of contact in California the landscape supported Native groups that reached a population of approximately 300,000, speaking nearly 90 languages and belonging to perhaps 500 distinct ethnic groups. To organize and to make some sense of this richness in an archaeological context, early California archaeology is involved with the study of *culture history*, which has gripped researchers in what Moratto calls "a classification obsession of Californianists" (Moratto 2004:xxix). The history of California archaeology has been driven by an obvious diversity of materials and the need to develop order. Since the 1970s the study of California archaeology has moved into the approach known as the study of cultural process – the *how* and *why* of understanding how cultures developed. Research has addressed such issues as the early settlement of California, complexity of huntergatherers, and European colonialism.

Archaeological studies in California began approximately 150 years ago, as artifacts and human remains were first uncovered during the course of the Gold Rush. In the first three decades of the 1900s anthropologists and amateurs began to excavate sites, primarily in the Bay Area, Central Valley, and Southern Coast. Advances were made in the field as the Smithsonian Institution, University of California, Berkeley, and a few other institutions began to publish their scientific and ethnographic research. As research methods advanced beyond simple classification, the path turned to understanding change over time. With rapid geographical expansion given the onset of salvage archaeology and eventually Cultural Resource Management (CRM), the introduction of the New Archaeology of the 1960s, and the more recent Postprocessual approach; the *way* of doing archaeology in California has passed through many hands. It has been greatly transformed in theory and method from its early beginnings. Below I will discuss some of the important events in the development of the field of archaeology in California and the inclusion (or, in some cases, the exclusion) of rock art studies and their integration into an informed California archaeology. An "informed" archaeology refers to methods detailed by Christopher Chippendale and Paul Taçon (1998b:79) that identifies an "informed method" as one that is based on knowledge that is passed directly or indirectly through ethnographic or other creditable account, as opposed to a "formal method" which is reached through no informed knowledge. As an example of a formal method, the information that is elicited by the images present at a rock art site – location in landscape, style, method of production, etc. Both methods can be incorporated into research.

History of California Archaeology

In the late 1970s Heizer identified the history of California ethnography as part of the "documentary record" of the European exploration of the area, beginning with the Juan Cabrillo expedition of 1542-1543 (1978b:6). The descriptions and place names of California Indians were recorded in the logs of Juan Cabrillo, Francis Drake in 1579, Sebastian Vizcaíno in 1602, and others. More than 3000 Chumash artifacts made their way to France through the explorations and collecting of Leon de Cessac in 1877 (Grant 1965:25). Records since the inception of the California Mission system, founded in 1769, and manuscripts relating to Ft. Ross and the Russian fur trade (between 18121841) have provided ethnographic material, ethnohistorical accounts, and direction for archaeological investigations. Alexander S. Taylor is credited as being the first anthropologist of California (Heizer 1978b:6). Taylor's articles on Native American culture appeared between 18601863 in a column entitled "Indianology of California" in the San Francisco publication *The California Farmer and Journal of Useful Art*s. An interest in pre-historic archaeology emerged during the Gold Rush period (beginning in 1848) as remnants of the past were unearthed during mining processes; descriptive accounts of the indigenous people were recorded which elicited an interest in pre-historic archaeology. The first systematic study (ethnographic) was that of Steven Powers between 18711872 (Heizer 1978c:4). In 1875 Powers was appointed to collect "objects of Indian manufacture" for the Centennial Exhibition in Philadelphia. He published a series of essays in the *Overland Monthly* and ultimately published more complete writings under the title *Tribes of California* (Powers 1877). Historian Hubert H. Bancroft compiled and published five volumes of *Native Americans in the West* (beginning in 1874). While neither Powers nor Bancroft contributed directly to archaeology (rather, their work was ethnographic and historical) they provided information that laid a foundation for later archaeological research. Through the years many individuals have earned a place in the history of California archaeology. Heizer presents a more detailed chronology of those contributions (Heizer 1978c) in the epic volume on California anthropology that he edited, which was mostly ethnographic. The Smithsonian volume (*Handbook of North American Indians* No. 8) was the first of a 20 volume planned (yet to be completed) 'encyclopedic' summary of what was known (at the time of publication) about the Native American with an emphasis on ethnographic groups. The volume also includes chapters devoted to general California topics, including environment, mythology, language, culture contact, archaeology and colonialization.

The historical and contemporary backgrounds of archaeologists in California indicates a very close relationship (either as faculty or a student) with the Anthropology Department of the University of California, Berkeley, and what is now known as the Phoebe A. Hearst Museum of Anthropology (formally the Lowie Museum or University Museum). This intimate connection between the development of California archaeology and the University goes back to 1901, when the joint Department and University Museum were established. The chairman was Frederic Ward Putnam. Alfred L. Kroeber was the instructor, and Pliny Earle Goddard was the assistant in anthropology (Heizer 1978b:8). The Museum was funded for several years by Phoebe A. Hearst. Kroeber, beginning in 1900, spent 40 years completing his detailed ethnographic work (Heizer 1978c:4), and totaled 45 years in association with the University until his retirement in 1946.

In 1903 the *University of California Publications in American Archaeology and Ethnography* (UCPAAE) began. The series included tribal ethnographies, linguistics, and special topics such as religion, basketry, social organization, archery, folklore, physical anthropology, and archaeology (Heizer 1978b:8). The series was in publication until 1964, and ultimately filled 50 volumes containing 241 contributed articles. Between 1937 and 1975 an additional 28 volume series was published as the *University of California Anthropological Records* (UCAR). In the mid1930s Kroeber realized that time was running out on recording ethnographic accounts of the California Indians, and he instituted the *Culture Element Survey of Native Western North America* (Heizer 1978b:910). According to Lightfoot (2005:3233) Kroeber employed a "memory culture' methodology to explicitly "mine" information about past native cultures. Lightfoot cautions that this method did not take into consideration the amount of time that had elapsed since European contact and its accompanying disruption in the cultures, and also that the selection of natives groups was biased. Between 1934 and 1938 Kroeber sent 13 field investigators on 20 trips and assembled 279 lists of specific ethnographic information from 254 separate tribes or groups. A few of these studies were beyond the geographical borders of California. The most knowledgeable informants were searched out, and on a onetoone basis were asked about the presence (+) or absence () of specific traits within their groups. By 1917 Kroeber had completed writing his ambitious volume *Handbook of the Indians of California* (1925).

Under the direction of Kroeber and the Museum of Anthropology, archaeological investigations were conducted by J.C. Merriam, F. W. Putman, Max Uhle, Llewellyn L. Loud, Samuel A. Barrett, and others. In 1909 Nels Nelson documented 425 shellmounds surrounding the San Francisco Bay and its extensive waterways (Nelson 1909). Between 1911 and 1916 Kroeber and Dr. Thomas Waterman had their well publicized and documented interaction with Ishi (Heizer and Kroeber 1979). During his tenure at UC Berkeley, Kroeber made an indelible mark on many, including Robert Heizer, who expressed a great respect for Kroeber.

Robert F. Heizer received his B.A. at UC Berkeley in 1936, and his Ph.D in 1941. One of his early contributions was the development of a chronology for Central California (Lillard, et al. 1939). He began his 30 year career with the University in 1946 as an Assistant Professor, and reached full Professor status in 1952. He organized and directed the University of California Archaeological Survey (UCAS) within the Department of Anthropology at UC Berkeley from 19481960. Heizer 's skills as a teacher and researcher led many students into successful and prominent roles in California archaeology Martin A. Baumhoff, James A. Bennyhoff, Albert B. Elsasser, Clement A. Meighan, Dave Fredrickson, Francis Riddell, C. William Clewlow, Karen Nissen, and many others. Many of these archaeologists, including Heizer, have taken an active role in rock art research.

In 1960 the California Archaeological Survey was disbanded and reorganized as the Archaeological Research Facility (ARF), and its research endeavors became more global, with research expanding to Europe, East Asia, India, Southeast Asia, Oceania, the Near East, Mexico, South America, and the Circumpolar Region. Current topics of study include technology, change, pre-historic art, agriculture, ecology, and historical archaeology. Under the directorship of Kent Lightfoot (1988-1989) the ARF was restructured and new goals were developed. Presently the ARF is under the leadership of Laurie Wilke, and now has nearly 40 Research Associates. It provides laboratory and research facilities, sponsors lectures, distributes grants, publishes archaeological reports, and provides outreach to local schools and the community.

While the regional emphasis of archaeology studies has become more universal since the early 1960s, several UC Berkeley individuals have played a significant role in California archaeology. One of the primary contributors was Albert Elsasser, who had joined the Museum in 1951 and continued his association with the University until 1979. His numerous publications continued beyond this time, notably his coauthored *Natural World of the California Indians* (Heizer and Elasser 1980), an archaeological history of Santa Clara County (Elsasser 1986), and his final publication on charmstones (Elsasser and Rhode 1996). Kent Lightfoot is currently devoted to the archaeology of California with his contact/colonialism and shell mound research.

John P. Harrington and C. Hart Merriman were two others who provided an ethnographic foundation for California archaeology. Both worked in cooperation with each other to the exclusion of Kroeber they shared an antipathy toward him (Baumhoff 1978:10). Harrington's work was under the auspices of the Bureau of American Ethnology, and Merriman was privately funded (by a bequest from Mary W. Harriman). Both of their research collections are available at U C Berkeley. Regionally, the Southwest Museum in Los Angeles (founded in 1907) has also greatly contributed to studies of California archaeology. The Holocene series (Erlandson and Colten 1991; Erlandson and Glassow 1997; Erlandson and Jones 2002) is representative of the role that UCLA and the Cotsen Institute of Archaeology currently holds in California archaeological research (and publication).

In the mid 1970s Academic Press began to search for someone to write a synthesis of California archaeology (Moratto 2004:xxxvxxxvi). While Michael Morrato was the ultimate creator of what has become the widelyused text and reference for archaeologists that chronicles California archaeology (Moratto 1984), it was Robert Heizer, grounded in his 40 years of dedication to the archaeology of California, who was initially asked to be the author. He turned down the offer commenting that "it can't be done" (p. xxxvi), probably due to the complexity of the subject. The history and development of archaeology in California involves a very complex story that has included an immense number of contributors. The Moratto volume has recently been reprinted with the inclusion of an introductory chapter (2004).

The year 1984 also saw the publication of an additional volume on California archaeology (Chartkoff and Chartkoff). This second overview was seen by Morrato (2004:xxxviiixxxix) as complementary to his recent publication. While Moratto's book was written as an introduction to pre-historic archaeology for students and general readers, the Chartkoffs' publication also covered the Historic period and the status of current archaeological programs and resources.

In 2004, the 20th anniversary of the publication of the Moratto and Chartkoff volumes, the Society for California Archaeology hosted a symposium to recognize the contributions of these authors and to review progress in understanding California archaeology in the past 20 years. Building on the presentations at the Symposium, ultimately the Society for California Archaeology and AltaMira Press published an edited volume on *California Prehistory: Colonization, Culture, and Complexity* (Jones and Klar 2004) with 53 contributors, including myself.

Culture History

According to Heizer (1978c:1) the California culture areas are not defined along the politicalgeographical boundaries determined in 1850 at statehood. Heizer cites Bancroft as the first to recognize the broad culture areas of the state (Northern, Central, Southern) (p. 8). While past anthropologists studied pre-historic cultures defined by state boundaries (Kroeber 1925; Powers 1976), Holmes (1919:114-117) was the first to offer a "culture characterization" (Heizer

1978c:1). He correctly linked the northwest of California with the Northwest Coast area, and southern California with the Southwest. However, he expanded the California culture to include the entire state and portions of western Arizona. Kroeber (1925) divided California into five subculture areas (Northwestern, Lutuami, Central, Southern, and Great Basin) later revisiting and modifying his classifications (1936). He changed the Lutuami to Northeastern. Kroeber considered the Northwestern, Southeastern, and Great Basin to be related to cultures other than Californian, and identified the Central subculture as "most distinctively California". It is within this Central subarea that the majority of my research sites are located. According to Heizer (1978c:1), Wissler (1938), while not specific in his mapping, did note that Central California tribes set the norm or were "typical" for California, and that the north, east, and southeast were influenced by adjoining areas. Clearly, this conception of culture areas and their relative integrity is underpinned by notions of diffusion. When the Smithsonian *Handbook of North American Indians* published the first of its 20 volume set (Volume 8), on *California*, Heizer outlined the California culture much as originally suggested by Driver (1961). Research in the last 20+ years has somewhat modified the archaeological regions and subregions of California. A recent textbook (Moratto 2004) identifies the following: 1) North Coast Region – a) Northwest Coast, b) Eel River, c) Russian River/Clear Lake; 2) Northeastern Region – a) Cascade, b) Plateau; 3) Central Valley Region – a) Sacramento Valley, b) Delta, c) San Joaquin Valley; 4) Sierra Nevada Region – a) Northern Sierra, b) Central Sierra, c) Southern Sierra; 5) San Francisco Bay Region; 6) Central Coast Region; 7) Southern Coast Region, a) Santa Barbara, b) San Diego; 8) Desert Region – a) Western Great Basin, b) Southwestern Great Basin, c) Colorado River. It is my contention that as more archaeological studies enhance our understanding of the pre-historic period, as rock art is more integrated into regional research designs, and reliable rock art dating techniques are developed, further modifications of culture areas will be proposed and accepted that address both the temporal and spatial perception of California prehistory. Other factors and developments may also lead to revisions in the spatiotemporal units commonly defined.

In review, the study of archaeology in California has gone through several stages, and addressed various major research questions. The above sections have focused on these phases. From the beginning, as Moratto argued, studies were based on *culture history.* Kroeber, Heizer, and others were concerned with the designation of *culture areas.*

Chronological Development

While some early endeavors at development of a chronology for parts of California were published in the late 1920s by M. J. Rogers, David B. Rogers, and Ronald L. Olson (Baumhoff 1978:12), it was not until 1939 that the first serious attempt at a synthesized chronology appeared (Lillard, et al. 1939). This synthesis of data by Jeremiah Lillard (President of Sacramento Junior College), Robert Heizer (a graduate of Sacramento Junior College, and at the time a graduate student at UC Berkeley), and Franklin Fenenga (also associated at the time with Sacramento Junior College), represented the existing archaeological work of Sacramento Junior College and the University of California, Berkeley, in the Sacramento Valley and Delta regions over a three year period. Their cultural sequence was based mainly on artifacts found in association with burials. Previous to this report, Kroeber had summarized the early attempts at chronology (including the early work of Lillard), in an *American Antiquity* article (Kroeber 1936). He noted that even though the earliest scientific excavations in California – shellmound research by Uhle, Nelson, Gifford, and Schenck – had ascribed sequence by statigraphy, because of the "meagerness of content" they were the "least favorable for attacking timechange problems" (pp. 112-113).

HunterGatherer Archaeology

The approaches of *huntergatherer* research have played a major role in California archaeology. Early interest in hunting traditions was directed to projectile point typologies. According to Moratto (2004:7981) no Folsom type points have been found in California, but Clovislike fluted points were identified by Emma Lou Davis (1874; 1968) and others. Fluted points were also the subject of study by Mark Harrington at Borax Lake (Harrington 1938, 1945, 1948), with later research by David Fredrickson for his Ph.D. dissertation that recognized three cultural components at Borax Lake based on lithic technology (1973).

The last twentyfive years have witnessed several notable developments in huntergatherer research in the archaeology of California by a number of individuals. Mark Sutton of California State University, Bakersfield, directed his work in the Mojave Desert at understanding the adaptations of huntergatherers to arid environments (1987) . The concept of *optimal foraging* – a high caloric return for less energy investment – has been the subject of research by Jack Broughton (1999). Breck Parkman (1994), in his study of bedrock milling stations, argued that the ancestral Ohlone utilized a subsistence strategy that focused on seasonal exploitation of their environment. Resource intensification has also been the focus of Mark Basgall (1987). A very recent volume (Raab and Jones 2004) presents current research on optimal foraging strategies of huntergatherers and will be discussed below.

Research into early coastal adaptation by huntersgatherers, especially in southern California has been the theme of work by Jon Erlandson (1988). Erlandson and others published a threevolume series on the Early (10,000 – 6600 B.P.), Mid (6600 – 3500 B.P.), and Late Holocene (3500 B.P. to contact) occupations of the California Coast (Erlandson and Colten 1991; Erlandson and Glassow 1997; Erlandson and Jones 2002). Most papers are from symposia of meetings of the Society for California Archaeology. The initial volume dealt geographically with Southern and Central California, as little research existed north of Monterey Bay. It focused on environmental reconstruction, humanenvironment relationships, and technological developments. The second volume summarized the nature of the coastal Middle Holocene environments and human adaptation, and included papers on the San Francisco Bay and North Coast areas. In the most recent volume, papers focused on the development of cultural complexity during the Late period, and examined relationships between environmental shifts, culture changes, and other aspects dealing with the emergence of sociopolitical and economic complexity. More regional studies were directed to Northern California. Jeanne Arnold was the Senior Series Editor for the volumes. Arnold, a graduate of University of California, Santa Barbara, and on the faculty at UCLA, has completed many field seasons in the Channel Islands and has written on the social complexity of huntergatherers and origins of chiefdoms (1992, 1993) and recently published a new article on the complexities of the Chumash culture (2004). She is also the coauthor of a new regional synthesis of California archaeology, (Arnold, et al. 2004), and the author of a new SAA publication on California (2010), discussed below. This Spring (2011), Erlandson and colleagues (Erlandson, et al. 2011) published an article in *Science* that reported human bones on Santa Rosa Island had been dated to 13,000 B.P., confirming very early dates for Coastal California.

Mark Raab and Terry Jones have recently published a book focusing, in part, on hunting and gathering societies in California (2004). They argue that it was not until the close of the twentieth century that California archaeology was ready to accept alternative theoretical perspectives on foraging (2004:3). Data now exist and are presented in this volume that offer "alternatives to the traditional tendency to interpret California archaeological data primarily by analogy with ethnographic scenarios" (ibid.). Contributing authors explore the ecological impact of hunting practices, climatic changes, and variability of food abundance. The optimization or selectionist approaches are the subject of papers by several authors (Broughton 2004; Hilderbrandt and Jones 2004; Kennett and Kennett 2004; Porcasi and Jones 2004). The intensive reliance on resources, in this case acorn, is addressed in another chapter (Basgall 2004). Jones had previously edited a book on the maritime prehistory of California that included contributions by Arnold, Erlandson, Glassow, Lightfoot, Raab, and others (1992).

Absent from the major research questions outlined above is the role of rock art studies in California archaeology. Such studies have developed along a separate path from socalled mainstream archaeology, and are summarized below.

Rock Art in California Historical View of Studies

The first recording (drawing) of rock art in California was by Joseph Goldsborough Bruff, on October 1, 1850 (Bruff 1873:423424). He discovered a panel of incised images as he crossed into California from the Plains, in Snowstorm Canyon, Lassen County. As he drew the extensive petroglyph panel, he was guarded by companions from what he perceived as menacing Indians. Heizer and Clewlow note that Bruff published his drawings in a *Report to the Smithsonian Institution* (1873), with images altered from the original 1850 drawings (Heizer and Clewlow Jr. 1973:3). Plates of both drawings and a photo documentation of the site by Dale Ritter are included in the Heizer and Clewlow text. Heizer and Clewlow (1973:Plates 21 a,b,c) also mention sketches of petroglyphs at Paiute Pass in San Bernardino County in 1854 by Lt. A. W. Whipple (Whipple, et al. 1856:56). This panel was later relocated and studied by Aida Haenszel (1971a), who noted artistic liberties taken by Whipple in combining separate elements into a single panel.

In 1879 Col. Garrick was appointed ethnologist to the newly formed Bureau of Ethnology (Mallery 1893:vi). Mallery's interest in petroglyphs began in 1876, while stationed at Fort Rice on the upper Missouri river. Mallery's macro survey/study of *PictureWriting of the American Indians* was submitted as the *Tenth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution* by J. W. Powell, in 1889. An earlier essay by Mallery, "*Pictographs of the North American Indians: A Preliminary Paper*", was contained in the *Fourth Annual Report of the Bureau of Ethnography*. Mallery's 188889 reports included the first attempt at a survey of rock art in California. This survey was compiled from information gathered from several individuals. According to Mallery (p. 56), Dr. W. J. Hoffman, of the Bureau of Ethnography, had 'hastily examined' some of the sites in the Owens Valley in 1871, and returned for more study in 1884. Mallery includes the text of Hoffman's report (pp. 57-60). While the number of individual sites is not included in his report, Mallery does identify sites occurring at Rocky Hill (near Visalia), Tule River, Owens Valley, Death Valley, Mojave Desert, San Marcos Pass, San Diego County, Santa Barbara, Los Angeles, and Susanville. Mallery was the first to recognize the petroglyphs that are now known as PCNs (**P**ecked **C**urvilinear **N**ucleated) (Mallery 1893:69), along Porter Creek, in Sonoma County.

Alfred Kroeber (1925) in his *Handbook of the Indians of California* included petroglyphs (which he titled *Pictured Rocks*) in the final pages of his text (pp. 936939). His short general discussion was accompanied by a map that identified 23 painted sites (pictographs) and 27 carved sites (petroglyphs), noting that the majority of sites were either within historic Shoshonean territory or adjacent to it. Observing that rock art is common in the Great Basin (Shoshonean), Kroeber drew a strong inference that the rock art of California was the direct work or influence of the Great Basin Shoshonean people.

The first systematic survey of California rock art was by Julian Steward (1929). Initially planning to include just petroglyphs (and pictographs) of California, Steward expanded his survey to include adjoining states to avoid the political boundaries and to include similar styles. Steward did not personally visit most of his reported sites, gathering most of his information on the sites from records on file with the Department of Anthropology of the University of California, Berkeley, primarily from private contributors. During the two years prior to the publication of this volume, Steward solicited site information through correspondence. Steward sent inquiries to the local Postmaster of small towns throughout California in search of known rock art sites. I came across some of Steward's original letters and responses while browsing through an unpublished manuscript folder in the Hearst Museum several years ago. These very interesting notes (which provide fascinating insight into Steward's work) are now identified as Manuscript #230 of the *Collection of Manuscripts for the Archaeological Archives of the Phoebe A. Hearst Museum of Anthropology*. Steward only made personal visits to a few of the sites. He identified 293 sites (129 within California) and labeled them as Pt. (petroglyph) or Pc. (Pictograph). Steward was the first to place petroglyphs in California in style areas (see detail below), and has been credited with the first to use the terms *petroglyp*h and *pictograph* (Bahn 1998:65). This claim will be challenged later in the chapter during a discussion of terminology. In 1946 C. E. Smith prepared a supplement to Steward's work detailing additional sites, which is found as Manuscript #61 in the *Collection of Manuscripts for the Archaeological Archives of the Phoebe A. Hearst Museum of Anthropology*.

In 1946 R. M. Tatum published an article in *American Antiquity* identifying 130 sites in California and noted that the survey was complete, and it was not expected that additional rock art sites would be identified (sites now number in the 1000s).

In the early 1960s Robert Heizer and Martin Baumhoff (1962) reported results of a three year rock art study of the western Great Basin in a publication of *Pre-historic Rock Art of Nevada and Eastern California*. It concluded that the rock art of the study area was the result of the "economic pursuit of hunting large game" (p. 239), and magical or ritual events.

Ten years later Heizer again published on the *Pre-historic Rock Art of California* (Heizer and Clewlow Jr. 1973). Heizer and Clewlow noted that this twovolume publication was the culmination of the work, since 1948, of the Archaeological Survey of California, now the Archaeological Research Facility (ARF), University of California, Berkeley. The rock art portion of the survey was meant to resume where Steward's 1929 monograph ended. Much controversy surrounded this publication and the professional relationship between the authors and Tom King and Michael Morrato of California State University, San Francisco. According to the recollections of Breck Parkman (California State Senior Archaeologist) the basis of the ongoing controversy was related to the newly defined field of CRM. King and Morrato were instrumental in the development of CRM in California, and Heizer adhered to the traditional academic structure. Heizer was also very 'secretive' with his site records. This 'titfortat' resulted in the censure of the publication (Heizer and Clewlow Jr. 1973) by the SCA (Society for California Archaeology) for revealing site locations (a violation of the SCA ethics code). At the time, Chester King, who also engaged in CRM practice, was President of SCA. This censure was retracted two years later (2005: Breck Parkman, personal communication).

The Smithsonian volume (*Handbook of North American Indians* No. 8) on California (Heizer 1978a), included a 6 ½ page chapter on rock art (Clewlow Jr. 1978). In this short article Clewlow reiterated the style areas that he had earlier defined in his book with Heizer (Heizer and Clewlow Jr. 1973). The article includes a very short historical introduction to California rock art.

Several individuals who have made substantial contributions to California rock art studies came to the discipline from outside academic ranks. In 1979 Klaus F. Wellman, Clinical Professor of Pathology, State University of New York, an avocational rock art researcher, published (in Austria) a comprehensive reference and source book of North American rock art (Wellman 1979). In the California section Wellman includes 30 pages of his own high quality photographs, which provided much material for future comparative studies. He served as the first president of the American Rock Art Research Association. Another contributor of note is Campbell Grant, a professional artist, naturalist, and author of several books and articles on rock art (Grant 1965, 1967, 1971; Grant, et al. 1968). While he produced one volume on the *Rock Art of North America*, much of Grant's work was directed toward Chumash rock art and that of the Coso Range in southern California. Grant visited his first painted cave, near Santa Barbara, as an avid hiker and naturalist in 1960, when only 17 such caves had been identified. Spending three years of intensive field work, he eventually identified more than 80 pre-historic painted caves in the Santa Barbara region (1967:vii). His work expanded throughout California and surrounding areas funded by a grant from the National Science Foundation. Much more than photo essay, Grant's work included extensive text related to all facets of rock art research and interpretation, including the designation of style areas. It is hard to not regard the work of Wellman (1979) and Grant (Grant 1965, 1967, 1971; Grant, et al. 1968) as anything but that of professionals. A third 'work' is that of Bill Sonin, Bay Area Volkswagen repairman, and rock art enthusiast. Discovered at the time of his untimely death in 1993 was a computer file containing a 1300 page annotated rock art site inventory and bibliography for the state of California, meant to pick up where Heizer and Clewlow left off. While this file has been published (Sonin 1995), caution must be exercised when using this reference as a research tool, as this was a work in progress, and the accuracy of the information is not always reliable. The Sonin archival materials are now curated at the Bancroft Library and his bibliographic database has been expanded by Leigh Marymor to now include more than 20,000 entries, worldwide. The database consists of searchable rock art papers and manuscripts both published and "grey literature" – that can be accessed worldwide through the Bancroft web page:

http://bancroft.berkeley.edu/collections/rockart/search.html.

How Rock Art Developed in Theory and Method

As stated above, early California archaeology was driven by *culture history*, and what Moratto called "a classification obsession of Californianists" (Moratto 2004:xxix). In many ways a historical perspective on the development of rock art studies mirrors that of the general field of archaeology. Rock art research began with Mallery's ethnohistoric work (Mallery 1893). The early rock art studies, such as Mallery's, consisted of only a collection of sites, and was similar to the early archaeological collection and cataloging of artifacts that served as the basis for taxonomies. Tatum (1946:123124), when commenting that his study only deals with petroglyphs (eliminating pictographs), states that pictographs may represent a 'higher stage of development' – a stage or evolutionary (Darwinian) approach to pre-historic development common to the period.

The later work of Grant (1971a; 1965; Grant, et al. 1968), Heizer and Baumhoff (1962), and Heizer and Clewlow (1973), follows the explanatory approach of the Processual or New Archaeology of the period, with research designs, hypothesis formulation, and rigorous testing. Hypotheses were presented that introduced the broadly held interpretation of rock art as representing "*hunting or sympathetic magic"*. This period of rock art focuses on hunting magic theories and corresponds with a surge of interest in anything in anthropology on huntergatherers and "man" as a hunter as exemplified in the international 1966 Symposium at the University of Chicago, that produced the classic edited volume on *Man the Hunter* (Lee and DeVore 1968). This interest was preceded by the interpretation of the French painted caves as representing hunting magic, and the publishing of Breuil's volume on *Four Hundred Centuries of Cave Art* (Breuil 1952). Nels Nelson, early California archaeologist, had also spent time in the early 20th century, working in France.

With the rapid population growth in California beginning in the 1960s, archaeological resources, including rock art sites, were being obliterated at a brisk pace. Rapid changes took place in the field of archaeology. Salvage archaeology first gained a footing, with much of the work being done by volunteers. Avocationalists also became very active in rock art recording. Large universities continued to produce scholarly articles, but a great number of the salvage projects failed to submit written reports or the reports were of poor quality – yet this is all the information that remains of many sites. During the 1970s new environmental laws were enacted, and government agencies needed to deal with cultural resources. Cultural resource management (CRM) developed as a business to deal with new regulations, and CRM became a course of study in colleges and universities. The State Information Centers became clearing houses for regional site information. The Society for California Archaeology welcomed both professional and avocational archaeologists to unite in ethics measures (Moratto 2004:xlxliii). Many rock art site reports and manuscripts were completed and written during this period.

In the 1980s a movement mainly embraced in the United States by David Whitley drew on the work of South African researchers David LewisWilliams and Thomas Dowson (1988). They recognized the universality of many rock art elements based on what they saw as entoptic phenomena that are "seen" when one is an altered state of consciousness (ASC); this was their neuropsychological model. While this interpretive approach may be applicable to some rock art, most researchers do not now give it as much consideration as it once garnered (Bahn 1988; Hedges 2001; Layton 1988; Quinlan 2000). During the same period, empirical dating techniques, as applied to California petroglyph studies, were introduced by Ronald Dorn and David Whitley. Some of the early attempts at dating Coso rock art produced very early dates (Whitley and Dorn 1987, 1993) that, for a short time, generated great excitement in the rock art community. Initially these techniques appeared to be very promising, but questions about the methodologies later challenged the credibility of the results. Currently, the chronology of rock art sites is 'backtothedrawingboard' (Dorn 1996, 1998). Most recent advances in dating methods for rock art focus on associated (or relative) dates, but advances in direct dating are also in progress. These methods will be addressed in a later chapter. Accurate dating is now limited to pictograph sites, where organic material in the pigment can be tested by employing time tested methods such as AMS (Accelerator Mass Spectrometry) Carbon14 dating.

Rock art research, following the developments in archaeology in general, has in the last two decades moved through a PostProcessual phase and is engaging in recent approaches that contextualize rock art. The PostProcessual period of archaeology is also known as an interpretive archaeology that strives to understand social factors and how human societies function. This is accomplished through a contextual approach with many researchers using a landscape epistemology, and incorporate crossdisciplinary studies. Researchers are consulting with Native people, researching ethnographies and oral histories, investigating with multiple lines of inquiry, and are applying new research designs that include GIS (Geographic Information Systems) and 3-D imaging and recording. The advent of the digital age has also introduced new technologies that are being applied in the area of photographic recording including work by Robert Mark and Evelyn Billo (David and Wilson 2002; Mark and Billo 1999), and the exciting new field of digital capture and documentation by Cultural Heritage Imaging (CHI). CHI Founders Mark Mudge and Carla Schroer have collaborated with Hewlett Packard Laboratories (HP Labs) and university and government researchers around the world to develop a photo technique to record heritage objects (including rock art) (Mudge, et al. 2006; Mudge, et al. in prep.)

As noted earlier, many of the individuals who have taken an active role in rock art research in California (Grant and Wellman, to name two) have been avocationalists or have been trained in fields other than archaeology. In many cases the marginalization of rock art by the archaeological discipline may be due to rock art research being, so often, the ‘domain’ of avocationalists. Much of the early disregard for rock art by archaeologists was due to the inability of placing rock art in a stratigraphic context, which left its temporal status indeterminate (at least as perceived by many). Much credit must be given to those outside the ‘professional’ realm for their contributions and the untold hours they have spent (and many continue to spend) in the field recording numerous sites.

Rock Art Studies Today

As noted above**,** great advances have been made in rock art research over the last several years. David Whitley’s work has introduced a more theoretical approach, and relies heavily on models derived from ethnographic literature. Amy Gilreath has integrated her studies of the Coso area rock art into her mainstream investigations of the archaeology of the region. Federal and State agencies integrate rock art resources into their studies and policies. Some Native American tribal elders, scholars, and cultural affairs officers are beginning to take an active interest in rock art.

Research into the PCN (Pecked Curvilinear Nucleated) tradition of rock markings began in 1972 when its typesite was first identified in Marin County (Hotz and Clewlow Jr. 1974). In the last three decades subsequent research (Fentress 1999; Gillette 1998b, 2003; Miller 1977; Parkman 1991; Rushing 2004) has advanced the knowledge of what the tradition may encompass. My goal in writing this dissertation is to contribute substantial additional knowledge concerning PCNs, and, through a contextual approach, will move beyond simply a ‘rock art study’ to a contribution to the field of California archaeology that will answer larger questions about the pre-historic movement of cultures across the landscape.

The Role of Rock Art in California Archaeology

As stated in the quote at the beginning of this chapter by Brian Fagan, rock art studies within the discipline of archaeology have had until recently a history of being and feeling marginalized to what have been the socalled "mainstream" archaeological approaches and subjects. As the theoretical approaches to archaeology have changed in the last several years, so have those of rock art studies. As noted earlier, University of California, Berkeley, has long encompassed rock art studies in its research and publications.

Early site reports provided few details on rock art sites. They included comments such as "painting on the rocks nearby", only approximate locations and little or no contextual information. Currently, site reports provide explicit UTM (Universal Trans Mercator) coordinates, and surveys now actively search for rock art within the project boundaries.

Even though there is increased and specific incorporation of rock art information in site reports and in many archaeological studies the major text books of 25 years ago (Chartkoff and Chartkoff 1984; Moratto 2004) gave little attention to rock art. Chartkoff and Chartkoff included little more than a page (out of 344) of total text (plus photographs) to rock art, and, while Moratto did integrate rock art several times in his text, mention was minimal and superficial. At the final session (Symposium 10) of the 2004 Society for California Archaeology (SCA) meeting, Amy Gilreath, current President of SCA, gave an impassioned plea for the inclusion of rock art in future textbooks. This session, organized with the above authors as discussants, reviewed the status of California archaeology since the publishing of both texts in 1984, which culminated in a new edited volume (Jones and Klar 2004). This new text contains a chapter dedicated to rock art (Gilreath 2007). The newest volume on California (Arnold and Walsh 2010) does include a section on Chumash and Coso rock art, but has ignored the rock art in the rest of California.

In 2001 the Society for California Archaeology asked Brian Fagan to write a book about the archaeology of California for the general public (2003). One of the fifteen chapters (22 pages) in this interesting and well written narrative is entitled *Art on the Rocks*. While presenting a basic understanding about rock art to the reader, most of the emphasis of the chapter is directed to the elaborate (and colorful) images of the Chumash, the interesting petroglyphs of the Coso Range, and much emphasis on shamanism. There is a short section on earth figures (geoglyphs). I argue that in addition, some of the less representational and sensational elements (such as cupules and PCNs) might make a substantial contribution to the understanding of prehistory.

As indication of the increasing acceptance of rock art studies in academia, several recent Master theses have been submitted that focus on California rock art studies. These follow the early work of Louis Payan (1966), Ken Hedges (1970), and Teresa Miller (1977). Payan presented an intensive identification and study of the rock art of the northern Sierra Nevada Range; Hedges dealt with Diegueño rock art from the very southern part of California; Miller's thesis identified a predictive model for locating PCN sites. Miller's work contradicted the earlier claims by Steward (1929), and Heizer and Clewlow (1973) that Marin County was devoid of rock art. She identified 56 PCN sites within the county boundaries (Miller 1977:5861). Kay Sanger (1987) produced a thesis on rock art in the Temblor Range that focused on an interesting cultural boundary where different groups converged, possibly for trading. Jeffrey Fentress (1992) documented the presence of pre-historic rock art in Alameda and Contra Costa counties, and Leigh Jordan (1995) completed a study of style and meaning in the Southern North Coast

Ranges. This was followed by Richard Star Shepard's study (1996) of Luiseño rock art and the sacred landscape. My own Master's thesis (Gillette 1998b) identified the geographical distribution of PCN sites and addressed whether they represented a technological or ideological aspect of the culture. Two recent theses (Basgall 2004; Rushing 2004), took a contextual approach. The Jones thesis also addressed ritual expression, as represented by cupules in the southern North Coast Ranges. Rushing also focused research on the PCN tradition. However, his thesis suffers from some glaring problems, such as incorrect citing of my data, use of old maps, and several references missing from his bibliography, and his criticism of other researchers. On the positive side, he was the first to apply GIS tools to PCN research with promising results that suggest this method may provide a link between environmental data and PCN sites. The rock art database also lists theses involving California rock art by Bernard Jones (1979), Charles Davis (1981), and Thomas Thompson (1993). Others also likely exist.

Three Ph.D dissertations also focus on California rock art, including research by David Whitley (1982), which was directed on South Central California, and laid the foundation for his continuing plethora of work. The second, by Karen Nissen (1982), encompassed fareastern California (Great Basin), and included the analysis of rock art as it pertained to the hunting magic hypothesis. A third dissertation was by A. M. McDonald (1992), who studied Indian Hill in AnzaBorrego State Park.

Rock Art Style Areas

As is evident in the historical perspective of rock art research offered above, the designation of style areas has, over the years, gone through much revision. The history of defining rock art styles is not unlike the changing definitions of culture areas in anthropology. After's first quantification of California sites (Mallery 1893), Steward (1929) placed the 129 sites he identified into seven 'stylistic areas', based on geographic location. These included 1) Northwestern California, 2) Northeastern California, 3) Tulare, 4) Owens Valley, 5) Santa Barbara, 6) Mojave, and 7) Southern California (p. 56). Heizer and Baumhoff (1962:197109), while concentrating their studies in the fareastern area of California, initially divided their style designations into five groups – 1) Great Basin Pecked, 2) Great Basin Painted, 3) Great Basin Scratched, 4) Puebloan Painted, and 5) Pit and Groove. A later revision subdivided the Great Basin Pecked into Great Basin Representational and Great Basin Abstract, further delineating the Great Basin Abstract into Curvilinear and Rectilinear. The Pit and Groove style had been introduced in an earlier report (Baumhoff, et al. 1958). Perhaps this style name had an influence on the name selection for PCNs – Pecked Curvilinear Nucleated (Miller 1977:1) because it makes explicit the probable techniques for the actual marking.

In his thesis that recorded 133 rock art sites in seven counties in the Central Sierra area, Payen (1966) analyzed the sites in terms based on eleven elements, separating them into two groups. First, the Pit and Groove Tradition, which was then further, differentiated into Style 1) Pitted Boulders, Style 2) Pit and Groove, and Style 3) Complex Pit and Groove. His second tradition (or group) he labeled AbstractRepresentational, and contained Style 4) Simple Abstract Monochrome, Style 5) Abstract Polychrome, Style 6) Valley Sierran Abstract, and Style 7) High Sierra AbstractRepresentational. Payen considered Styles 1 and 2 to be the oldest based on superposition of styles, visual appearance related to patination, weathering, and preservation, and by relating associated archaeological deposits with the rock art (pp. 6671).

Campbell Grant (1967:114) divided the rock art of California into four style areas based on method of production and the major concentrations – 1) Abstract Linear (Painted) in Southwestern California, 2) Abstract Polychrome (Painted) in Coastal Ranges (Santa Barbara Area) and the Sierra Foothills (KernTulare Counties), 3) Abstract Curvilinear (PeckedIncised) in Northern California, and 4) Pit and Groove (Pecked) Northern California.

When Heizer wrote his second rock art book with Clewlow (Heizer and Clewlow Jr. 1973), their inventory of sites had increased to over 400 (Shepard 1996:9). They argued that two basic types of rock art could be recognized in California – *pictographs* (painted), and *petroglyphs* (pecked, abraded, or ground into the stone), and proceeded to further classify the sites (Heizer and Clewlow Jr. 1973:2147). They identified four petroglyph styles – 1) Great Basin petroglyph style, 2) Central Sierra petroglyph style, 3) Southwest Coast petroglyph style, and 4) North Coast petroglyph style. The North Coast style was based on a sample of only eight sites in four counties (Humboldt, Trinity, Lake, and Mendocino). These North Coast sites have been identified through ethnographic literature to represent two distinct ceremonial practices: weather control (Tolowa, Karok, and Hupa) and fertility (Pomo). The former refers to rain rocks, while the other one "baby rocks". It is this second practice outlined by Heizer, (and referred to as *baby rocks*) which cited ethnographic accounts that relate to my research. They proposed five style names for pictographs in California: 1) South Coast Range Painted style, 2) Santa Barbara Painted style, 3) Southwest Coast Painted style, 4) Southern Sierra Painted style, and 5) Northeast Painted style.

Since the early 1970s little research has addressed rock art styles or traditions in California from a macro perspective. David Whitley's recent publication revisits the designation of California rock art traditions (2000:4767). Whitley begins his section on rock art traditions by designating a broad area of the western United States as representative of what he calls the Far Western Pit and Groove Tradition. He sees this tradition as widespread, extending into the Great Basin, Columbia Plateau, and elsewhere in the West. Whitley argues this tradition is not representative of any specific culture, but representative of a broadly shared practice that transcends much of western North America. It consists of the abrading of cups (cupules or pits) and lines (grooves) into the rock surface. They exhibit no discernable pattern. Whitley has identified two regional variants of the Far Western Pit and Groove Tradition the Northern Pit and Groove, found north of the San Francisco Bay area, and north and eastward into the central and northern Sierra Nevada, which would encompasses the research discussed in this dissertation, and the Southern Cupule variant, which extends south from the San Francisco Bay area and eastward into the Great Basin. The designation "*Far Western Pit and Groove Tradition*" was introduced by Whitley in this text (personal communication 2005), although Heizer and Baumhoff had noted that the Pit and Groove style occurring in Nevada appeared to be the same as that which occurred in California (Heizer and Baumhoff 1962:235). Whitley identifies four additional tradition areas for California: 1) *California Tradition* – which encompasses most of Coastal and Central California – is primarily, but not exclusively painted. More regional local variants may be subsumed under this tradition, and consist of SouthCentral Painted, Southwest Painted Maze, Peninsular Painted, and California Engraved variants; 2) *Great Basin Tradition*, extends beyond the Mojave Desert, the basin and range area of California, and portions of Nevada, Oregon, Utah, Idaho, and Wyoming. It consists of rock paintings over engravings. He recognizes two variants within the tradition – the Great Basin Engraved, and the Great Basin Painted variant; and 3) *Plateau Tradition* – located on the Modoc Plateau in northeastern

California and southern Oregon. It is characterized by stick figure humans, blockbodied animals, rayed circles or arcs, concentric circles, tally marks, and other geometric designs. The tradition includes both pecked engravings and paintings. Whitley's last tradition is 4) *Earth Figure Tradition*, which is further divided into geoglyphs (intaglios) and rock alignments located near the Colorado River in the desert. In general I agree that Whitley's designation of California rock art traditions is an acceptable fit for presently identified sites. The exception for this 'fit' will be presented below.

Do Rock Art Styles Correspond with Culture Areas?

To me the designation of style areas or traditions reflects a snapshot in time, and does not accurately portray boundaries or allow for change over time. Pre-historically groups of people were on the move. This is evidenced by the maps accompanying linguistic studies (see Moratto 2004:529574). Whitley comes the closest to dealing with this problem by defining the Far Western Pit and Groove Tradition, which address different temporal periods. Whether or not the rock art styles and culture areas of California correspond is a complex question, and will need additional study. The above section indicates that rock art style areas – just as California culture areas in California Culture history archaeology – have been of great importance to researchers. It may also indicate that for a large period of time, rock art studies involved taking the rock art off the wall out of context – and just studying the elements from a comparative approach.

Proposal for the Revision of Accepted Tradition/Style Areas to Include the PCN

When Heizer and Clewlow published their compendium of *Pre-historic Rock Art of California* (1973), they ended the text portion of the volume with the statement:

> "A great deal is now known about the kinds of rock art which occur throughout the state of California, and while there are undoubtedly large numbers of sites still awaiting discovery and recording, it can be said that no large areas with new and distinctive rock art styles will be found" (p. 64).

How correct they were that many sites remained to be revealed through the remainder of the 20th century, and the first decades of the 21st century, and many will continue to be documented in the future. However, they were mistaken about the complete identification of "new and distinctive rock art styles". The identification of the PCN (**P**ecked **C**urvilinear **N**ucleated) tradition in the Coastal Ranges of California (my research area) presents a style or "tradition", as discussed earlier, that requires a new look at designated rock art "style areas"/traditions in California, or as Whitley has suggested, "variants in the California tradition" (2000:4749). As recent as this latest publication, North and South variants of the California Tradition, (a component of the Far Western Pit and Groove Tradition), are considered separately. I argue that the PCN tradition stands by itself, based in part by the geographic distribution of known sites (see Gillette 2003) whose occurrences appear to be restricted to the Coastal and Transverse Ranges, and may add a new dimension to the understanding of the use of the pre-historic landscape. I also propose that recognizing the PCN tradition as a separate entity can add important information on how pre-historic people moved through the landscape, and offer additional temporal information on the prehistory of California. The distribution of sites throughout the Coastal Ranges California will be elaborated on in the following chapter (IV).

Who Made the Rock Art and What does it Mean?

The interpretation of rock art has long been problematic for researchers. Perhaps Heizer put it best when he stated that "when the rare chance arises to place any type of petrography (what Heizer calls rock art) in a solid ethnographic context, a goodly amount of scientific interest is excited" (Heizer and Clewlow Jr. 1973:39). Fortunately, ethnographic accounts relating to the interpretation of rock art use exist in some areas. These include the Southwest Coast area, with the painted girls' pubertyrite sites as mentioned above, the rain rocks of the North Coast Petroglyph style in Tolowa, Karok, and Hupa tribal areas, and the Pomo "baby rocks" in the same style area. As mentioned earlier, David Whitley draws heavily on ethnographic accounts in his defined Great Basin Tradition. With ethnography playing a key role in interpretation, the ethnographic literature in the Pomo area will be addressed in a later chapter.

Synthesis and Direction of California Archaeology and Rock Art Studies

A reflective look at California archaeology and its intersection with rock art provides an interesting glimpse into the past. The interest in rock art by Mallery, Steward, and Kroeber predated the inception of archaeological research in California. Kroeber noted that the early research in California needed to concentrate its efforts on gathering ethnographic information while Native speakers were still around that had a recollection of the times before contact and the introduction of nonNative ways. While ethnographic studies normally focus on participant observation at "surviving" villages, Kroeber's study initiated a "memory culture" methodology where a few tribal elders were asked to recall as much about their past as possible – including their childhood, parents, and previous generations, construct traditional Indian cultures before European contact (Lightfoot and Parrish 2009:7778; Lightfoot 2005:3233)

I find it interesting that the academic world, especially UC Berkeley (Heizer), took so much interest in the rock art of California. Although often marginalized, rock art studies in California have been 'grounded' in academia. During the latter half of the last century few scholars crossed into the rock art domain for their graduate studies. The last few years have seen an increase in graduate work directed toward rock art, and a movement of research from specific sites to placing rock art within the landscape – both cultural and geographical. I believe this direction moves rock art studies closer to mainstream archaeological investigation. This gap is being further closed as new study methods are developed that encompass a more empirical approach as creditable dating techniques are developed and new technologies, including computer related aids (GIS and photoenhancing, to name a few) gain in use and acceptance.

Rock Art Terminology

There is something about terminology and rock art studies that seems to garner a lot of attention with researchers and compel many to get overly concerned with certain descriptive words. This section will briefly discuss the current issues and my use of the term 'cultural markings', as well as comment on the selection of the acronym PCN to identify the tradition that I am studying.

The Term 'Rock Art'

According to Reinaldo Morales (2005:61) the first use of the term 'rock art' in the English language is credited to J. Desmond Clark in 1959 in his publication on South Africa Prehistory (Clark 1959). Morales goes on to cite the beginning of the controversy in North

America as starting with Campbell Grant (1967) and his objection of the 'art for art sake' interpretation that implies that pre-historic man had leisure time to develop great art (p. 40), which did not pertain to huntergatherers. Grant stated that the "pictures" on the rocks were put there for special purposes, usually ceremonial. As well, Southwest rock art scholar Polly Schaafsma, found the term too limiting, citing that rock art was created for many different functions (1985:259).

The term 'rock art' always congers up a discussion on the aesthetic quality implied by the term 'art'. Is rock art really art, or is it the result of a shamanic experience or ritual expression? Does the term rock art adequately identify this subject matter? Rockart vs. rock art? Does it really matter?

Much of the discussion of the term 'art' is usually the domain of art historians who argue aesthetic appropriateness of the term and the fact that what we today label as art was not originally constructed as an object of art. Is the use of the term 'art' an attempt to place Western values on the visual remnants of a culture that questionably did not even recognize or have a word for art? Is it a Western construct, since the word art is not even present in many Indigenous languages? A recent edited publication addresses many of these issues (see Heyd and Clegg 2005).

If not 'rock art', then how to should we refer to the field? Carolyn Dean (2006), in her discussion of indigenous art argues that 'visual culture' may be a more accurate description of rock art that eliminates value judgments, is more flexible and a more appropriate recognition of nonart traditions. Carol DiazGranados adds the term 'rock graphics' to the issue of terminology (1993), presenting an in depth discussion in her dissertation. Perhaps one of the most thought provoking and interesting dialogues on the subject is found in the 20062007 issues of *Rock Art Research*, published by the Australian Rock Art Research Association (AURA) where Christopher Chippindale and Paul Taçon proposed 'improving' terminology by inserting a hyphen between rock and art (rockart) (2006), citing Garrick's use of the hyphen in his *PictureWriting of the American Indians (Mallery 1893).* The discussion continued for some time with Robert Bednarik (editor of AURA) commenting that the term has been in use for a long time and needs to be retained (2006). It's the tradition of use that justifies its continued use despite the critiques.

Morales argues that the use of the term rock art is not only acceptable, but also is appropriate stating that "a properly informed understanding of art, one which includes pre-historic painting and engraving on rock as art –*rock art* – can be, in fact, productive and rewarding" (2005:61), and does not "deny the art's communicative, functional or spiritual significance" (p. 71). And, in addition, "it serves to place it alongside the meaningful expressions of Western cultures" (ibid.).

Rock Art vs. Cultural Markings

It is hard to argue with Morales' final comments on the term rock art as presented above. However, in my research I refer to the elements that are identified as PCNs, as 'cultural markings'. I believe that the term cultural markings encompass more depth to the modification on the boulder and more correctly identifies the element. If one wants to be even more accurate, and the ethnographic literature is correct, one might almost be able to identify PCN sites as quarry sites – the removal or quarrying of powder to use in increase rituals. The mark left on the boulder may be the result of the quarrying and, while probably being removed in a ritual manner – in a form identified by many as a vulva – was not the key reason behind the making of the marks.

The Acronym PCN

I have been often asked in my research why use the acronym of PCN and why don't I suggest another designation for the element. Having put much thought into the use of this term it has become obvious that not only is the term widely recognized by archaeologists and researchers in California, but it is probably the most descriptive title offered to date. My initial Master's research (Gillette 1998a) focused on determining a geographical distribution of similar sites within the Coastal Ranges of California. I found that rock art researcher Georgia Lee (Fleshman) identified similar elements as pecked circles and 'pecked ovids' (Fleshman 1975; Lee 1981). PCNs are not oval, or 'egg shaped' as defined in the dictionary, while Mary Alice Baldwin referred to them as 'look like donuts' (personal communication 1995), and 'elongated circle' (Baldwin 1971b). All are descriptive names, but the term PCN seems to be a better fit. A conversation with Teresa Miller (now Saltzman), who ascribed the name, indicated that the acronym PCN – Pecked Curvilinear Nucleated – was decided upon during the writing of her M.A. thesis with consultation with Dr. Michael Morrato, her committee chairperson. It was felt that this was the most descriptive, inclusive title that could be used to identify the tradition. While some researchers maintain that the PCNs at some sites appear abraded, I believe that these individual elements were first pecked and later abraded to obtain powder in a more expedient manner.

So, does it really matter what we, as researchers, call this subfield of archaeology that is widely known as 'rock art'? Probably not, as the term 'rock art' has worldwide acceptance and recognition and use. One example would be the organization known as IFRAO – the International Federation of Rock Art Organizations. The public also identifies with the term, so perhaps, 'rebranding' of the inclusive name is unnecessary! The tradition of the use of the term continues despite the critiques.

Conclusions

This chapter has reviewed the history of archaeology in California and its intersection with rock art. Also discussed was the terminology that is used in rock art research and a defense of the use of the acronym PCN. The following chapter will delve deeper into the PCN tradition and examine the geographical distribution of identified sites, and give a description of known PCN sites both in the study and in the surrounding vicinity and briefly cover analogous sites within the tradition.

IV. The PCN (Pecked Curvilinear Nucleated) Tradition in California

> PCNs … the basic elements are circles and ovals, which have nuclei that appear raised.
> (Miller 1977:44)

Introduction

The previous chapter has reviewed the history of California archaeology and the role that rock art has played in that history. Terminology was also discussed and the rational for the term *PCN* was also included. This chapter will examine the PCN as a tradition of markings that covers a distribution limited to the Coastal Ranges and a portion of the Transverse Range, primarily in California. Similar markings have been reported in Oregon and possibly in Baja California. I have not confirmed these sites with personal visits. The PCN markings were placed on a particular type of boulder – hightalc content schist, with a few anomalous ones being found on sandstone. Beginning with a brief review of their identification I will then focus primarily on the marked boulders that are in the traditional ancestral Pomo lands (Mendocino, Lake, and Sonoma counties), then briefly give an overview of other similar marked boulders to the north and south. A complete listing of known PCN sites is included in the Appendix. Similar markings that appear in other geographical areas will also be addressed. The chapter will conclude with a brief discussion of the "missing centers" of the markings at some PCN sites, and of the bowl quarry hypothesis.

The first identification of the markings that have become known as the PCN tradition was introduced in Chapter I. Beginning with the recognition of the type site on Ring Mountain in Marin County, then the greatly advanced understanding given the research of Teresa Miller (1977) and the geographical distribution that was identified with my M.A. thesis (Gillette 1998a) the PCN element is now recognized by most archaeologists and rock art researchers working in the Coastal Ranges of California and has been the subject of several published manuscripts and the focus of several M.A. theses (see Chapter III).

PCNs have now been identified at over 100 sites in California. An additional ten sites remain to be verified, and three are beyond the California border to the north and remain to be verified. New sites are being identified yearly, through various CRM (Cultural Resource Management) studies, federal and state agency surveys, and by the public. It is also believed that PCN sites may have been destroyed through the years before the markings were identified as cultural artifacts. One example of this is the occurrence of several PCN markings in a wall at the Alvarado area of Wildcat Canyon Regional Park in Contra Costa County. In the 1930s, depressionera work programs were employed to carry out extensive masonry work in the park, including the construction of several walls. Materials for the walls came from local boulders that were broken up to provide the needed materials. Unknowingly, these boulders included PCNs, which are now visible in the walls. How many artifacts were destroyed by this process is unknown. The potential for additional sites to be recognized in nowdeveloped areas is impossible to determine. When the research for this dissertation is complete, all known sites will be identified to the California Historical Resources Information System of the California State Parks Office of Historic Preservation, in either customary or confidential site reports. Earlier site reports will be updated, where indicated. Records for the Information System are housed at twelve locations statewide; the records for my research area are archived at the Northwest Information Center in Rohnert Park, near California State University, Sonoma County.

Identification of the PCN Element

By the beginning of the 1970s, several rock art surveys of California had recognized the occurrence of numerous petroglyph and pictograph sites statewide (Grant 1965, 1967, 1971; Heizer and Baumhoff 1962; Heizer and Clewlow Jr. 1973; Mallery 1893; Steward 1929b; Wellman 1979). These publications failed to identify any petroglyphs or pictographs in Marin or Sonoma Counties, although Steward (1929b) had identified what are now known as PCN sites in Sonoma and Mendocino County. In fact, at least six of Steward's nine "Pt." sites (Steward used *Pt.* to identify petroglyph sites as opposed *Pc.* for pictograph sites) are now identified as having PCNs. It is surprising to me that the PCN tradition was not observed earlier as a "style". Why did Heizer and Clewlow fail to report four sites (Steward's #69 Pt.) that had been published by Steward (1929b) in Sonoma County? Perhaps Heizer and Clewlow only reported on sites with official site reports and failed to take account of printed literature? It was not until 1972, with the identification of the unique markings on the boulder on Ring Mountain (Hotz and Clewlow Jr. 1974; Hotz, et al. 1974), and the intense field surveys of Miller (1977) and Reed Haslem, that PCN elements were identified as a broad tradition and given the name "PCN". The extensive distribution throughout the Coastal Ranges was not recognized until my M.A. research (Gillette 1995), and published in my M.A. thesis (Gillette 1998a).

The PCN Tradition and Vulva Forms

In Chapter I, I identified my use of the term, "tradition", as referring to a specific "type" of petroglyph that covers a broad geographical distribution that is restricted to a certain type of host boulder material, and can be found a cross what we understand to have been probable pre-historic tribal boundaries. Since we cannot directly date petroglyphs it is difficult to address the question of whether this was a "one time period event", or a practice (presumably of a ritual nature) that continued over an unidentified period of time, or if the marking and marks even retained the same meaning(s) over time. The most obvious identifier to us is its characteristic shape the circle, oval, or the elongated form that we have come to know as the "PCN" element. We, as westerners, often look for visual identification (or familiarity) to give objects and "things" meaning or explanation. The task of ascribing a "meaning" to the shape of the elements – or, an interpretation, is where one enters problematic ground. To understand our world, we often draw on the previous work of others to help explain the unknown.

The term "vulvaform" or "vulvalike in appearance" has been applied by many researchers, including myself, to PCNstyle and similar rock art elements worldwide, including the early cave art in Europe (Davis 1961a; Giedion 1957:179; Gillette 1998a; Hedges 1983b:314; HotzSteenhoven 1986:184; Parkman 1993a:354; Rhode 1991). What wants to make us relate the shape of a PCN to represent a vulvaform? In our attempt to give meaning to the PCN we have looked to the early interpretive work (now considered problematic and of a different approach) of Giedion (1957), who considered anything in a round form – a circle, dot, hollow, spots, etc., as always being related to the external human desire for procreation, for fertility (p. 126). Giedion discusses, for example, a connection between fertility and salt mines in Bolivia (p. 180181). By combining the fertility link to the salt mines in Bolivia to the pre-historic method of removing salt from mines in Nevada (Harrington 1925) that leaves a PCNlike scar, it is tempting to suggest some connection between fertility and the removal processes for salt, that leave a distinctive shape and element. The Hohokam ball courts in Arizona where the oval shape of the courts were suggested by David Wilcox (1996) to represent a vulva form, and "linked to fertility" (Russell 199798), provide another easy to assume connection between fertility and shape. Charlotte McGowan (1978:15), in her work directed at fertility themes in rock art, discussed indepth the vulvaform, represented in both rock art images and in the rock formations known as "yoni's" in the Kumeyaay territory of southern California (McGowan 1978, 1982) (Figure 4.1).

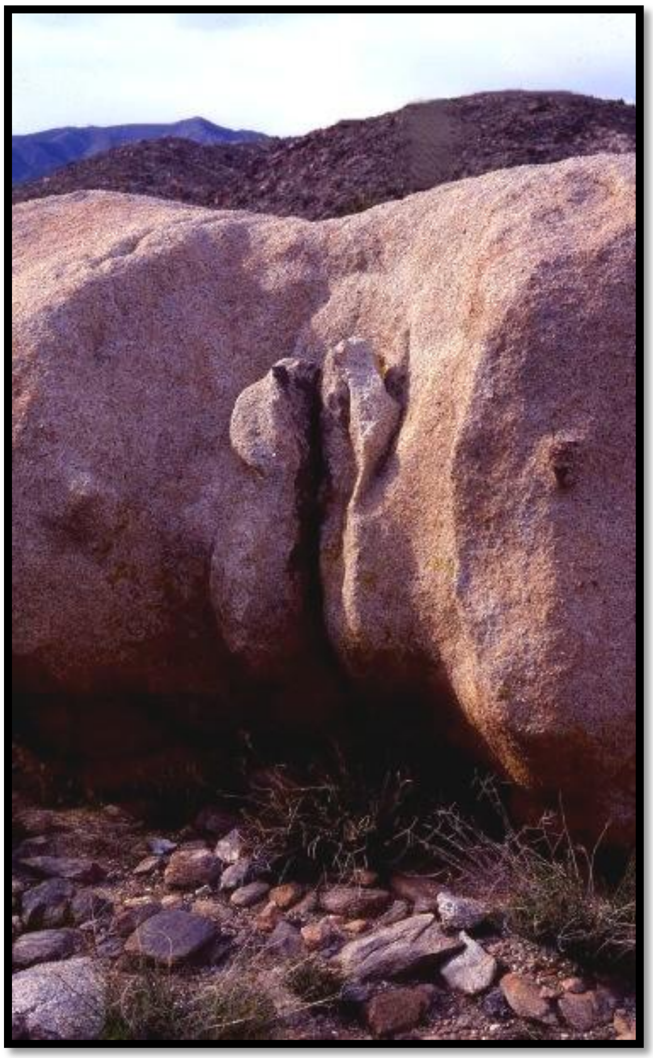


Figure 4.1: A yoni in San Diego County. A natural opening in the rock has been modified to resemble a female genital. Remains of a rock cairn are below. Photo by Breck Parkman

While the round or oval shape of the PCNs-while clearly an intentional shape given the hundreds of repetitions of it—is evocative to some western interpreters, we cannot base interpretations on the above works that draw from multiple selected ethnographic or archaeological instances without making rigorous analogies to the PCN case. It has long been the case that despite our wish to find “meaning” for images, whatever the “true” meanings might have been, they will, most likely remain unknown and hypothesized.

Several sites that display PCNstyle petroglyphs have been identified in the literature as "horseshoe" or "horse tracks". Representative of these is the early recording by Julian Steward of a site (4 PT.) in Mendocino County, now identified as a PCN boulder site (CA-MEN-1941). Steward described the site as one "where rocks are of talc and have 'horse tracks' and Indian Signs" (1929b). Davis (1961a) also used the term “horseshoe” in suggesting “magical unity”. She was quoting a reference to elements from the Girl's Puberty Rites in the Diegueño territory of southern California recorded by Horatio Rust in 1906. The symbol was said to have been in reference to or to symbolize the female genitalia. In 1998, the California State Parks was considering the purchase of property adjoining an OffRoad Vehicle Park. I spoke with the landowner, a rancher (Dennis Gibbs personal communication 1998), about a marked boulder that was on the property, having been sent photos by the archaeologist from the adjoining park. The rancher acknowledged being aware of the boulder, but had not given it much thought as he had assumed that the markings had been made by his ranch animals walking over the soft boulder and thus imprinting it with “horseshoes”.

The above discussion of the markings just touches on a very few of the known sites with similar images. To present an opposing view to the association between socalled vulva shapes and fertility, Robert Bednarik cautions that the interpretation of the vulvaforms, one of the most common elements found worldwide, deals with the "preoccupations and cognitive biases of the researchers", and are "only of relevance in studying our own cognition" (1993:4). Paul Bahn relates that "obsession with sexual interpretations" in many rock art studies can be traced to the interpretive comments about some Paleolithic “signs” made by the Abbé Breuil in the early part of this century (Bahn 1986; 1998:174). Bahn also states that if the vulvaforms are not depicted "in context", or in "association with a female body depiction", then they are not, in his opinion, "definite specimens", but only interpretations. Bahn has previously published a caution regarding the interpretations of vulva motifs, specifically dealing with Paleolithic art (1986:99119). Although none of the PCNstyle elements are found in association with female bodies, there is some ethnographic and mythological literature that suggests that the oval forms found in the north and central Coastal Ranges of California do depict or at least be associated with female elements (Barrett 1952:382).

One could perhaps imagine that from early times and under varying circumstances, peoples have felt a need to produce images relating to fertility; although understandings of “fertility” could have also been highly varied. Whether known as vulvas, vulvaforms, yoni’s, horseshoes, or ovaloids, the pre-historic marking of boulders with an element that is widespread over time and space I am suggesting that we could consider a hypothesis that the markings be interpreted as being part of a worldview that included a knowledge and need to continue life, whether through human fertility or world renewal.

PCN Marked Boulders on the HREC

This section will discuss the PCN and other marked boulders that are present on the HREC landscape. In 1988, Chuck Vaughn and Bob Keiffer, of the HREC staff, attended a lecture on local rock art, given by archaeologist Mark Gary. Gary had been conducting surveys of local areas, along with his wife, Deborah Mclear-Gary as part of their Mendocino Archaeological Research Project. Shortly after the talk, Bob Keiffer recognized the first marked boulder on the property and Gary was called out to direct a more intense field survey of the HREC to identify other possible sites. Over the next few years, three PCN sites were located and recorded.

The first site recorded was CA-MEN-2213, otherwise known as the Huntley Peak Petroglyphs, located near a mountain pass on a trail system between the Russian River (about 1.2 km east) and about 500 m from Parson's Creek (Gary, et al. 1988j) (Figure 4.2). Present on the large (5 m x 2 m) chlorite schist boulder are 100150 "ovals", now referred to as PCNs. No cupules or incised lines were observed. Considered part of the same general site, a group of smaller marked boulders were identified across the ravine (Parson's Creek) approximately 140 m southeast. The site report lists Boulder 2 (1 x 1 m) as having six ovals, Boulder 3 (1 x 1 m) with 12 ovals, and Boulder 4 (1 x 1 m) with four ovals. All measurements were estimated and no image drawings accompanied the site report (Gary, et al. 1988j).

Figure 4.2: The Huntley Peak PCN boulder (CA-MEN-2223) on the HREC. There are 100150 PCN elements on this boulder.

In 1988, the second site CA-MEN-2221 was located and recorded (Gary, et al. 1988c)-(Figure 4.3). Given the name Hidden Hill Petroglyph, it is located at the edge of a hill with a view of the Russian River, but not visible from the HREC road, above. The site report indicates the 1 x 1 m x 1.5 m boulder is split naturally in two, located at the head of a spring. There are markings on both pieces of the boulder, and a partial PCN, split in half, indicating that the boulder split, through natural causes, after the markings had been made on the boulder. The boulder has one very large oval (25 x 30 cm), one crossed circle, seven ovals, one ½ oval, and 27 cupules. The crossed circle is not only unusual for the PCN sites on the HREC, but also for PCN sites in general. The large PCN is also of a larger size than found at most sites. While several PCN boulders have cupules and incised lines, additional images are rare. No other PCN sites on the HREC have cupules. The Hidden Hill site is the focus of my research on the HREC.

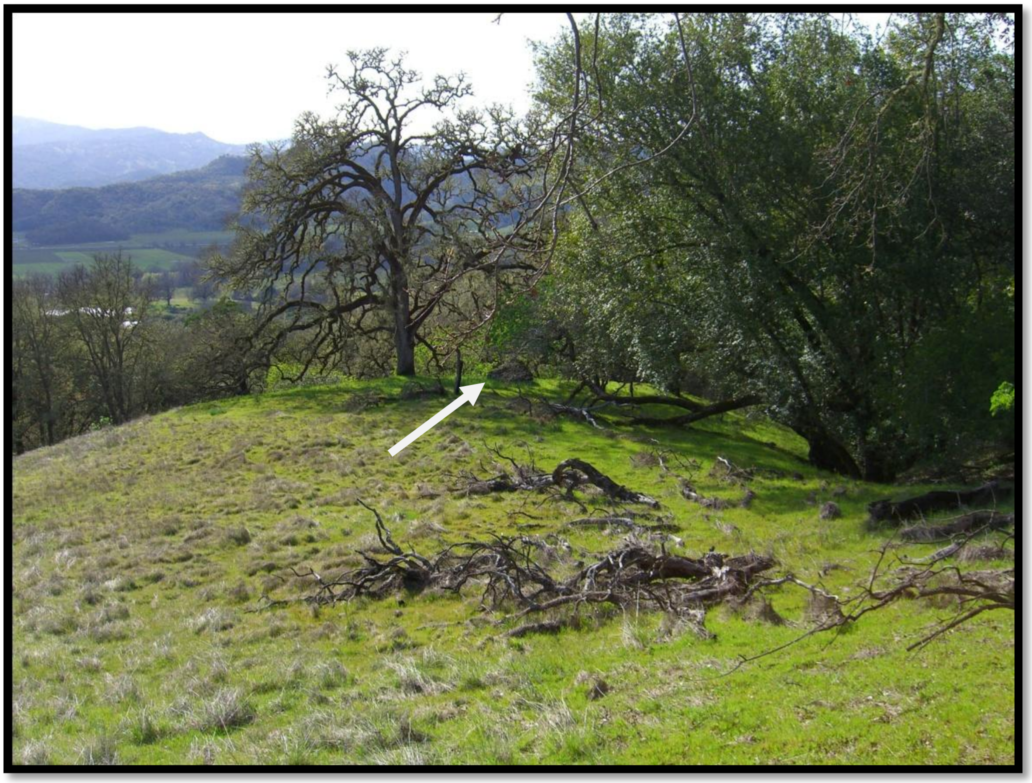


Figure 4.3: The Hidden Hill PCN site (CA-MEN-2221) with the split boulder that was the focus of a portion of this study. Note the viewshed.

The third site recorded in 1990 on the HREC is CA-MEN-2235 (Gary, et al. 1989) and has appropriately been named Watershed Down (Figure 4.4). It is located on the bank of an experimental drainage area 250 m south of the ridge between Parson's Creek and the Russian River. This schist boulder also split in half after the boulder was marked. The larger measures 3 m x 4 x 1.5 m, with the piece that broke off, measuring about 1 cubic m. This smaller piece slid upsidedown into the drainage 10 m below and is partially buried. Recorded on the boulder are 40 ovals, ranging in size from 1220 cm, one large 40 cm oval, three possible ovals, and six cupules. There are PCNs on both pieces of the boulder, indicating that the split occurred after the boulder was marked.

Figure 4.4: Location of the Watershed Down PCN boulder on the HREC.

During the same period, a fourth petroglyph site, CA-MEN-2300 (Gary, et al. 1990) was also recorded on the HREC. This site is unique, as it has no PCNs, but 14 cupules. Named Glittering Rock Petroglyph for its high mica content schist material, it was discovered by Bob Keiffer as he was waiting to meet Chuck Vaughn at this pre-arranged location. The host boulder was identified by Robert Mark, at the time a geologist with the USGS (United States Geological Survey), as white mica (Mark 1990).

Several years ago Bob Keiffer identified another PCN site located further down the drainage from the Watershed Down site. It consists of a small boulder, with two PCNs. It has been temporally designated as HREC 15 (Figure 4.5). I have not personally visited this difficult to reach site, but have observed photos, and concur that they are PCNs. This site will be properly recorded and registered with the Information Center.

Figure 4.5: Bob's Rock the HREC-15 PCN boulder. Photo by Paula Reynosa

One other PCN site was identified by Chuck Vaughn in 2007 (Figure 4.6). Tentatively known as Chuck's Rock (HREC-14), it is indicative of the elusive nature of PCN boulders. For more than 30 years Vaughn had passed by the site on a regular basis. This day, the sun was just right and he spotted the PCNs. This site also lacks the proper documentation, and a site report will be filed with the Information Center.

Figure 4.6: Chuck's Rock (HREC-14) the most recent identified PCN boulder on the HREC. There are 5 PCN elements visible on the boulder.

One other petroglyph site report was filed in 1988 as CA-MEN-2217 (Gary, et al. 1988k) on an alleged petroglyph boulder, near Huntley Peak, reported to have 100s of lines, either incised or punched. Located next to a road, this boulder has also been inspected by Robert Mark, and judged to be the result of the "emplacement process" (Mark 1990). In other words, the scratches are the result of the boulder being moved by a tractor. An amended report will be filed with the Information Center.

PCN Marked Boulders on Traditional Pomo Lands

Mendocino County

Traditionally, the Pomo ancestral lands included what are now Mendocino, and most of Lake and Sonoma counties. Beginning with the sites in Mendocino County the following is a review of the attributes and any idiosyncratic information on these sites. The most documented of the nearby sites is what is known as Knight's Valley Pomo Baby Rock, CA-MEN-875. While originally recorded and photographed by Barrett in 1904 no site report is on file for that date (Figure 4.1). The site was formally recorded in 1975 (Miller and Haslam 1975b). A more comprehensive report was filed in 1989 (Peterson 1989b), which identified a few small lithic pieces nearby. Peterson's report identifies 26 PCNs, six cupules, and a "couple of hundred" incised lines. This site was the subject of Barrett's ethnographic account, and mentioned in two of his publications (Barrett 1908a:175; 1952:3857). The ethnographic reports identify the marks on this boulder as being made by the Bird People of the mythical village of *mü'yamüya* (see Chapter V for a full account and discussion of this topic). Miller had also identified a village site nearby, with house pits, which has never been recorded. (Figure 4.7)

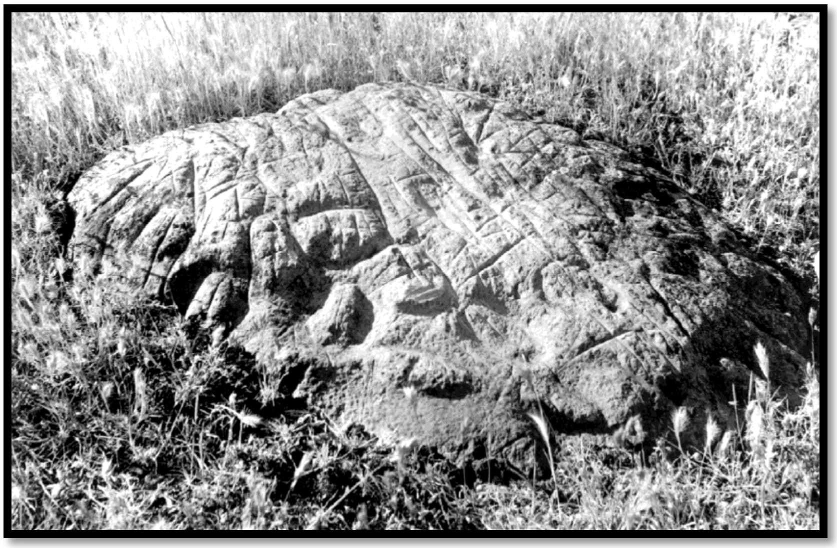


Figure 4.7: Barretts' Knight's Valley Pomo Baby Rock in a 1904 photo that accompanied the ethnographic account of the fertility ritual. Photo courtesy of the P.A. Hearst Museum of Anthropology

Barrett's account identifies the markings of this boulder as the beginning of what we now know as the PCN tradition, as Barrett wrote: "Since that day this, and other similar rocks, have been employed in the cure for sterility" (1952:387). I suggest that the marks on this boulder hold the ethnographic link between these particular marks, fertility and the PCN tradition, while recognizing that it is problematic to link ethnographic analogy in deep time. This subject will be further discussed in Chapter XI. Barrett's account states this is the larger of two similarly marked boulders in the near vicinity. The smaller boulder was reported by Barrett as being almost in the "middle of the country road". This smaller boulder has never been located, and was probably unknowingly destroyed. A larger marked boulder nearby will be discussed in the next paragraph. The Knight's Valley Pomo Baby Rock was one of the boulders identified in Hedges' study of baby rocks (1983b).

Located to the west and above CA-MEN-875 is a large 100 m outcrop of chlorite schist, which is the site of another boulder with PCN markings. The markings are oriented to the west, and thus, not visible from the former site. The site was recorded by Miller during her field research (Miller and Haslam 1975a), with a more comprehensive report filed by Peterson (1989a). Barrett evidently was not aware of this site. Peterson identified seven PCNs, which are significantly larger than those on the nearby boulder (CA-MEN-875).

Two of the earliest recorded petroglyph sites in California were reported by Julian Steward, early in the 20th century (1929b:57). The site recorded as CA-MEN--433 is known as the Bell Springs site (Foster 1984; Groves 1927). There is confusion regarding the second site (Stewarts Pt. 4), and this will be covered in the following paragraph. This site was described by Steward as "[a] large rock covered with carved figures", and given the identification as Pt. 3 (Steward 1929b:57). The chlorite schist boulder is covered with incised lines, figures, and cupules. While there is no mention of PCNs present in the site report, accompanying photos indicate that they may be present, and Teresa Miller, the "original" PCN researcher, reports their presence here (personal communication 2011). Parkman and Paul Freeman have also reported PCNs on this boulder (Sonin 1995). Foster also indicated in his report that a "fertility function (baby rock) seems likely for some of the petroglyphs at this site", and indicated that the site probably had multiple uses and purposes. An interesting note on the 1927 dated site report by Groves is the reference to published references that cites “Steward, 1929”, which was, however, published only two years after the report was dated! In the past, this site (CA-MEN-433 has been confused with the Spyrock Road site (CA-MEN-1912) (Sonin 1995:87).

I will now attempt to explain the confusion surrounding what was originally recorded as CA-MEN-434 (Steward 1929a). The site was recorded in 1929, and described as “[t]he rocks are of talc and have ‘horse tracks’ and Indian signs”, and identified as “North of Willits”. Earlier in this chapter I discussed the different designations that have been given to PCN elements. Steward designated this marked boulder as Pt. 4 (1929b:57). In 1984, Dan Foster, with Mark Gary and Deborah McLear filed a site report with the Information Center that was given the designation of CA-MEN-1941, “V” Greenfield Ranch ,(Foster, et al. 1984). The site included the main boulder and three smaller marked boulders nearby. The chlorite schist boulder was reported to contain 50100 cupules, 1015 grooved ovals (Gary’s designation for PCNs) with two of the ovals bisected with a sharp incised line resembling “vulvaforms”, a few crossed circles, and numerous recent glyphs. A year later, a second site report was filed (Foster, et al. 1985). At this time, the report was expanded and the overall site was renamed as Genesis #4, 5, 6, 7, 8, and now included five boulders. The elements recorded included 62 ovals (PCNs), 78 cupules, five circles with cups in the center, and one circle with crosses. In 1988, Gary wrote a letter to the Information Center as supplemental information for CA-MEN-1941, indicating that CA-MEN-1941 and CA-MEN-434 were the same site. He had discovered this when he was studying Steward’s 1929 manuscript (1929b), and recognized the photo in that book as identical to the site he had recorded with Foster and McLear. The mistake was due to incorrect locations given by Steward. A rationale for the revision and combination of the site designations is given by Jordon (1995). Included with the supplemental letter, and located in the site report folder on file at the Northwest Information is a very informative, several page monograph, detailing how Gary researched the “mystery”.

The site designated as CA-MEN-793 is well protected by the property owners. Breck Parkman had visited the site and reports “a few” PCNs (personal communication 2010). This site is one of several complex sites in the general area, including CA-MEN-2200, CA-MEN-1800, CA-MEN-0034 that also have at least a “few” PCNs.

The Spyrock site, CA-MEN-1912, is well known to rock art researchers. This petroglyph boulder was first reported in a 1951 site record as six feet in diameter and covered with petroglyphs (Meighan, et al. 1951). The site was originally given the designation of CA-MEN-551 (n.d.) filed on an undated Archaeological Research Facility form under the name “Heicksen” (n.d.). The form records the site as a rock deeply incised with concentric circles and angular designs. This record was reassigned a CA-MEN-437 trinomial. A complete site record was filed by Foster and Imhoff (1982). In their record they noted 50+ petroglyph elements were scratched, incised, and pecked into the soft metamorphic boulder. They noted the most common element consists of four concentric circles with a cupule in the center. They also mentioned that the additional elements were animal tracks, large angular designs, and cupules. Foster addressed the confusion in the site number designations in a paper presented at the San Diego Museum of Man “Rock Art Conference” (1983). Foster reviewed the archaeological literature, and determined the duplicate numbers assigned the Spyrock site. As a result a new i.e., a third different) trinomial (CA-MEN-1912) was assigned to this site by the Northwest Information Center. A metate fragment with a PCN element pecked on the underside was incorrectly reported by Miller in her thesis as having been recovered from CA-MEN-433. In actuality this artifact was found at the Spyrock PCN site (Miller personal communication 1998). Miller (personal communication 1998) and Flynn (personal communication 1997) report that they have observed definite eroded PCN elements (from sixeight) near the ground level of the Spyrock petroglyph.

In 1986 Dan Foster submitted a site record for CA-MEN-2020 (1986), a schist boulder located in the north end of Porter Valley. An uncooperative landowner refused his collection of data from the site, so the report is from memory from his 1983 site visit and a few photos he was able to secure (which he shared with me). Foster remembered dozens of carved ovals (PCNs) and incised lines. Included in the site report is a note from Foster to "California Rock Art Researchers" stating that "this would be an example of Miller's 'PCN' site, but these ovals are not pecked". There is no quantitative information available.

Identified as Genesis #9, CA-MEN-2028 is a large chlorite schist boulder, near Willits (Gary, et al. 1985a). The boulder is reported to contain 13 pecked ovals (PCNs) of various sizes, 49 cupules, and two incised lines. One of the ovals was bisected. They indicated in their record that a nearby boulder fragment contained two additional large ovals (PCNs).

A similar boulder to the above, CA-MEN-2029, (Gary, et al. 1985b), designated as Genesis #10, was recorded nearby and the report noted that it was heavily weathered. Gary, McLear, and Foster identified 21 ovals (PCNs), three of which were bisected, and six with cupules superimposed. Also present were one additional possible oval (PCN), 28 cupules, and recent carvings**.**

The small, blue schist boulder, CA-MEN-2030 (Gary, et al. 1985c) designated as Genesis #11, contains two large (30 cm) ovals (PCNs), which are deeply pecked and joined together to form a "figure eight". This site, near Willits, is located on a mountain pass.

Located in Redwood Valley, CA-MEN-2034 (Gary, et al. 1985d), is reported as a small. ground level schist boulder, containing eight ovals (PCNs) and nine to ten cupules. Three of these are crudely pecked and heavily weathered and connected. The site also contains two PCNs that form a "figure eight," as had been noted at CA-MEN-2030. The record indicated that the site had been crudely pecked and heavily weathered.

Also located near Willits, CA-MEN-2035 (Gary, et al. 1985e), this small blue chlorite schist boulder, known as Infinity #1, contains three ovals (PCNs). Two of the ovals form a "figure eight," as reported at CA-MEN-2030 and CA-MEN-2034.

One of the most complex marked boulders in Mendocino County is found on private property, near Willits. Registered as CA-MEN-2200 (Gary, et al. 1988l), this huge and complex mica schist boulder, known as the Keystone Petroglyph Site, is covered with pecked and rubbed elements. The motifs include 700+ cupules, 1000+ incised lines, 33 small circles with cupules, five small circles without cupules, two concentric circle elements, six large circles, five parallel curvilinear elements, four shields, and a row of dots. Although I had previously believed that this boulder contained no PCNs, an examination of original photographs by Leigh Jordan (who listed this site under PCN sites in her thesis (1995) indicated their existence. A site visit confirmed the PCNs on the boulder, and I also observed an interesting variation in the PCN style. Careful examination of the elements on the boulder revealed six that were very large ovalshaped, several very elongated PCNstyle forms, and numerous small, round elements that had large, superpositioned cupules obliterating the nucleus. It was only with careful observation that pecked grooves were evident surrounding many of these elements. It was difficult to discern the

PCN elements as they were the lowest markings on the boulder and several images had been superpositioned on the PCNs.

The Elledge Creek Petroglyph Site CA-MEN-2068 (Gary, et al. 1986) presents another confusing problem. The site report very clearly states that the four mica schist boulders contain cupules only, and the accompanying drawings verify that information. It was recorded by a very informed group of archaeologists/rock art researchers who were very familiar with PCN images, and had recorded numerous PCN sites. Barrett had referred to these as baby rocks in both his 1908 and 1952 publications (Barrett 1908a:175, 177 ; Barrett 1952:238, 385). In the 1908 publication, Barrett mentioned the Elledge Ranch baby rock sites (he noted two marked boulders). In his 1952 publication, in his explanation of Plate 20 (which shows a photo of one of the boulders) he incorrectly located the site as being on the Eldridge ranch, rather than the Elledge ranch (both give the exact same location). Both Elledge and Eldridge are historic names in Mendocino County. When Hedges visited the site (1983b:156), he correctly used the name Elledge for the site. He identified the two marked boulders as being nearly 30.5 m apart. Hedges' visit was following a snowstorm and during rain, and the site was not well documented. About rock #1 he wrote: "[t]he surface of the rock bears numerous cupules of varying size, a large number of grooves ranging from fine lines to very deep gashes in the rock, and an undetermined number of pecked oval forms (PCNs), one of them very large" (p. 16). He gives no account of the markings on rock #2; however, his drawing on the next page clearly identifies a PCN, a cupule, and many incised lines. What does this mean? Evidently confusion has existed as to whether the two sites are indeed the same. My conclusion is that the sites mentioned in Barrett and visited by Hedges, have not been properly recorded and there is no official listing of the sites with the Northwest Information Center. At the completion of this dissertation, I will attempt to relocate the Barrett/Hedges site, and properly document and record this site with the Information Center.

One other site that has escaped documentation of the presence of PCNs is CA-MEN-1800. The Cloverdale boulder is a very large schist rock that sits on the east side of the Russian River, just north of Cloverdale (and south of Hopland). The extensive site is one of those mentioned earlier with many complex images – cupules, incised lines, crosshatchings, and much superpositioning. PCNs have never been mentioned on any site reports or published articles concerning the boulder (Gifford and Kroeber 1937:186; Hedges 1983a; b:19). Hedges noted four small additional cupules boulders nearby that may be covered with sand at times. The file at Information Center contains two reports on the site (Adams 1980; EknessHoyle 1989). In 2005 I took fellow grad student and South African rock art researcher, Sven Ouzman, to visit the site. Through a thorough examination of the top of the boulder (beyond my capabilities), Ouzman observed a PCN. This has been confirmed with a photograph (Figure 4.8). It is actually a PCN, within a PCN, with a cupule on the middle. On a visit to the site in 2008, I observed a boulder that is located about 20 m southeast of the large one, on the east bank of the Russian River. This may be either Feature A or B from the EknessHoyle report. It is difficult to match the boulder to the copies of photos in the report. I had noticed this boulder before, with cupules visible on the top. On this visit, I observed that it had been excavated around the perimeter, about 20 cm, exposing many additional cupules and several PCNs. I contacted Cal Trans about recording the PCNs and updating the site report, since the boulders are located on their rightofway. Apparently this did not happen. My photos will be submitted to append the site report.

Figure 4.8: A PCN element on the top of Cloverdale Boulder (CA-MEN-1800). Photo by Sven Ouzman

To the east of Hopland is Lake County, where two PCN boulders are located. These two sites are recorded as CA-MEN-0034, and CA-MEN-1577, and the only two identified sites in the county. Originally identified as "Indian Rock", and now known as the Bachelor Valley Baby Rock, CA-MEN-34 was first recorded in 1935 (Fenenga), with a supplementary report submitted at a later date (Mauldin 1952), giving additional information on the location and markings. Subsequently, a comprehensive report was filed that included the identification of the site in ethnographic literature, and included references and photographs (Peterson and Peterson 1989). This site, included in Hedge's study of Pomo Baby Rocks (1983b) is well protected by the property owners, who keep very quiet about the site and restrict visitation. Markings recorded on the large boulder include 214 cupules, hundreds of incised lines, and one "clear oval (PCN) form and a number of other suggestions of this type of glyph". There are nine sunburst designs, four with pecked centers. Other incised line motifs include parallel lines, grids, chevrons, and triangles. One of the incised lines is 190 cm long.

The second Lake County PCN boulder, CA-MEN-1577, located 9.7 km to the south of CA-MEN-0034, consists of a small isolated schist boulder with markings on all exposed surfaces (Peterson and Peterson 1987). The boulder was moved from its original location when the property owners uncovered it while digging a pond, and moved the boulder out of the way with a tractor that left scars on the rock. One year after the initial report, a supplemental report was filed detailing the movement of the boulder from its original location. The following year, at the request of the property owners, who were "protecting" the boulder, and placing their property for sale, the local Native Community was contacted and Elder Nelson Hopper agreed to “store” the boulder in his yard. A recent visit to the area confirmed that the boulder remains in his yard.

Sonoma County

The majority of identified PCN sites in this threecounty area are located in Sonoma County. The earliest identified site, CA-MEN-268 (Graff and Lee 1929) was one that Steward included in his early publication (1929b:57) as Pt. 8. The site report is very sketchy and is limited to the comment “[t]hey may have originated as bedrock motors, some being elaborated by circle grooves are in the Rain Rock”. Steward, in his publication (1929b) identifies that the “figures are much like those of Willits”. This is one of the sites reviewed above, originally recorded as CA-MEN-434 and now designated as CA-MEN-1942. Since there has been no update on the site report since the original 1929 site form, there is no quantitative information on what and how many markings are present. This site was also listed in Heizer and Baumhoff (1962:236; 209 [map]).

The last petroglyph site mentioned by Steward (1929b:57) is CA-MEN-269, and identified as the Porter Creek Site, was recorded again in 1968 (Dimitrov and Johnson), and assigned the trinomial CA-MEN-682. Dimitrov and Johnson did not realize that the site location had been previously found. Steward took his information from Mallery (1893:69). This site was originally recorded by Dimitrov and Johnson as basalt rock and described as a "painted design with geometric bisected ovals (two and onehalf as recorded in original record), one bisected circle, two full circles, and one (element) as illustrated”. During the course of their fieldwork, Miller and Haslam relocated the boulder and submitted an additional site record identifying at least 19 pecked circles and ovals (PCNs) (Miller and Haslam 1974b). They noted the large boulder and reidentified the lithography as "schist with chlorite, etc." Miller and Haslam submitted an additional site record for another boulder across the road from the original site, which the Northwest Information Center included under the same site designation (CA-SON-682), expanding the site boundaries. On this second boulder (Rock #2), they identified at least two pecked circles and ovals (PCNs). In her thesis Jordan discussed problems that exist in the archival database at the Northwest Information Center (1995:64). One of the problems that she identified concerned CA-SON-682. In her research based on element and location correlation, Jordon determined that CA-SON-269, the site designation given to a petroglyph site that Steward had gleaned from Mallery's 1883 volume on petroglyphs, and CA-SON-682, were the same site. As in the Jordan thesis, these two sites will be considered as one.

CA-MEN-568 found in the Warm Springs Cultural Resource Study Area (Fredrickson and Schwaderer 1982) was first reported in a site record by Banks (1974a). In the record, he only mentioned cupules on the three rocks at a habitation site. In 1981 Schwaderer submitted an additional site record to the Northwest Information Center, noting the design elements as cupules and circular grooves (1981b). In the Warm Spring Report, prepared by Vera Mae Fredrickson and Rae Schwaderer (1982:B2021), they indicated that there were five curvilinear grooved elements on the top of the boulder and that they fell within Miller's (1977) definition of PCNs. The Warm Springs Report indicates that these rocks are away from the bed of the creek, and although subject to damage by changes in water level, they are of a hard material and damage should be minimal (p. A2). From this report it can be assumed that this site is today within the flooded area of the dam.

CA-MEN-579, also known as the Henry Moore Site, was first recorded in 1974 by Banks (1974b) as two petroglyph rocks. One had several shallow pecked circles and had a cupule centered within it. There is no mention of a raised nucleus. Schwaderer indicated in the Warm Springs Report (Fredrickson and Schwaderer 1982:2) that this site was one of several petroglyph boulders within the study area. She indicated in her Table 1, [in Appendix A (A6)] of the report, that the site contained a "few worn pits and grooves." In the Appendix B portion of the report (B89), Schwaderer indicated that the boulder was sandstone, had been subject to heavy stream erosion, and discounted some of her earlier identified petroglyph elements as being natural phenomena. She noted one cupule within one of the circular formations. Schwaderer also indicated in Appendix C that she had included a site record within the report. No site record was found and no other site record other than that submitted by Banks is on file at the Northwest Information Center. The Warm Springs Report (p. 9) indicates that this boulder had so few design elements that it did not justify elaborate preservation procedures. In a personal communication, Schwaderer (1997) noted that the boulders were located in a changeable stream bed (subjected to heavy stream erosion) at the time of her study. She suggested that the boulders might contain the elements that were recorded by Banks in 1974, but the elements in question were now located below ground level. She commented that on one visit to the site the boulders were completely covered by gravel in the creek bed. Parkman (1993b) had also listed this boulder in his paper on PCNs based on the Bank's site record. As stated above, Schwaderer had identified the lithology of the boulder as sandstone, which is an anomaly for the PCN tradition, but I will continue to list this as a PCN boulder based on the report of “shallow pecked circles”. Unfortunately, the recorded elements are below ground level and cannot be verified. There is another PCN site in Santa Clara County with PCNs on a sandstone boulder (Swift and Roop 1977).

The Yorty Cupule Rock, CA-MEN-585, consists of a single serpentine schist boulder (as identified in the site record) located in the Warm Springs Study Area. At least 100 pecked cupules are located on its tip and upperside surfaces. Located on the lower west face are several pecked curvilinear designs (PCNs). A drawing submitted by Schwaderer (Fredrickson and Schwaderer 1982) included in a site record within the Warm Springs Special Petroglyph Report, and on a site report in the Northwest Information Center file (Schwaderer 1980a), indicates the presence of 15 PCNstyle elements. Another site record on file at the Northwest Information Center (Devey 1974) indicated only 98 pecked cupules present on the boulder. The Warm Springs Report indicated that this boulder was probably the most valuable for future studies of the petroglyph rocks in the study area (Fredrickson and Schwaderer 1982:9). The report also indicated that the Yorty Cupule rock was moved, but the location is not indicated, and is today unknown.

The majority of the Sonoma PCN sites were recorded during Miller’s research (1977) by both Miller and others who were assisting her. Petaluma #1, CA-SON-844, is one of a group of five chlorite schist boulders, located near Petaluma, within a 91.5 meters radius of each other. They were recorded by Miller and Haslam as Rock #2#6 (1974a). They are individually recorded; Rock #2 has at least seven circles and ovals (PCNs), and it is noted that more forms may be below the surface, but no cupules. Rock #3 has at least six pecked ovals (PCNs), on the east face, and may have been part of a larger rock. Rock #4 has at least two ovals (PCNs). Rock #5 has at least 20 circles and ovals (PCNs). A portion of this boulder appeared to be covered with earth, which may conceal additional elements. The boulder may also be part of Rock #6 that was recorded separately. And, Rock #6, with at least two ovals (PCNs) may also have more elements below the current ground level.

Petaluma #3, CA-SON846, a chlorite schist boulder, is one of five boulders (recorded as state trinomials) that are in association with each other. CA-SON-846 is the only boulder with PCNs (the others only have cupules). Recorded by Miller and Haslam (1975c) , they identified 16 circles and ovals (PCNs) and 73 cupules.

Located on San Antonio Creek, CA-SON-928, also known as the Grazelli Site, and Mike's Rock, this very large chlorite schist boulder contains at least 1000 PCNs and scratches, or incised lines, as recorded by Whitson and Miller (1976a). They reported that "destructive" pecking and the other style of random incising looked more recent than the pecked forms. I will address this issue in Chapter X. They also observed possible pecking tools of chert and quartzite nearby.

CA-SON-929, Jan's Rock, a second schist boulder on the Grazelli property, was also recorded by Whitson and Miller (1976b), who identified at least 40 PCN circle and oval elements. Near San Antonio Creek, CA-SON-1026, also known as Nana's Rocks, was recorded by Whitson (1977a), and consists of two chlorite schist boulders that contain 12 pecked oval and one circle (PCNs), and 50 cupules.

Known as Lee's Rock, CA-SON-1041, consists of two chlorite schist boulders with the first large rock broken in two pieces containing over 50 PCNs on the top and southeast face (Whitson 1977b). Also present are 12 cupules. Two of the PCN forms appear to have missing centers and some cupules seem to circle two of the PCN elements. One circle has a divided center with a groove extending from the circle. The second small boulder is located 75 m south of the main rock and contains six PCN markings.

Kellies Rock, CA-SON-1075, near Toley Creek, was originally recorded by Whitson and Haslam (1977) as a lowlying chlorite schist rock with one cupule, two circle type PCNs, and nine oval PCNs. They reported that the upper surface of the boulder appears to be covered with badly eroded remains of many more PCNs. Whitson and Haslam also recorded one PCN element on a small boulder located 45m to the southwest. In 2006, an update was filed with the Northwest Information Center. This updated report (Jones 2006) only recorded six PCNs and two cupules with no mention of the nearby small boulder, but smaller boulders were present in the accompanying color photo.

An additional site on Toley Creek, CA-SON-1160, idenified as Site #7, consists of a "green" schist lowlying outcrop. The site record indicates that the elements include pecked circles, ovals, vulva shapes, and cupules (Mulloy 1978). Incised lines, squares, and rectangles were also noted. Fortyfour PCN elements are indicated in an attached drawing, but it is also noted that some of the elements are only partially exposed, and petroglyphs may cover a much larger area of the subsurface of the rock.

Located in the Warm Springs Cultural Resource Study Area, CA-SON-1319 is now inundated by Lake Sonoma according to the site record. This large boulder was originally recorded by Schwaderer (1980b) in 1980 as a large rock known as Kathleen's Rock, containing approximately 50 cupules. Schwaderer filed an update in 1981 noting a second large boulder immediately to the northeast of the original boulder. She recorded "at least" six PCNs on the top/north facing surface. The lithography of the boulders was identified as serpentine schist.

Partially located in the bed of Dry Creek, and now inundated by Lake Sonoma, CA-SON-1320, also known as Field Camp Petroglyph Rock, is a large boulder also located in the Warm

Springs Cultural Resource Study Area (Schwaderer 1980c). Approximately 200 cupules are located on the top and upper side of the boulder. In her original 1980 survey record, Schwaderer identified two PCNtype elements pecked on the lower western face. In Appendix B of the 1982 Warm Springs Cultural Resources Report (Special Petroglyph Report) (Fredrickson and Schwaderer 1982), Schwaderer, while noting the similarities to Miller's PCNs, discounted CA-SON-1320 as containing PCNlike elements. She based this on the fact that the elements on this boulder did not have a raised nucleus and they may simply be pecked circles. In her thesis, Jordan included this site in her list of sites with PCN elements in her study area, based on Schwaderer‘s site record, on file with the Northwest Information Center (1995) I continue to list this site as containing PCNs, based on the original report and the inability to confirm the PCNs.

The Banded Rock Petroglyph, CA-SON-1383 was also part of the Warm Springs Cultural Resource Study Area study, and consists of a small boulder with at least four PCN-type elements on the north face of the rock (Schwaderer 1981a). Noted on the site record is the superposition of one element within another. The record listed the lithology as a stream worn cobble, and the material is not identified. Drawings and rubbings are on file at the University of California, Davis.

In a report by Archaeological Resource Service (Chattan 1999), citing a plotting of petroglyph sites given to them by Michael Whitson and Reed Haslam, avocational archaeologists who combed Sonoma and Marin Counties searching for petroglyph, Chattam noted that two of the plottings were on the study property. Site reports were never filed with the Information Center. During her field study, Chattan recorded one of these boulders and it was designated CA-SON-2303 (1999), as being chlorite schist, and having at least 14 PCNs, with one bisected, and in no discernable pattern.

In a recent report filed at the Northwest Information Center, and designated as CA-SON-2354, Origer and Thompson (2002), reports on an additional site in Novato. The medium size schist boulder has two PCNs and one cupule. The submitted drawings indicate that the second PCN may have a small PCN attached to it, similar to a figure eight.

Idenified as Phil’s Rock, CA-SON-2403 (Larsen and Much 2005), is a large serpentine/schist boulder outcrop with 112 incised lines, 64 cuplues, and two possible PCNs. Several of the incised lines form “v” shapes similar to chevrons. One of the PCNs has a cupule in the center, and another is crossed with an incised line. This area, which has several petroglyph boulders, is known as Rockpile Ranch, mentioned as Steward’s Pt. 6 (Much 2011:712; Steward 1929b:57).

One final note on the PCN sites in Sonoma County. While Bryan Much was doing his research at Rockpile Ranch, he was on the ridge of a neighbor’s property and observed two petroglyph boulders, one covered entirely with cupules and another that incised lines, cupules and at least two PCN. Supplying me with a photograph of a PCN, it appears that he relocated Steward’s Pt. 7b (1929b:57), reported by Steward as being in Cole’s pass (personal communication 2005). For a discussion on this finding see Much’s thesis (2011:73).

PCN Marked Boulders in Other Areas of the Coastal and Transverse Ranges

While my research is focused on the PCN tradition on the HREC, and related to other PCN sites in the traditional ancestral Pomo lands, I believe that it is important to briefly discuss the tradition, beyond these boundaries. By understanding the geographical distribution of sites (see Gillette 1998a), insight into the tradition as a whole, gives credence to the presumed antiquity of the markings. In this section, I will briefly summarize the PCN sites that are outside the study area, by county. Many parts of the Coastal Ranges are remote and on seldom visited ranch property, which is reflected in the recording of sites. An inventory of known sites will be found in the Appendix (A).

Beginning to the north, while still in what is now California, CA-TRI-1, known as Slakaiya Rock, is Steward's 2 Pt., also known as Little Moose Peak. This elusive petroglyph site was first reported in 1913, and reported to Steward for inclusion in his book (Steward 1929b:57; plate 22a). The site was rediscovered but its location lost a few times in the intervening years, with the California Department of Forestry (CDF) searching for 12 years. The site was relocated in 1992, with a site form submitted in 1993 (Foster, et al. 1993). The rediscovery and history of this site was also the subject of a paper by Daniel G. Foster and John W. Foster (1994). The blue schist boulder contains two panels with PCNs, cupules and other abstract designs.

Humboldt County has one recorded PCN site, CAHUM983 (Gary, et al. 1994), Squaw Rock. CA-HUM-983 contains several PCNs, hundreds of incised lines, and other abstract forms. A second schist marked boulder has been reported as the Whitlow site (, with no PCNs identified, but noted as a schist quarry site (this is not the first time that PCNs have been identified as a quarry site). No site record was submitted to the Northwest Information Center.

Marin County has the most identified PCNs sites, due to the focused research by Miller in the 1970s (1977). The plethora of sites on Ring Mountain, the type site for PCNs, also accounts for the numerous recorded sites. In other cases, the numbers are skewed by several boulders being recorded individually (with different trinomials) while other times multiple boulders (a group of boulders) are recorded with a single trinomial. Sites are located throughout the county, with the concentration on Ring Mountain, a group on Deer Island, and several parts of Novato. Of special note is a site in Novato with 26 chlorite schist boulders, 22 of which are marked with more than a 1,000 PCNs. Very recently, I was allerted to an unrecorded PCN site in Novato. The site has been visually confirmed by Teresa (Miller) Saltzman, who also identified an additional PCN marked boulder nearby. It is believed that these boulders may have been recently unearthed with construction. These sites will be recorded and submitted to the Northwest Information Center.

Contra Costa has three confirmed PCN sites. The Canyon Trail site, CA-CCO-0152 (Pilling and Meighan 1949; Squire 1949), is a large schist boulder, that for over 40 years was the focus of a children's sand box play area. Originaly recorded as a bowl quarry, with additional markings, including bed rock mortars, my excavation in 2004 revealed several buried PCNs, cupules, and incised lines. The second site, in Wildcat Canyon Regional Park, was discussed earlier in this chapter, in relation to the PCN marked boulders being used in construction of the wall. An additional panel of PCNs is also located at this site. The third site is a nonrecorded site on private property, with numerous cupules, a few BRMs (bed rock mortars), and several PCNs. Two other reported PCN sites (Parkman 1993b), have now been removed from the PCN site list (see Gillette 1998a:189 for discussion).

Alameda County only has one reported site, east of Livermore (Hood, et al. 1997), on State land, in an Off Road Vehicle Park. The site was excavated by a field class from San Francisco State University (Fentress 1992). The site has numerous PCN elements.

There are five verified PCN sites on schist boulders in Santa Clara County. In addition, there are three additional sites that either have recorded, or reported PCNs occurring on sandstone, which presents as anomalie. I have visited these sites and verified that the images do appear very similar to PCNs. An additional site was reported on the campus of Stanford University, but has not been relocated. Whether these can be considered as part of the PCN tradition is up for question, due to the lithology of the boulders. Was there need for a ritual performance and no proper material was nearby? There is no schist in the area. Or, whether these are simply a circular element on sandstone is not known. One additional PCN site was reported in a survey for a potential acquisition to California State Park land, I retain photos of the petroglyph boulder. Unfortunately the acquistion did not take place, and the site remains in private ownership, unrecorded, with the property owners adamant about not allowing access or study (Teddy Goodrich personal communication 2011).

The San Benito County site, CA-SBN-12, is probably one of the most interesting of all PCN sites. The boulder is now inundated under a reservoir, in a remote area of San Benito County. The largest of all known PCN boulders, it measures more than 30m long. I have had two periods of opportunity to study the boulder, and while the complete boulder has been traced, the final drawings are not available as yet. We do know that the boulder contain hundreds of PCNs, cupules, incised lines, numerous BRM-like holes, and several pietin shaped depressions. This site was also initially identified as a bowl quarry (Pilling and Drake 1950) This boulders has many stories to tell.

Not far from the San Benito is a single PCN boulder in Fresno County. Designated as CA-FRE-2485 (Foster, et al. 1990), Swallow Rock, has been the subject of a study by Daniel Foster and several members of COALARG (Coalinga Archaeological Research Group) (Foster and Betts 1994) that identified seven distinct rock art styles on the schist boulder, including several PCNs.

After a sparse “sprinkling” of PCN sites on the landscape, San Luis Obispo County has at least seven sites, with other’s that may be identified by site visits. (See Figure 4.1 for site distribution map) The Fleshman Site #4, CASLO225, is one that was recorded and cited in a publication on pit and groove petroglyph (Fleshman 1975:98100), while no PCNs were identified at that time, a personal visit to the site, after being alerted by another researcher (Charles Dills personal communication 1998) observed numerous “elusive” PCNs below the reported elements (Figure 4.5).. Photos of sites in the publication reveal the probability of addition identification of PCN sites. Three of the other sites in the county are on the Hearst Ranch, including a newly identified site on the Monterey, San Luis Obispo county line. San Luis Obispo County will be left to future research, but may yield some interesting results.

Figure 4.9: PCN elements at CA-SLO-225 that escaped notice when the boulder was originally recorded. Photo by Garry Gillette

The next site to the south is located in Santa Barbara County, at the inland Chumash village site of Soxtonocmu (Lee 1981). The PCN marked boulder is one of several petroglyphs nearby. A horizontal Boulder, reported as serpentine, and at present ground level, contains 18 "pecked ovids" (PCNs). While this boulder is in very close proximity to the village, which is not usual for the PCN tradition, this Boulder may be older than the village. This site and the next three sites, in Kern and Los Angeles counties, are in the Transverse Range of California.

There are two sites in Kern county, located about three kilometers apart. While none of the site reports mention the PCNs, I was alerted to their presence by researchers and have personally visited the sites. One final verified site in Southern California was encountered by Beth and Chris Padon in a survey in connection of a now deferred construction site near Palmdale. In the process of relocating recorded sites they came up on a PCN boulder in 2005, within the bounds of CA-LAN-1631. While no amendment has been added to the site report, in their records, that have noted and photo recorded the newly identified boulder, and the four or five pecked PCNs on the schist boulder.

Similar Marking in Other Regions

As mentioned earlier, a few other sites have been identified beyond the historical borders of California. Two probable PCN sites in Oregon have been brought to my attention by fellow rock art researchers. Site (35CU142), is located on the south coast of Oregon, approximately 16 km south of Port Orford, in the sand at the point where the beach meets the hill slope. Jeffrey Fentress (personal communication 1996) reported that this site was recorded in 1982 by Rick

Minor. In the newsletter of the Bay Area Rock Art Research Association, Fentress (1992) stated the lithology of the rock was either serpentine or schist, and noted six PCN forms in various states "of execution". He recorded a pecked circle that appears to be an outline of a PCN, and small ovoids (ca. 10 15 cm) with cupules centered on top. Also noted was one very large PCN, and one that appears to be slabbed off, leaving a saucerlike depression. A large shell midden and rockshelters are nearby. The second site is located in Umpqua National Forest (John Betts, personal communication 1995). Betts sent me a photocopy of a photograph of the site North Umpqua River and Roseburg, Oregon. Elements on the boulder appear very similar to PCN elements found in California.

Earlier in this chapter I discussed some vulva sites in Baja California (p. 41). In addition, I was sent a photo by Jon Harmon (personal communication 2005) of a PCN appearing element that he had photographed in Cueva Pintada, about 650 km south of the CaliforniaBaja California Border (Figure 4.10). Since the Hokan language family is known in that area, it is possible that this could be an early PCN. No host lithology of the boulder was given.

Figure 4.10: PCNlike element from Cueva Pintada, in Mexico . Photo by Jon Harman

Before summarizing this chapter I will briefly touch on two characteristic of the PCN tradition that has been reported at some PCN sites. The first concerns the mystery of the missing centers. It has been suggested in some site reports and publications that the nucleated centers were missing and had been removed from some PCNs. While it is correct that not all PCNs have intact nuclei, this may or may not reflect cultural activity. Parkman has argued that some of the PCN nuclei may have been defaced or removed by a second population, which was negating suspected malevolent powers (1993b:3556). Later in his paper he indicated that the secondary removal might have been to reinforce suspected power. The hypothesis of charmstones and other small artifacts being produced from the removed or quarried nuclei of PCNs has been proposed by several researchers (Gillette 1996a, b; Haslam 1986; Parkman 1993b; Rhode 1991). In an earlier paper I proposed that any removal of the PCN nuclei by a secondary culture was intended to extract power from the rock a universally recognized vulvaform, from which could be made a charmstone or possibly a phallic charmstone (Gillette 1996b:4), or other small items. Subsequent replication research has convinced me that the purposeful removal of a PCN center with the intention of making a charmstone is not a viable explanation for the missing center. When doing replication work, it became obvious that a misplaced hammerstone, while pecking, would result in the abrupt removal of the nucleated portion. Also, the nucleated center would often fracture in several pieces. It would be much more productive to select a small, schist pebble that was already in the basic shape, to construct a charmstone. I realize that PCN “centers”, or “blanks” have been reported from excavations (Kathy Flynn personal communication 1998). I believe that this is just coincidence, and was selected as a workable piece of schist. Foster and Betts (1994) suggested that a pendant found on the Domengine Ranch in Coalinga was "remarkably similar" to the blueschist material at both Swallow rock (CA-FRE-2485) and Slime Rock (as Foster refers to CA-SBN-12). Foster also wrote an article about the pendant (1990). A visual examination of this artifact at the Baker Museum in Coalinga (where the collection is housed) by Haslam and myself, left doubt that CA-SBN-12 was the source for the material. The artifact appeared to have a very high content of talc, which was not apparent in site visits to the boulder. For an expanded discussion on the removal and use of nucleated centers see my M.A. thesis (Gillette 1998a). Concerning the removal of PCN centers to negate power, I still believe that centers may have been defaced or removed by a later culture occupying the same land. I will discuss this further in Chapter X.

As mentioned earlier in this chapter, some sites have been initially identified as ‘bowl quarries”. The San Benito county site, CA--SBN012, is an example of such a site. In their original site record Pilling and Drake (1950), and later Jay von Werlhof (found in a supplement to the 1950 site record), indicated that CA-SBN-12 was a bowl quarry similar to those on Catalina Island. In dissertation research at the University of California at Los Angeles, Virginia Howard studied the emergence of craft specialization involving the production of steatite vessels crafted on Catalina Island by the Gabrielino (Tongva) culture of southern California (1998; n.d.). Howard invited me to accompany her on a trip to Santa Catalina Island quarry sites to view many of these quarries first hand, and to observe the techniques used by the Tongva in the preparation of the boulder for removing the blanks used in the production of stone bowls. Close examination revealed intentional scar marks used to expediently and carefully remove the bowl "blanks" from the source quarry. At the same time care was taken to plan for the removal of subsequent blanks. None of these techniques appear to have been utilized at the CA-SBN-12 site, and the boulder material does not appear practical for bowl use.

Conclusions

This chapter has introduced the PCN as a tradition, briefly reviewing the identification of the elements, focusing on specific data on the PCN sites on the HREC and in the traditional ancestral lands of the Pomo. To better understand the geographical distribution of the marked boulders as a tradition, which has been described for sites found throughout the Coastal Ranges and a portion of the Transverse Range, the remainder of the identified PCN sites was summarized. The chapter concluded with a brief discussion of the “missing centers”, and the early identification of some sites as “bowl quarries”. Chapter V will discuss the physical landscape of the HREC, the geological formations and the material development of the schist boulders. The connection of the PCN tradition and fault zones, and the soils of the HREC, and their distinguishing characteristic will also be presented. The chapter concludes with a short section on the climate and flora of the area.

V. Geographical and Geological Context of the North Coastal Ranges and the HREC and Flora present on the Landscape

To find old sites, you must look in old dirt. Jonathan O. Davis (19481990)
Geoarchaeologist

Introduction

Chapter IV discussed the PCN tradition, the identification and characteristic of the element, and, specifically the PCN sites with the HREC and the surrounding region. PCN sites in other areas of the Coastal Ranges were briefly summarized, to place the PCN tradition in a broader context. This chapter explores the geological formation of the landscape and specifically the lithology of the boulders that host the PCNs. Fault lines and zones, and their connection to the PCN tradition will be reviewed. I will also describe the soils at the research site. The chapter will be concluded with a brief look at the climate both now and pre-historically, and at the flora present on the landscape.

Geology of California and the North Coast

The geology of California plays an integral role in the study of the PCN tradition as manifested in the Coastal and Transverse Ranges of California, and possibly beyond. It was geologist Salem Rice in 1972 that first questioned the markings on the boulder outcrop on Ring Mountain on the Tiburon Peninsula; geologic maps were the defining tool in the first predictive model about the distribution of such outcrops, and soil maps may aid as an additional predictive tool for identifying possible locations of these metamorphic, marked boulders on the landscape. Underlying this discussion is one possible hypothesis, held by many researchers (Gillette 1998a; Miller 1977; Parkman 1993b) that it was early people, perhaps millennia ago, who sought out this specific rock type to ritually release the powder and power from the confines of the boulder to insure the continuation of life in this world, leaving the marks as evidence for us of their presence.

The geology of California is unique by its complexity, the result of tectonics, and by its young age 600 million years in formation (Harden 2004:iii). The earth’s lithosphere (the solid crust and the uppermost solid portion of the uppermost mantle, which extends 0100 kilometers), is divided into seven large plates and several smaller ones. The major plates are the African, Eurasian, IndoAustralian, Pacific, North American, South American, and Nazca. It is the movement of the North American and Pacific plates that are mainly responsible for the formation of the landscape in Coastal California. Additional contributors to the shape of the landscape are weathering and erosion, deposition of sediment (landslides), and waveaction at the seashore. The plates are in sporadic motion, and it is through volcanic and earthquake activity that they are separating, colliding, and sliding (Sloan 2006:2628) and modifying the land. The landscape of California is bisected by numerous fault zones (tectonic activity), most running northwest to southeast. The movement of the earth takes place along these lines, and is responsible for the variety of geological formations (and rocks) that are present. It is only through the theory of plate tectonics that the rocks of the Coastal Ranges of California can be understood, and the geologic history of the area can be revealed.

The Coastal Ranges contain a wide mixture of rock types. Andrew Lawson, the first geologist to map the rocks of the San Francisco area in 1892 named this complex assortment of geological material the Franciscan Formation or Complex (Harden 2004:286). This formation, of Mesozoic age, forms the heart of the Coast Range Province. The most prevalent rock types of the Franciscan Assemblage are the sedimentary sandstone and shale, with the sandstone often called greywacke sandstone due to its composition of quartz, feldspar, and fragments of shale, chert, and other rocks that give it a dirty brown color. Chert, a third type of sedimentary rock is composed almost entirely of silica. Limestone is also present in small quantities. About 10% of the Franciscan Formation consists of volcanic rock that has metamorphosed through interactions with seawater, producing minerals resulting in a rock known as greenstone. The most unusual stones of the Franciscan Formation are the metamorphic rocks known as Blueschist, with glaucophane, which give it the blue color (Harden 2004:286291). These are the boulders where the PCN markings have been placed.

Rocks are classified into three major rock types or groups – igneous, sedimentary, and metamorphic (Harden 2004). Igneous rocks are the result of molten silicate material (or magna) becoming solid while cooling. Igneous rocks can be either Plutonic or Volcanic. The Plutonic types are formed when the magna cools underground, and include granite, granodiorite, and diorite. Volcanic rocks are the result of eruption and cooling on the surface (volcanic action), and include obsidian, rhyolite, andesite, basalt, and tuff. Sedimentary rock forms at or near the earth surface and are the result of the accumulation of minerals, rock, and organic material (plant or animal). They are the result of binding together fragments of other rocks and include sandstone, greywacke, shale, and conglomerate. Rocks comprised of organic material include limestone, radiolarian, and chert. The third rock type, metamorphic, are rocks that are altered by heat and/or pressure deep beneath the surface of the earth that causes the grains to grow together, yet not at a high enough temperature to completely melt together. Metamorphic rocks include schist, gneiss, marble, slate, and serpentine (Sloan 2006:49). (See example of the rock cycle in Harden 2004 pg. 34).

Blueschist, the precise name for the metamorphic rock type that hosts the PCN markings, is defined as "foliated metamorphic rock containing diagnostic materials that form under conditions of high pressure and low temperature in a subduction zone" (Harden 2004:518). It appears as belts within and is widely dispersed within the "MesozoicCenozoic circumPacific orogenic zones" (Ernst 1988:1081). Orogenic zones refer to areas that are formed by faulting of the earth's crust. Harden notes that this type of rock is most abundant on the Tiburon Peninsula in Marin County, (where one today finds 24 PCN marked boulders), near Cazadero in Sonoma County, and in the Eastern Diablo Range (all areas where PCNs occur). Other geologists extend the range of blueschist to include the entire Coast Ranges and the Transverse Range; this geographic area includes all presently identified PCN sites (Ernst 1984:436).

Clark Blake, a retired USGS geologist and the recognized authority on schist, describes the lithology of these boulders as resistant blocks of metamorphic rock, usually containing the distinctive blue mineral glaucophane. Most of these blocks or "knockers", as they are referred to by geologists, range in size from very small (less than 1 m) to several meters in length (1985:1, 6) . The primary mineralogy consists of a combination of glaucophane, garnet, omphacite, rutile, and white mica. Most knockers contain a partial to complete rind of talc, actinolite, and chlorite that was formed by a chemical reaction between the block and serpentine within which the block was once encased. Comparison of the geologic data and mineralogical data with data obtained from laboratory experiments and current tectonic theory suggests, according to Blake (ibid.), that they were formed as oceanic crust (basalt). About 150 million years ago this material was carried down in a subductive zone to depths of approximately 2030 kilometers where the basalt was converted to highpressure and hightemperature minerals. It is assumed that sometime following this metamorphic event they were encased in serpentinized ultramafic rock in the upper mantle while they were still hot enough to react with the serpentine and form the reaction rinds. Blake (ibid.) relates that this is a good hypothesis, to this point, but does not provide the mechanism for getting the rocks back up to the surface. He states that many models have been proposed but none are entirely satisfactory. He does suggest and most geologists agree, and as confirmed by examination of geologic maps, that the blocks were brought back up along fault zones, and are not randomly distributed. These blueschist outcroppings occur within rather narrow northwesttrending zones within the Franciscan Complex. Characteristic of these blocks are their rather restricted size range, and the fact that they are spheroidal or partly spheroidal, and usually contain a soft metasomatic reaction rind that rarely grades into serpentine. The schist rind measures 2 2.5 on a scale of 10 on the Moh's Chart of hardness of geological material. The surface of this soft rind has numerous linear grooves or striae (sometimes referred to as "slickensides") that were probably acquired as the blocks returned to the surface of the earth within a fault zone. These marks are often in a crisscrossing pattern. Blake (1985) relates that excellent examples of these blocks still partly encased in serpentine and showing the straie, were excavated by the U.S. Corp of Engineers during construction of a road west of the Dry Creek Dam site, Sonoma, California. During excavation for construction of the new Adler Springs Road, a few miles northwest of Elk Creek, California, another group of similar knockers were also uncovered.

Often, California archaeological literature has incorrectly identified many artifacts and quarries as "steatite", which are now recognized by researchers to be schist. One example is the excavation report of Thomas F. King of CA-MRN-27 (1970), which made reference to a steatite quarry located nearby (probably MRN442). The lithology of this PCN site has now been identified as blueschist (Parkman 1993b:351). Another site that was previously misidentified was CASBN12, which Pilling had initially reported as soapstone (Pilling and Drake 1950). Examination by geologists Mark and Newman (Gary, et al. 1989) has confirmed the lithology of this boulder as chlorite schist.

Mineral composition of the boulders used in PCN production may provide information giving more insight into the role minerals might play in the “cure” for sterility or to enhance fertility. Local Native groups were knowledgeable about most of the rock formations and minerals that were present in their territories. Their use of rocks and minerals indicated their awareness and understanding of the individual deposits as related to “their texture, hardness, cleavage, and other characteristics” (Wallace 1971:36). Were they also aware of possible medicinal qualities to the schist boulders? This is a question that I have often pondered. To that end I have had several specimens of schist collected in association with PCN boulders analyzed. While I do not have definitive evidence, I will present this information in Chapter IX below on Analysis and Results.

The Landscape of the HREC

The HREC or the Hopland Research and Extension Center are located in Northern California in the southeastern portion Mendocino County, in the intermountain valley in the foothills of the Mayacamas Range of the North Coast Ranges, bordering Lake County (Figure 5.1.).

Figure 5.1: Entry sign for the HREC in Hopland, California. Photo by Garry Gillette

The property is on the westfacing slope of the valley (Figure 5.1.). The property is located about three miles east of the present day town of Hopland, within the drainage of the Russian River, less than 1.6 km from the protohistoric village of Shanel, an important Pomo settlement, and about 160 km north of San Francisco (Figure 5.2 Map).

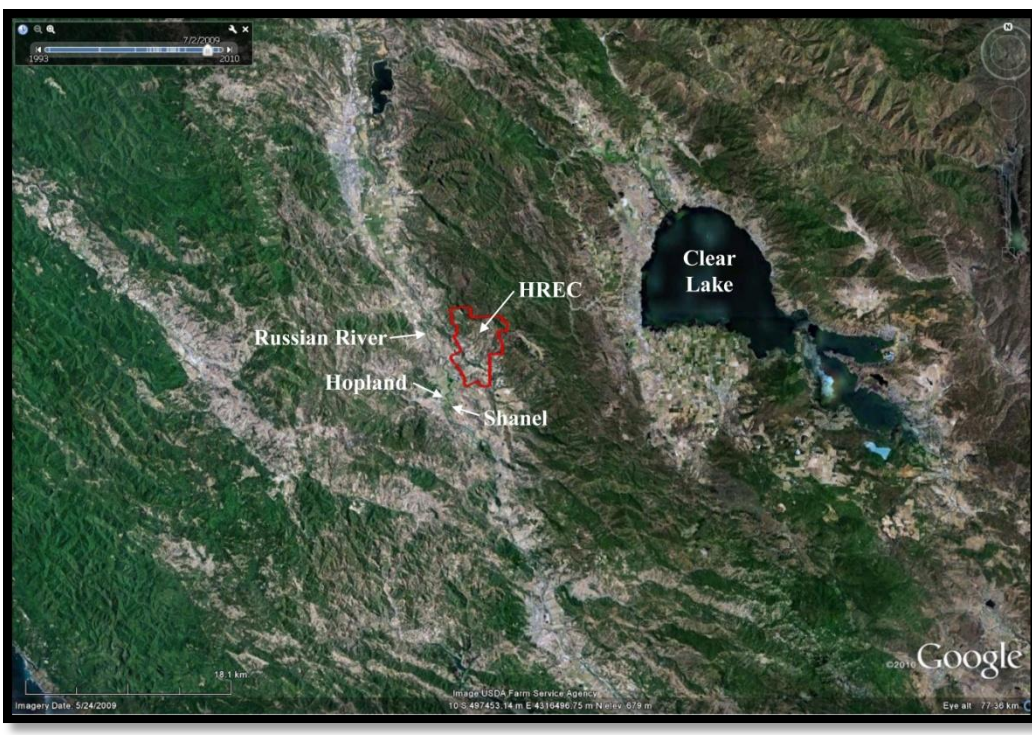


Figure 5.2: Map identifying the location of the HREC in the Northern Coastal Ranges of California.

Situated at an altitude of 150900 m above sea level, the research center was founded in 1951 with the purchase by the University of California of the 1,874 hectare Roy L. Pratt Ranch. The University of California later acquired additional land from the federal government and the center now totals 2,168 hectares. The Pratt Ranch had grazed sheep on the landscape for many decades. The topography of the area ranges from rolling hills, with small valleys to steep rugged terrain with many riparian corridors throughout the center located in drainages from the many natural springs and along Parson's Creek, a tributary of the Russian River, which bisects the lower portion of the property. It is in this lower portion of the center, within the drainage of Parson's Creek, where the PCN marked boulders occur (Figure 5.3).

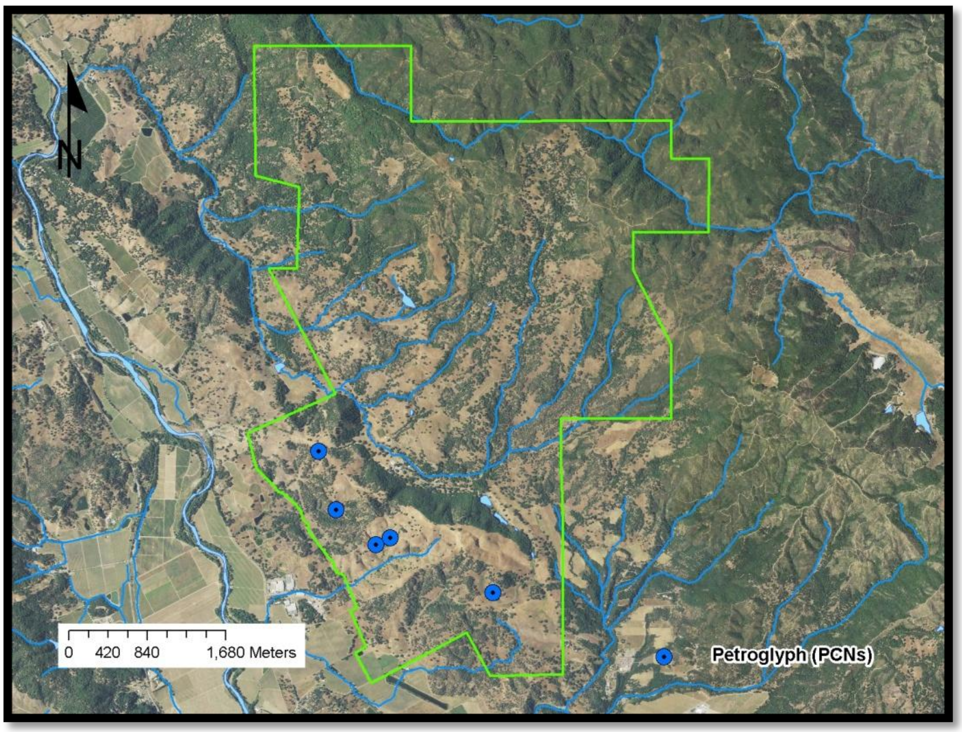


Figure 5.3: Location of the identified PCN marked boulders within the HREC landscape.
Google Map modified by Shane Feirer

The landscape of the HREC serves as a research facility for agriculture and natural resources, owned by the University of California and administered by U C Davis. The facility was purchased for use as a site for longterm, controlled research on native rangelands, watersheds, and wildlife. The Center is the home to the largest herd of research sheep in the United States, and is maintained at around 700 breeding head, expanding to more than 1900 during the birthing season. While not recognized as a facility for archaeological research, the staff of the HREC recognizes the insight and importance of understanding pre-historic activity that took place on and near the center, and welcome archaeological studies. Hundreds of environmental of studies have been undertaken on the HREC, and a published volume provides the abstracts of these studies during the first 50 years of the HREC existence (Timm and Vaughn 2003). This volume provides reference to several studies pertinent to my research that will be cited in this dissertation. Previous archaeological research on the HREC will be covered in chapter VIII on Field Research.

Role of Fault lines

As stated above, the PCN marked boulders appear in fault zones. The "Maacama" fault zone trends northwest to southeast. While the spelling of the North Coast Range study area is known as the Mayacamas Range, geologists refer to the fault zone as the Maacama fault (Sickler 2003:iii; Upp 1989). Two geologists, R. Rexford Upp and Robert Sickler, have conducted indepth studies of the Maacama fault zone. The fault zone is 180 km long, and is the northern extension of the Hayward and Rodgers Creek fault zones. Together, these faults comprise a major part of the San Andreas Fault, branching from the San Andreas north of Hollister (Sickler 2003:iii; Upp 1989:375). The Maacama fault is a northnorthwest trending fault. Upp notes that there is a prominent thrust fault on the south bank of Parsons Creek, which is near the HREC (Upp 1989:401). The major habitation (probable seasonal) site identified on the HREC, CA-MEN-852, is on the banks of a sag pond (actually three linear ponds). Sag ponds, elongated depressions, are found along the faults (Harden 2004:364365), and are not fed by streams or rivers, and thus, have no endemic fish species. As for recent movement on the Maacama fault, Sickler stated that the most recent event along the fault occurred sometime after 1310 AD but before 1660 AD and argued that the fault is a significant seismic hazard (Sickler 2003:iv). Upp"s study from exploratory trenches that he dug, produced evidence that there were two surface offsets that produced surface rupture within the past 16,200 years, and at least one of them was within the past 8,310 years, with none recorded within the past 1,140 years (1989:375). The above two reports are based on surface ruptures, and both researchers indicate that seismic activity continues to take place, while Upp states that the creep rate of the Maacama fault zone is about 7 mm/yr (Upp 1989:410).

Soils

When the HREC land was initially purchased a soil survey was conducted to meet the requirement to understand the soils for the experimental work in agriculture that was to take place (Gowans 1958). Since that time, the HREC has been expanded with additional acquired lands, and numerous studies have taken place focusing on individual soil types (see Timm and Vaughn 2003 for a listing of all soil studies through 2000). Gowans identified 17 soil series during his survey. The soil series include the Climax, Henneke, Hugo, Josephine, Laughlin, Livermore series; the Los Gatos, Maymen, Montara series; the Pleasanton, Sobrante, Soquel series, the Stonyford, Sutherlin; and the Ulmar, Willits, and Yorkville series. The majority of the PCN boulders rest on the Yorkville series soil type, with the two exceptions, which also manifest slight Yorkville inclusion. Both of these "exception" PCN marked boulders rest in areas that indicate that the boulders had, at some period in the past, tumbled down a steep incline (CA-MEN-2221 – the Hidden Hill Petroglyph and CA-MEN-2235 – the Watershed Down petroglyph). Both of these sites are presently located in landslide areas (Gerbic 2009:1921). Both sites were probably utilized pre-historically in their present *in situ* locations. The PCNs and other markings (on CA-MEN-2221) are located on the upright side of both boulders indicating that the boulders were marked after the landslides that deposited them in their present locations. This placement will be verified for CA-MEN-2221 in Chapter XI on Analysis and Results.

The Yorkville soils have developed from glaucophane schist and related metamorphic rocks, with the surface a dark graybrown, mediumtextured, slightly acid composition. They are often covered with grass and scattered oaks. Landslips and seep areas, especially with surface runoff seasonally present at the CA-MEN-2235 site (descriptively named Watershed Down), are also prevalent in these areas (Gowans 1958:20). This locational information by Gowans is consistent with the environmental location of the PCNs on the HREC.

Climate and Hydrology

The climate of the HREC is Mediterranean with hot, dry summers (June through September) and mild rainy winters (HREC 2010). Most of the rain falls between November through February, and the majority of the precipitation (75%) is received during these months. Average rain measurement recordings (from the four weather recording stations on the HREC) range from 94 cm at the 244 m level to 114 cm at 2438 meters elevation. There is infrequent snow at the higher elevations. The summer temperature (July through September) ranges from 2143 degrees Celsius, with a mean temperature of 33 degrees Celsius.

The studies nearest to the HREC to determine paleoclimate were conducted in the Clear Lake Basin, approximately 15 km to the east, through core sample testing (Casteel and Beaver 1978). These studies were based on studies of fish scales (tule perch) as a determinate of water temperatures in Clear Lake. At the time of these studies, unsuccessful attempts were made to also recover core samples in the sag pond adjacent to CA-MEN-850 on the HREC, but too much disturbance was indicated to be of value (Robert Keiffer personal communication 2010). The temperature changes through time are reflected in the changes in the growth curves of the fish scales. Results indicated that between ~11,0009000 BP, there were depressed temperatures, which were followed by a relatively steady increase in temperatures that peaked between ~40002800 BP, followed by decreasing temperatures since ~2800 BP, to the present (p. 338). The studies found that the most restricted growth in the scales occurred during the Early and Late Holocene, with the most growth during the Middle Holocene (White, et al. 2002:27). These climate fluctuations are supported from studies of conifer and oak pollen (Moratto 2004:476).

Also shedding light on the pre-historic climate record are studies in dendrochronology; especially informative were two Bristlecone Pine (*Pinus longaeva Bailey*) studies from the 1950s (see Moratto, et al. 1978). Evidence indicates that California experienced six periods of cool/moist weather separated by five warm/dry periods. In other words, California experienced great variation in climatic systems throughout the Holocene. Populations faced with changes in the climate and changes in subsistence patterns may have had to relocate to those areas that can better provide for their needs.

Understanding the climatic periods of the Holocene helps to inform archaeology about the occupation of geographical areas during certain periods and may explain the lack of archaeological material that attest to habitation areas. It also informs us how human societies adapted to certain localities and conditions, as the environmental conditions changed. Moratto, *et al*., report that the climate changes for the North Coast Ranges experienced depressed temperatures prior to 9000 B.P., with a temperature increase lasting until 400 B.P., and a period of high temperatures peaking between 4000 and 2800 B.P., with a continuing decrease in average temperatures into present times (1978:149). They concluded that periodic climate shifts were enough to affect human populations. Such archaeological studies may serve to predict impacts of the climate on future populations. They argue that archaeologist should closely coordinate climate change studies with archaeological research wherever possible.

The hydrology of the area is best understood by looking at the water flow on the HREC. The Parson's Creek Watershed, which covers approximately 56% of the HREC, is an intermittent stream that flows into the Russian River, and is able to support a steelhead trout population. A perennial stream, Morrison Creek, and Dooley Creek, an intermittent stream, are small tributaries of the Russian River. Also present on the HREC landscape are a number of vernal pools, 18 of which remain filled with water for several months, the largest being Hog Lake. Also present are two sag ponds, which remain year round and are fed by underground springs (HREC 2010). A third sag pond is seasonal. The two permanent sag ponds are located in association with CA-MEN-850 and CA-MEN-3462, with the former being the largest archaeological site currently known on the HREC and possibly a seasonal habitation site.

Flora

A comprehensive inventory of the HREC has identified 600 species of vascular plants (Murphy and Heady 1983). Vascular plants are identified as those that have true stems, leaves, and roots that allow them to thrive in diverse environmental conditions, as opposed to moss and lichen. Four major vegetational types covering 95% of the landscape have been mapped on the HREC – *grass, grasswoodlands, dense woodland, and chaparral*. The remaining 5% is composed of wet meadows, cultivated areas, rock and gravel, and areas covered by buildings. The *grass* type consists of many species, native and introduced, perennial and annual. This grass vegetation type, while present at all elevations, is most established below 610 m on south and west exposures, especially in the Yorkville soil series where the soil is often wet and is prone to slippage. The *grasswoodland* area, is the most prevalent vegetation type, and is similar to the grass type, with the addition of oak trees, the most abundant being blue oak (*Quercus douglasii*), valley oak (*Q. lobata*), and live oak (*Q. wislizeni*). Also present, in lesser amounts are madrone (*Arbutus menziesii*), California laurel (bay) (*Umbellularia californica*), California buckeye (*Aesculusm Manzanita*), poison oak (*Rhus diversiloba*), and hillside gooseberry (*Ribes claifornicum*), and other riparian plants. These plant types are found at all elevations where soil is stable and deep enough to support the root systems, usually on south and westfacing slopes. The major species found in the *dense woodland* areas are black oak, interior live oak, madrone and California laurel (bay). Their heavy canopy only allows shadetolerant shrubs, and thrives in storm drainages, with abundant summer soil moisture and deep soil, at all elevations on northfacing slopes. The fourth vegetation type is *chaparral*, and consists of predominately evergreen and shrubby. This plant community is represented by chamise (*Adenostoma fasciculatum*), buckbrush or wedgeleaf ceanothus (*Ceanothus cuneatus*), ceanothus (*C. foliosus*), Manzanita (*Arctostaphylos spp.*), leather oak (*Quercus durata*), poison oak, chaparral pea (*Pickeringia montana*), and shrub forms of black oak (*Q. kelloggii*) and interior live oak. These plants occupy the thin, rocky soils on dry hillsides. While many of the plants are native to the area, others have been imported, especially since colonial times, with new species appearing from time to time being imported as feed for the domesticated research animals.

Conclusions

The above chapter has examined the physical characteristics of the research station beginning with the geological formations that have made the landscape of California so unique, and specifically with the formation of the blueschist boulders that became the canvas for the PCNs, and provided the talc material utilized in the ethnographic rituals. This chapter also looked at the soils present on the HREC and specifically near the PCN boulders. How fault zones and seismic activity are related to the location of boulders is also covered. The chapter concludes with an examination of the climate of the area, both currently and in the earlier pre-historic periods when Native peoples were utilizing the landscape, and how the climate might have affected periodic habitation of the area. Flora present on the HREC is also discussed. The following chapter will present the cultural environment of the Pomo, the geographical areas they occupied, their subsistence, the natural resources they utilized, and their village life, and that of those in surrounding villages. Early ethnographers and their consultants will be reviewed along with pertinent ethnographic material and the myths or oral traditions that formed their cosmology. The pre-historic movement of the Pomo will be viewed through linguistic studies, with the chapter ending with a brief look at the Pomo of today.

VI. The Pomo and Ethnographic Perspectives

> Landscape [is] a frame for discourse that encourages the development of metaphors, which enables the exploration of old topics in new ways, and which may provide the framework for the construction of new theories. (Morphy 1995:205)

Introduction

The previous chapter has viewed the geographical and geologic aspect of the PCN tradition and especially the physical characteristics of the HREC. This chapter will introduce the Pomo and the landscape they occupied, their environment, and how they utilized their available resources. The Pomo are still very much alive today although relegated, in some cases, to different lands and to a different set of cultural relationships. In this chapter, I will refer to what we think we know about them in the recent and distant past their history while recognizing that they are still a people with pride, identity and practices into the present, much changed through the impacts of cultural contacts. A brief look at Pomo village life will focus on those that once lived in what is today the HREC research area, just east of the Russian River, and their neighbors, with a short review of their worldview, through their myths. The ethnographic accounts will focus on those reports on the use of certain rocks for enhancement of fertility or to cure sterility, with a contextual look at those who gathered the ethnographic information, as well as their informants. The chapter will conclude with a discussion of linguistics and migrations and the current trends in a linguistic understanding of the Hokan language stock, concluding with a brief look at the Pomo today.

The lands of the Pomo are situated in what is now identified as the Coastal Ranges of California, north of San Francisco, with the heart of their land in the valley of the Russian River. Ethnographers, in the early 20th century, recognized and labeled the Pomo into seven linguistic groups – Northern Pomo, Central Pomo, Southern Pomo, Southeastern Pomo, Kashaya, Northeastern Pomo, and the Eastern Pomo.

Territories of the Pomo

The ethnographic territory of the *Northern Pomo* was comprised of what is now central Mendocino County, with 35 km of coastline, beginning just south of Ft. Bragg and continued eastward nearly 80 km to the region to the northwestern shore of Clear Lake, which they shared with the Eastern Pomo. To their north resided the Cahto and various Yukian groups. To the south were the Central Pomo. The *Central Pomo* group, who occupied my study area, was located in what is now Mendocino County. Their geographic area included about 56 km of coastline, where it meets the Southern Pomo at the mouth of the Gualala River, and extended about 64 km inland to the crest of the ridge east of the Russian River, where it met the Eastern Pomo. The southern boundary extended about 32 km south of the county border, where it met with the Southern Pomo area. *The Southern Pomo* ethnographically extended from about 8 km south of the present city of Santa Rosa, and northward 64 km to what is now the Sonoma County northern border. To the east they occupied the eastern drainage of the Russian River until they intersected with the Kashaya territory. The Southern Pomo maintained a small extension to the coast between the Central and Kashaya territories. The *Southeastern Pomo* occupied a small area at the eastern end of Clear Lake. The *Kashaya* occupied about 48 km of the northwest coast of Sonoma County extending inland 8 to 21 km, and probably no further south than

Duncan's Point, about eight km south of the mouth of the Russian River, where they bordered with the Coast Miwok. The *Northeastern Pomo* were geographically separated from the other Pomo bodies in a small area of the drainage system of the Big Stony Creek, boarding the Yuki and Patwin areas. The *Eastern Pomo* shared the shore on Clear Lake with the Southern Pomo. They occupied the area between two chains of the Coastal Ranges. The northwestern portion, consisting of Clear Lake proper and the Upper Lake were the domain of the Eastern Pomo, while the southern portion of the lake, consisting of East Lake and Lower Lake were the territory of the Southern Pomo. These geographic areas are based on knowledge that was obtained by anthropologists during the ethnographic period, that is when ethnographers were collecting their primary information about these groups, albeit some decades after contact.

Linguistics

The linguistic prehistory of California is not clearly understood. It is believed by many linguists that the oldest linguistic stock still *in situ* in California is the Hokan, which includes the Pomo linguistic family (Shipley 1978:81). Golla, however, has speculated that there may be a very old "remnant" of an earlier language found in the Chumash and Yukian languages (2004:81). Golla (ibid.) cited Kroeber (1925:159) as also proposing a possible early connection with the Yuki, when he suggested they may be a "relict" population from the "earliest peopling of California". While this hypothesis is also considered a possibility by other linguists, the Hokan language family has played an early dominate role in the linguistic history of California, and is considered the oldest phylum (historically related) language group in western North America, that can be documented by using standard "comparative linguistic methods" (Golla 2004:78). Langdon (1974:87) has suggested a ProtoHokan language that consisted of what she describes as a rather simple sound system. Many groups were displaced by the incursion of the Penutians, which pushed the speakers of the Hokan language family to the periphery of the state. Morrato (2004:536) also views Hokan as the oldest known California language stock but mentions the possible exception that the oldest one is Yuki. Shipley (Shipley 1978:81) suggests that the antiquity of Hokan needs to be considered as an unverified hypothesis, with Golla (2007:78) giving a time depth of 8,000 years. Kaufman (1988a:59) argues for a time depth of 9,000 to 10,000. The Pomo language of the Clear Lake Basin is believed to be the oldest of the Pomo languages. The Central Pomo dialect of the spoken language was identified at the time of n ethnographic times as being spoken in seven or eight tribelets (Stewart 1943:43). A more indepth discussion of the complicated linguistic movement and migration in California prehistory will be addressed later in this chapter.

Tribe or Tribelet

The term "tribe", concerning the political organization of California Indian groups calls for a short discussion of its use. While the term is applied to most central and eastern American Indian groups, Kroeber took issue with the use of the term in California (1925:830). He introduced the word "tribelet" in his *Handbook of the Indians of California* as synonymous with "ethnic group", rather than a united political group, citing that "tribes" in the usual sense of the term, did not exist in California, with the exception of the Yokuts (p. 474). Kroeber characterized the smaller California units as a "small body, evidently including on the average not much more than 100 souls" (p. 830831). He identified them more as a "village community", implying a tract of land rather than a settlement. In a later publication (Kroeber 1932) he further identified a tribelet as “groups of small size, definitely owning a restricted territory, nameless except for their tract or its best known spot, speaking usually a dialect identical with that of several of their neighbors, but wholly autonomous” (p. 258). These tribelets were tied by relations of kinship. In this publication Kroeber also retracted his suggested use of the term “village” or “village community” as being too vague.

Several noted anthropologists who followed Kroeber have also employed the use of the term triblet (Heizer 1978a; Levy 1978; Margolin 1978). Leventhal (Leventhal, et al. 1994:300) takes issue with the term “tribelet” calling it demeaning to Ohlone, Esselen, and other California Indian people with the implication that the term implies an impression of pre-contact Native California as being an area of extremely smallscale, provincial cultures that lacked forms of largescale integration. He feels that the Kroeberian approach has blocked a more sophisticated assessment of pre-historic California cultures. Two recent publications (Lightfoot and Parrish 2009; Lightfoot 2005) present additional background information relating to the polities of indigenous groups in California and the application of the term “tribelet”. Milliken (1995) has noted that the term is not used outside of California for similar groups, and thus, may not continue to be acceptable with the academic world. In this dissertation, I will address the California groups as tribelets, following Kroeber and others, who saw the term tribe to indicate a more political organization, which does not describe the looselyknit relationships of the local groups.

Environment/Subsistence/ Natural Resources

The environment of the Pomo encompasses three distinct settings – the Coast, the Russian River Valley, and the Clear Lake district. The Coastal Ranges of California experiences a rainy winter and a hot dry summer. As indicated on the map (see Figure 6.1) the Central Pomo had access to a wide variety of resources from a diverse range of habitats extending from the ocean, mountains, valleys and large lakes, and drew their subsistence from all these areas. There were large grassy areas, some of which were marshy during a portion of the year. The streams were lined with willow, dogwood, and wild grape vines. The lake shore was abundant with tule grass. The surrounding mountain ranges and upper valleys contained a conifer forest, consisting of Douglas fir, sugar pine, yellow pine, and incense cedar. The lower, dryer slopes supported by what are called digger pines. Several types of oak supplied the acorns, their main food staple (Kniffen 1939). Fish were abundant in the many streams and lakes, and the mountains and forests sheltered much wild game. The ocean provided a great variety of marine resources.

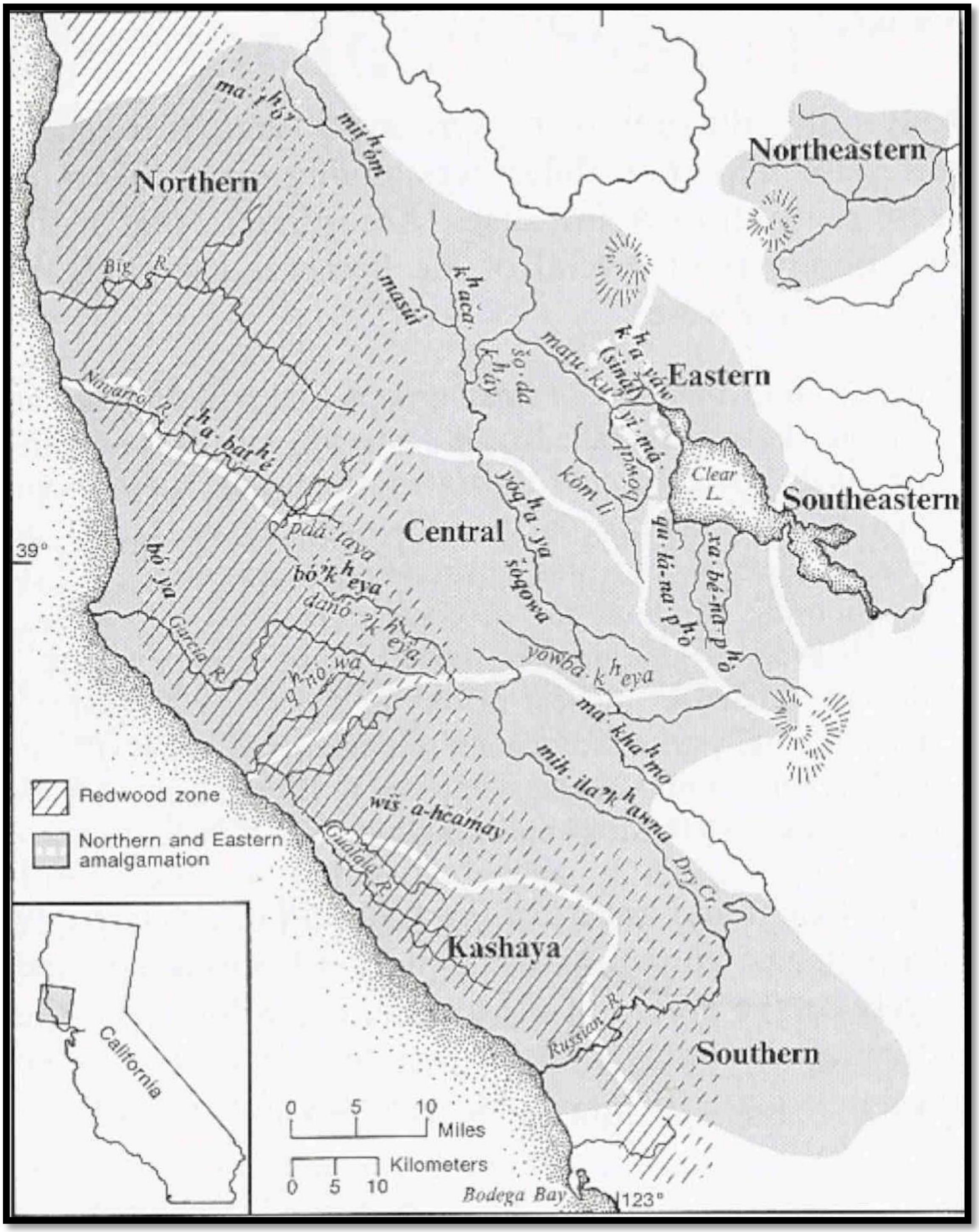


Figure 6.1: Territories of the seven language groups of the Pomo, indicating the diverse environmental zones they inhabited. McLendon and Oswalt 1978:275

According to Barrett (1933:7) these three diverse environmental areas the Coast, the Russian River Valley, and the lake district (Clear Lake) made for what he called ideal "Indian

Country", within which Native people developed specialized cultures. Barrett also commented that the variety of available resources is reflected in their myths.

Of natural resources, the area to the east of the HREC included Clear Lake and the volcanic lava flows of Mt. Konocti and Borax Lake that provided the source of the majority of the obsidian used for the manufacture of projectile points and other tools in archaeological assemblages over a broad area. Also present at Clear Lake are magnesite quarries (from the White Buttes, near Cache Creek) where material was obtained for the making of cylinders that were highly prized and often called "gold" by the Indians when compared to the clam shell beads from the coast (known as "silver"), according to Kroeber (1925:249). (Note the European metaphors, indicative of cultural influences). The magnesite was too valuable to be strung as beads, and instead was ground down, baked and polished (heat changes the color from dull white or streaked gray to a lustrous buff, salmon, or red), and traded as individual items. Both items (mainly produced by the Pomo) served as what was interpreted as barter system for pre-historic Central California.

The Pomo also used the wide range of available fiber materials to produce elaborate baskets, which became very popular as collector items in postcontact times. While baskets, cradleboards, and fish traps had served as functional items as well as gifts and ritual and social uses in local Indian cultures, it was after contact collector that baskets were often decorated with trade beads (European), and brilliant feathers (Barrett 1908b). These baskets are highly prized and today are found in museums and ethnographic collections worldwide (Sarris 1994).

Although Stewart recognized seven or eight Central Pomo tribelets, he only included six in his writings (1943:4351). To briefly summarize his ethnographic notes, the largest Central Pomo group that he observed at the time was the *Yokaia* of Ukiah Valley whose territory covered about 161 square km extending about two and a half km north of Ukiah to about 13 km south and to the top of the mountains to the east and the west. He estimated the population at 5001000 people. These Pomo lived in several small villages and probably concentrated living in one main village during the winter. Stewart identified *Cokadjal* as the main village and it was thought to be a permanent residential location. The houses in this village were burned every year and the villagers scattered to different parts of the valley based on the best sources for different food (acorns, buckeye, fishing, etc.). They were the only Central Pomo group known for this yearly burning of their homes (except after the death of a family member). They practiced private ownership of collecting and fishing areas. As the valley did not provide them with all their subsistence needs they were granted permission by other groups to go into other areas and also acquired needed items through trade.

In this section, I will give a brief synopsis of other Central Pomo groups to place the Hopland group (the Sho KaWah as they prefer to call themselves, today) in context of the larger group. The *Ciego* of Largo effectively spatially separated the villages of Ukiah and the Hopland Indians, providing a buffer zone between what some considered to have been the two warring tribelets (Ukiah and Hopland). The Ciego were a very small group at the time and only occupied about five km of the Russian River. While Barrett (1908a:173) cited this group as one of the most important groups in the valley. I will address here the Hopland tribe, as one group that is most relevant to the study are under consideration.

The *Yobakeya* of Echo occupied the eight km of the Russian River below the Hopland group and also served as a buffer group, numbering about 60 individuals. They were one of the Pomo groups reported to have been very warlike at the time.

The *Danokeya* of Yorkville occupied about 97 square km between Hopland and Point Arena (near the coast). With only two small streams in the area they depended on their neighbors for much of their food. They exchanged gathering rights with the Hopland group for fishing along the Russian River. Culturally, they closely resembled the Hopland tribelet.

About 64 km of Coastal area was occupied by the *Bokeay* of Point Arena. In the northern area they always occupied land no more than eight km from the Coast. The southern portion occupied area on the coastal shelf about 32 km inland, including part of the redwood belt. Not much is known of their political organization. The three or four autonomous groups apparently merged together and functioned as one tribelet (Stewart 1943:47), and no boundaries of the subgroups were recognized (p. 49).

Kniffin (1939:373-380) chose the *KachaPoma* of Redwood Valley (north of Hopland) as a typical Russian River Pomo group. He identified the landscape as abundant in several types of oak trees, and grasses, which were burned regularly by the Indians. Deer, elk and bear were present. The oak trees drew an abundance of squirrels, and there were many birds (quail, doves, etc.) and the streams were populated by salmon in the winter. He stated that the area was "a land of abundant resources, flora and fauna." The seasons consisted of rather hot temperatures in the summer and cold, rainy winters, with occasional snow. December and January were spent in the village with the exception of gathering wood and some hunting for fresh meat. The subsistence that was gathered in the fall was enough to see them through the colder months. They spent this time making bows, obsidian arrows, beads, and storytelling and preparing for the outdoor season. During this time they made nets, spears, fish traps, and other fishing paraphernalia; both men and women made baskets.

In the early spring, salmon were running and they were gathered with a long pointed spear. While the first caught fish were eaten, the later ones were split, dried and stored in baskets. In June the soap root was ready to be harvested and used as a poisoning substance to stun the fish. As they floated downstream they were picked up by villagers and put in baskets. Deer killed in the spring were eaten fresh; the remainder were dried and put in baskets. Fresh plant foods were gathered in the late spring, with seed plants gathered in late spring with beaters and baskets. When the first good weather appeared in the spring, a group of men and young women would make the trek across the mountains to gather seaweed. By early and middle summer the weather was right for traveling, feasting, and dancing, and visiting neighbors. The great harvest began in July and continued into the fall, with abundance of flora and fauna. By December, the cycle began anew.

Village Life

According to Kroeber (1925:228), the village community, as a political unit, generally consisted of several settlements, with one principal village where the chief lived which was recognized by all the people. Community members were at liberty to hunt, fish, and gather plant material in the claimed area, without regard for private ownership. The boundaries of the claimed land were definite. At times of abundance, these rules were waived and land rights were open to others. Kroeber also noted that little warfare was known of the Pomo, either among themselves or with neighboring groups (p. 235). Powers (1976:146) also recognized the "collective' Pomo as peaceful and nonwarlike. As noted above Stewart (1943:43-51) seems to disagree with Kroeber's take on warfare, noting the warlike behavior of the *Yobakeya* of Echo, and the *Ciego* of Largo who served as a buffer between the *Yokaia* of Ukiah Valley and the *Cokoa* of Hopland .

While coastal Pomo, located in the heavier timber belt, built their houses of redwood bark leaned into a cone of 34.5 meters, the Russian River Pomo (including the Hopland) tended to build their structures from a framework of poles, bent together at the top, and thatched with bundles of grass. The Clear Lake Pomo used a similar method, more elliptical, substituting tule for the grass. Woven mats lined the interior walls of the structure. Temporary summer camp dwellings were usually made from brush (Kroeber 1925:241).

Pomo villages contained a sweathouse, which was similar to their assembly or dance house, but served as a place where the men 'sweat', slept, and spent most of their time. The dance or assembly house was 1218 meters in diameter and covered with earth, and served as the location for their many ceremonies and dances. Barrett (1917) observed and documented many of the ceremonies in the early 20th century, while Loeb (1926) gave a detailed account of the secret societies.

The clothing of the Pomo was very simple, consisting of a reed skirt for the women, and if anything, a skin, wrapped around the hips, for the men. If they wore shoes at all, they consisted of a softsoled moccasin, fashioned from reeds. The men wore long ear tubes of bird bone decorated on the ends with a bead or brilliant feathers. A pin or shaft of halitosis (abalone) pierced their noses (from Kroeber 1925).

Pomo of the Hopland Area

In regard to the *Cokoa* of Hopland, and the village of Shanel, I will explore their culture in more detail as they are the group that is traditionally linked with the landscape of my research territory. There are two Pomo villages known as Shanel, with no apparent connection. The northern village is also known as Seel or Botel, and is located at the north end of Potter Valley (Powers 1976:146147). The Cokoa people occupied about 13 km of the Russian River from three km north of Hopland to ten km to the south, and extended their territory into the mountains to the east (the location of the HREC), including McDowell Valley, also an area that will be discussed below. They occupied a total area of about 70 square miles (Stewart 1943:45). The Cokoa are also known as the Shokowa (McLendon and Oswalt 1978:276), and have also been referred to as cōkōwa, Shokhowa, Shókoah, Soca (p.282). Kroeber (1925:232) places the village of Shanel as being near the mouth of McDowell and Feliz Creeks in Hopland Valley. He noted the tribal name as Sokows, which is probably a synonym for Shanel. They occupied the pre-contact village of Shanel whose population was reported by informant Jeff Joaquin at being 1500 in number (Stewart 1943:43). This estimate of 1500 villagers was substantiated by Powers (1976:168, fig.19) who identified 104 house pits and the foundations for five assembly houses in the village. The five assembly houses each were said to contain about 100 (men). An estimate of those living in the old village in 1847 was between 300500 "souls" (p.169). The village is also known by several variants – Canel, Sahnel, Sahnels, Sainals, Sanelos, Senel, and Sinals. Powers (1976:168) noted that at the area near the Native village of Shanel, there was also an American village known as Shanel. The name Shanel was recorded in 1844 as a Mexican land grant. According to Stewart (1943:45), the Native population was forced from the site by Spaniards (Mexican's?) and moved first to the village of Kabebel, and then to Kaletslu, where they stayed until 1910.

The Cokoa were known by their neighbors as “dangerously brave warriors” (ibid.). Fishing rights were often the cause of conflict between the Hopland and Cloverdale groups.

Pomo Myths

According to Barrett (1906:10), the main theme matter of Pomo myths involve the “bird people” or other supernatural beings that inhabited the earth before the creation of people. Their “Culture Hero” is coyote, who is responsible for the change from “early times” to what they are now (i.e., the creation of the ocean, the mountains, the animals, etc.). Coyote, as in many cultures, is also depicted as the “trickster”. Barrett (1933) lists the involvement of Coyote in nearly onethird of the over 108 myths that he presents in his volume of Pomo myths. Kroeber (1907:12) had identified three distinctive areas of similar myths in early pre-historic California, apparent by the variants of the myth content – a small Northwestern area, an area in the Southern part of the state, and twothirds of the state being referred to as the Central area. Barrett (1906:12) then divided this Central area into North Central and South Central with the dividing line at about San Francisco, placing the study area in the North Central. He noted specially the absence of migration and historical accounts, and commented on the creation of the world with what he called “true creation motifs” such as humans from objects, and the transformation of “bird people” from humans into the present birds and animals. Also of note is a myth to explain the presence of the obsidian at Mt. Konocti, which Barrett spelled Mt. Kanaktai (Barrett 1933:231). According to Barrett, the ObsidianMan, on his return to Mt. Konocti, got caught in some brush and his body broke into many pieces. Another ObsidianMan myth has his long hair caught in the brush such that he pulled so hard to get free that his body fell and broke into many pieces. These many pieces would be a reference to the fractured pieces of volcanic glass or obsidian. Pomo myths focus on a great number of supernatural beings.

The world of the Pomo consists of three layers: the Earth, previously occupied by the “Bird people” and other mammals, and where humans now live; the Upper World that is called *Kalī’mīnaū*, the home of their chief god *Madū’mda’*; *Mabel McKay: Weaving the dream* and the second Upper World, which had no special name but was the home of *Madū’mda’s* younger brother *Tsīko’lkol*. There are many versions of the creation story, from the earth always existing to individual creations. While the method of creation is not the focus of the creation myths, they seem to focus on the pranks and other actions of Coyote; some myths even give him credit for creating the earth, himself (Barrett 1933:15).

Pomo Ethnographies

Perhaps the most intensely studied of Native cultures (Cook 1957; Kroeber 1925; Kunkel 1974:11) in what is now California; the “Pomo” are often treated in anthropological literature as a single group (Cook 1957; Kroeber 1925). While there are extensive ethnographic references available, it has been cautioned by some that knowledge about the Pomo leaves much to be desired (McLendon and Oswalt 1978:276-277). McLendon and Oswalt identify three potential problems with Pomo ethnography. These include the fact that almost none of the sources/ethnographers directly observed the social, cultural, and religious organization they reported on. Those that did actual observations, namely Powers (1976), originally printed in 1877, and Gibbs (1853b) provided little information obtained directly from the Native people. In the case of Powers’ research information was provided by White settlers who claimed to have “expert” knowledge. The second caution involves the manner of the collection of information, in that just a few selected members of the tribe were consulted, interviews were conducted in English, and the process was carried out over only a very short time. The third caution is that Loeb only consulted five men (one from Central Pomo), from just a few linguistic groups, and Barrett only used informants from the Yokaia and Cokoa groups (both Central Pomo) (McLendon and Oswalt 1978:277). The Central Pomo, which includes the Hopland group, were among those consulted by these ethnographers. Thomas Keter recently presented a paper that cites problems with California ethnographies. While directed to research he has done in Trinity and Humboldt counties, some of his comments are pertinent to California ethnographies in general (2009). His research has been centered on helping Native groups to obtain Federal recognition, and he cites "the failure of ethnographers to discern and document the social complexities and sociocultural autonomy of Indian villages and communities and the complex interconnected web of kinship, linguistic, and cultural ties between the various communities that ultimately defined group identities in this region [that] has resulted in problems with efforts to gain tribal recognition for Native Americans…" (p. 4).

The accuracy of California ethnographic information is stated to be of "little question", according to Heizer and Nissen (1973:23), pertaining to information that was gathered in the last half of the 19th century and the first quarter of the 20th century. They note that those informants who were born before 1850 – the year they list as the effective date of American contact with those not impacted by the missions and others – could have grown to adulthood before seeing a white man. Heizer and Nissen also stated that even though those surviving California Indians had all been acculturated to some degree by 1900 to 1910, they had still continued their cultural practices in many ways, including language, thought, and some daytoday activities to maintain their Native heritage. Thus, the information they were sharing with ethnographers was either directly obtained through their own experiences or those of their parents. Perhaps Keter makes a good point at the end of his paper (2009:43) when he states that "Native Americans…..have a deep and wide reservoir of cultural knowledge about their past that remains underappreciated and unrecorded by the anthropological". Perhaps it is time that anthropologists make an effort to take a second look at the ethnographic literature and may be able to interpret a more accurate view of the early cultures.

In reality, the Pomo are not a tribelet, but rather are comprised of seven distinct geographically located groups who are linked through a common language stock (Hokan), even though their languages are mutually unintelligible. The languages are not even considered dialects of the same language (McLendon and Oswalt 1978:274). The seven groups are identified as Northern, Northeastern, Central, Eastern, Southeastern, Southern, and Kashaya, based on their geographic location in relation to each other (see Figure 6.1). The Kashaya were the only group that appears to have had a name for themselves; the others simply referred to themselves as 'people' (1978:1). Gifford and Kroeber (1937:119) write that there is no definable Pomo cultural entity, but rather a nationality, based type of speech (the Hokan linguistic stock).

The view is that there was a "series of highly similar but never quite identical Pomo cultures", but little of the ethnographic material collected by Powers (1976), Barrett (1908a, 1917; 1952), Loeb (1926), Gifford (1923, 1926, 1928, 1967; Gifford and Kroeber 1937), Kroeber (1925), Stewart (1943), and Kniffen (1939) was based on actual observation, much less systematic interviews with many different members of groups. The information provided to the early ethnographers was obtained through interviews with the oldest member(s) of a few tribal groups who were willing to share with them some ideas about the old ways. These accounts were limited to interviews representative of only two or three of the seven identified language groups (Northern Pomo, Central Pomo, and Eastern Pomo). Fortunately my study area in Mendocino County lies within Central Pomo group and thus there is considerable ethnographic material available, even if much of it must still be recognized to be somewhat unrepresentative and based on observations of severely impacted post –contact life ways.

The name Pomo was first ascribed to the Indians on the east fork of the Russian River in two reports by Indian Scouts, Col. Redick McKee (18511857) and George Gibbs (1853), according to McLendon and Oswalt (1978:277), while Barrett (1908a:118) gives the credit to Powers (1976:146) for the broad use of the term "Pomo" applied to the entire linguistic family.

The word 'Pomo' may translate from the word for 'at red earth hole' (ibid.). This word may also refer to the mineral magnesite, which was used in the making of valuable beads or to red earth or clay as Merriam (1955:38) suggested that may be identified as the hematite that was mined in the area and mixed with milled acorns to flavor and color the flour used for bread. Powers believes that the word Pomo is connected to the Wintūn word *pum*, meaning "earth". A second word 'Poma', based on Northern Pomo, was sometimes used to designate those who lived at that location (Barrett 1908a; McLendon and Oswalt 1978:277).

Ethnographers

This section will include biographical information on ethnographers who contributed to the Pomo literature or related areas, to better understand the context of their writings. The earliest ethnographer to work in the Pomo area was **Stephen Powers** (18401904**.** Kroeber acknowledged Powers as not only his predecessor, but his book *Tribes of California* as "one of the most remarkable reports ever printed by any government" (Powers 1976). Powers, a journalist by profession (Kroeber 1925:ix) made his first trip to California in 1869, when he walked across the U.S. in a year. He decided to do a study of the California Indians in the summers of 1871 and 1872. Heizer (1976:15), in his introduction to the reprint of Powers book (1976) quoted him as "[I] traveled some thousands of miles on foot and horseback among the California Indians during which time I collected a mass of original material and prepared an elaborate account of the habits, customs, legends, geographical boundaries, religious ideas, etc. of the California Indians of which the principle portion I published serially in the *Overland Monthly*, and one chapter in the *Atlantic*, in the years 1872-1871." Heizer notes that Powers actually published other manuscripts that are now available in Contribution No. 25 of the University of California Archaeological Research Facility (Baumhoff 1978). When Powers considered his Indian research complete he contacted Major J. W. Powell who, at the time, was in charge of the Department of Interiors Geographical and Geological Survey of the Rocky Mountain Region. Powell agreed that the information should be printed in book form and Powers rewrote the articles that he had previously written and *Tribes of California* was the resulting publication. One of Powers accomplishments with this volume was the first linguistic classification of Native languages.

C. Hart Merriam (1855-1942), began his early career in 1872 with a study of birds in the Yellowstone region, devoting his life to both ornithology and the study of medicine, receiving his M.D. from Columbia University in 1879. In the early 1980s his interest turned to mammals as he became the first director of the Division of Entomology and Mammalogy with the U.S. Department of Agriculture. In 1899 he organized the E. H. Harriman Alaska Expedition, financed by Harriman. The following year he moved to California and developed an interest in California Indians. In 1910 he received a life endowment from Harriman's widow to carry on research under the auspices of the Smithsonian Institution. Between the years of 1910 – 1937, concerned with what he saw as the rapid loss of Native information, he devoted his time to recording word lists (including terms for plants and animals), names and locations for villages, and, to recording exact tribal boundaries. Combining his natural history interests with his ethnographic recording he felt that Indians needed to be studied within the context of their environment, and focused much of his research in that direction. Merriman published little of his works during his lifetime, and in 1977, Heizer assembled and edited three volumes of his research, funded by the Mary W. Harriman Foundation (Heizer 1966; Merriam 1977).

Alfred L. Kroeber (1876-1960) is considered the "father" of anthropology and archaeology at the University of California, Berkeley. Born in New Jersey, he earned his Ph.D. at Columbia University under Franz Boas, who greatly influenced his later work. He was the first student of Boaz and received the second Ph.D. in anthropology in the United States, with a dissertation on the Arapaho Indians Wyoming, but is best known for his research on California Indians. During his prolific 65year tenure as an anthropologist, he published over 500 books and articles. Kroeber's *Handbook of the Indians of California* (1925) is considered an indispensible volume on California Indians. Founding both the Anthropology Department and the University Museum at Berkeley, Kroeber conducted no archaeological excavations in California, but sent his students to many areas of California to excavate. He was responsible for training most of the next two generations of anthropologists. Senescing a need to "salvage" California prehistory, before all the remnants of the cultures disappeared; he created the *Ethnological and Archaeological Survey of California* with the goal of reconstructing California cultures as they would have existed before contact with Westerners. Kroeber is repeatedly cited in anthropological/archaeological literature and several publications also discuss Kroeberian anthropology (Chartkoff and Chartkoff 1984; Fagan 2003; Leventhal, et al. 1994; Lightfoot and Parrish 2009; Lightfoot 2005; Raab and Jones 2004).

Probably the most extensive ethnographic studies in the Pomo region were conducted by **Samuel A. Barrett** (1879-1965) at the beginning of the 20th Century (from 19031907). Barrett received the first Ph.D. in Anthropology from the University of California, Berkeley, under the direction of Alfred Kroeber. He funded his education by buying and selling native baskets, and made the Pomo baskets the subject of his dissertation. For most of his career he served as Director of the Milwaukee Public Museum, returning to California to direct the Exhibit of Aboriginal Cultures of the Western Hemisphere as part of the Golden Gate International Exposition in San Francisco in 1940, a World's Fair that was held to celebrate the construction of the Golden Gate and OaklandBay Bridges. Barrett did not publish his two volumes *Material Aspects of the Pomo Culture* (Barrett 1952) until the early 1950s. He became a research associate of the Museum of Anthropology at Berkeley and later (1960), with Kroeber he established the American Indian Films, with the intent of educating the public about how Indians lived to counter the Hollywood version (Laszewski 2008). These films (over 20) were his final contribution to the field of Anthropology. Directly related to my research is his 1904 photograph of the Knight's Valley Pomo Baby Rock (Barrett 1952:2389) and his informant's account in his section on Sterility in this same report (pp. 385386).

Receiving his Ph.D. at Yale, **Edwin M. Loeb** (1894-1966), became a lecturer in 1922 at University of California, Berkeley, in the Anthropology Department under Alfred Kroeber. In 1924 the University received a generous grant from the Guggenheim brothers of New York City for research among the Indians of California. Kroeber chose Loeb for the task, which then spent 19241925 investigating the general culture of the Pomo Indians, publishing his *Pomo Folkways* (Loeb 1926). In 1931 he published an article comparing what he referred to as "religious organizations" between northern California tribes who practiced "Kuksu" that included the Pomo groups and those groups of Tierra del Fuego, following his interest in diffusion of trait complexes. He compared such cultural practices as boy's initiation rites and girl's puberty rites, noting the similarities (Loeb 1931). Leaving the academic community during the war years (he became a government specialist on South East Asia), he returned to Berkeley in 1946 as a lecturer in the Department of Geography under Carl Sauer, the Department Chairperson. He did extensive fieldwork in South West Africa, Polynesia, and Indonesia. Theoretically he was influenced by the evolutionary and Americanist schools, but also recognized that theoretical interpretations were temporary by nature.

Fred B. Kniffen (1900-1993) was a geographer/anthropologist who received his Ph.D. from the University of California, Berkeley, under the guidance of cultural geographer Carl Sauer and anthropologist Alfred Kroeber. This scholarly combination prepared him for his life studies as a "folk geographer". His professional career was spent at Louisiana State University as a Professor of Geography and Anthropology, where he was regarded as the foremost authority on Louisiana's indigenous cultures. He is also recognized as the founder of American folk geography. His work with the Pomo consisted of a book on *Pomo Geography* (Kniffen 1939), where he presented a 'cross section of Pomo material life in the context of natural resources", comparing Natural and Cultural Landscapes, as represented by Clear Lake, Russian River, and Coast Pomo (Anonymous 2010).

Omer Stewart (1908-1991) published his *Notes on Pomo Ethnogeography* (1943), after completing his Ph.D. at the University California, Berkeley in 1939, where he studied under Kroeber, Lowie, and Sauer. In 1944 he founded and became the first chair of the Department of Anthropology at University of Colorado. Most of his studies pertained to the western United States, focusing on the Native use of peyote, as an advocate for the acceptance of Peyote as an Indigenous religion, and as a vocal supporter of Indian Lands Claims. One of Stewart's greatest anthropological contributions was as the Father of Anthropogenic Fire Theory dealing with the study of indigenous human influences on the environment. He was considered by some as 'the most perceptive, influential, and possibly the greatest American anthropologist of the 20th Century" (Dubrasich 2007) . Possibly 50 years ahead of his time, he wrote the manuscript on indigenous fire theory in the 1950s, and it took more than 50 years for the manuscript to be accepted and published as *Forgotten Fires – Native Americans and the Transient Wilderness* (Stewart 2002a). He wrote his *Notes on Pomo Ethnography* as a supplement to Barrett's study, and to better understand tribal units since he had been accompanied to areas by Native people. He was also interested in giving information on foods, shelters, and other features that identified Pomo culture. One section of his paper dealt exclusively with the Central Pomo (Weaver 2002).

As a ProfessorEmeritus at the University of California, Berkeley, and also serving as DirectorEmeritus of the Museum of Anthropology, **Edward Winslow Gifford** (1887-1959) achieved this distinction without ever having had more than a high school education. He joined the California Academy of Sciences on expeditions to Mexico and the Galapagos Islands, where he utilized his exceptional skills in meticulous attention to accuracy in observation, and was known for his work in Oceania. He began his 47year association with the University of California when he was named Assistant Curator of the Museum of Anthropology in 1912, and was appointed as a Lecturer in Anthropology, and moved through the ranks to the level of a Full Professor. While his biography notes more than 100 contributions, much of his anthropological work was centered on Aboriginal California (Foster 1960). While Gifford devoted his life to studying California ethnography, his only article dealing directly with the Central Pomo, and specifically with the Hopland Rancheria, appeared in the *American Anthropologist* (1928). Based on fieldwork that took place in 1917, he reported on the succession of chiefs, land ownership (communal), marriage, death, and other social issues. He also listed a calendar of the twelve moons of the Pomo year. Gifford was also the coauthor, with Kroeber, of the *Cultural Element Distributions for the Pomo* (Gifford and Kroeber 1937)

During 25 years of research, anthropologists **Burt W. and Ethel L. Aginsky** published articles (and a book) on the recreation of Pomo life in the early 1900s. Both received their PhD's from Columbia University in 1935. Influenced and supported by Ruth Benedict and Franz Boas, the Aginsky first began working in Mendocino County in 1934-1936. Dr. Bernard Aginsky was the Chair of Department of Sociology and Anthropology at the College of the City of New York. Dr. Ethel Aginsky taught in the Department of Sociology and Anthropology at Hunter College in New York City. In 1939 they established The Social Sciences Field Laboratory, under the auspices of New York University, and continued their Pomo studies through 1941. A final field session was held in 1948 through the Maxwell Graduate School of Syracuse University in New York. Dr. Alfred P. Parsell took part in all five field sessions. Both the Aginskys and Dr. Parsell's extensive collection of notes and collected information have been donated to the Mendocino County Museum in Willits where they are open to researchers and members of local Pomo communities. Recently, the museum published a collection of Parsell's work (he was present at the Aginsky field schools) and other academic material that resulted from the field schools (Parsell 2002). This publication also provides an introduction to an extensive collection of ethnographic material. The historical novel *Deep Valley* was based on the Aginskys' many years of study of the Pomos. Shawn Padi, Hopland THPO (Tribal Historic Preservation Officer), and my Hopland Pomo contact, recently shared with me that he had acquired 95 pages of notes from the interviews by the Aginskys of his greatgrandfather, Jeff Joaquin. To his surprise, while reading *Deep Valley*, he realized that the book was directly based on the interviews with his greatgrandfather (personal communication 2010).

In addition to the above biographies of the ethnographers who worked with the Pomo, most having connections with University of California, Berkeley, there are two other sources for ethnographic information. While not academically trained in ethnography, they have made significant contributions through their recording of the Native American presence in the central California area. **John W. N. Hudson** (1857-1936) was born in Tennessee and trained in homeopathic medicine, traveling to California in 1889 where he become the physician and surgeon for the San Francisco and North Pacific Railroad, and settled in Ukiah. He married artist **Grace Carpenter (Davis)**, in 1890. Carpenter herself could be considered an ethnographer through the information she documented in her paintings with most of her subjects being local Pomos from Ukiah, portrayed in the context of their native legends and traditions. After just a few years, Hudson gave up his medical practice and focused, with his wife, on collecting Pomo baskets, and on studying the Pomo languages and cultures. As his basket collections became known, he was asked by the Field Museum in Chicago to become an assistant ethnographer, eventually collecting material for the Fred Harvey Company, even providing one of the Harvey hotels with Pomo basket weavers for demonstrations of the art and craft of basketmaking. The postcontact interest in decorative Pomo baskets no doubt came about through the influence of the work of the Hudson's. John Hudson amassed a large quantity of ethnographic and linguistic material on traditional Pomo cultures and, through the encouragement of John Peabody Harrington, he prepared it for publication, continually revising the manuscripts. He passed away in 1936, leaving his work in progress. His wife's intentions to prepare the manuscripts for publication never came to pass, as she died the following year. Many boxes of manuscripts, in varying states of revision, are housed at the Grace Hudson Museum in Ukiah, and contain "gems" of ethnographic data (Boynton 1978). This extensive collection of ethnographic notes remains unpublished, but available to researchers. In 2007 I spent several days at the museum going through boxes of notes. Some were labeled in an organized manner and others were loose notes. Where location information was available I have included it in the citations that refer to Hudson's field notes. It seems that Hudson was never satisfied with the order of his notes in preparation for publication and the collection contains many revisions of the same information.

The Lakeport Museum in Lake Country contains the archives of **Henry Mauldin** (1900-1981) that is a collection of 10,000 index cards and over 50 binders of typed oral histories, including information on informants, and personally collected knowledge that he compiled between 19501980. His interest in the history of Lake County began in 1940 when as a newlyelected county supervisor he was assigned the task of identifying historical sites for the upcoming state Gold Rush celebration. Realizing that the information on local history was so limited, he spent the next 40 years in research. His working years were spent as a nurseryman and he owned and managed commercial fruit companies. Following his research for the Gold Rush celebration, he was named the first County Historian for Lake County. Through the years he spent his time interviewing hundreds of people, and left well organized and indexed records of his labors. The Mauldin archives provide a glimpse into Lake County history and prehistory, with many references to Indian trails, trade relations and to the local prehistory of the area. The Mauldin collection also remains unpublished but is available to researchers at the Museum.

Informants

As noted earlier, the informants who were interviewed by the early ethnographers were usually the oldest elders of the community who still retained some of the knowledge of the "old ways". In the case of the Central Pomo of Shanel, Gifford (Gifford and Kroeber 1937) interviewed **Jeff Joaquin**, about age 88, and his wife Cecilia, with their son David, acting as the interpreter. Jeff was born in Yorkville (where people spoke a different dialect than those in Shanel). He moved to Hopland when he was 13 or 14 years old. His wife, Cecilia, was born and raised at Shanel. As noted above, Shawn Padi, my contact with the Hopland Pomo, is the greatgrandson of Jeff Joaquin. The information gathered in these interviews with Joaquin is incorporated in the "Culture Element Distributions: IV
" (ibid.). The material was gathered by Gifford, and analyzed by Kroeber. Gifford also listed several Central Pomo informants for his 1928 publication (Barrett and Gifford), including **Steve Knight** of the Yokaia village, and **Charles Ramon** (born in Cloverdale, Southern Pomo territory)**, David Thompson** (born in 1851 at Upper Lake in Eastern Pomo territory) , and **Captain Jack** (chief of the Hopland Pomo in 1917), all of Hopland Rancheria.

Stewart (1943:3031) lists nine informants from his work with the Central Pomo. Listed from the Cokoa of Hopland are **Cecile Joaquin**; about 60 years old. His father was Yokaia; and mother was from Cokoa. He lived his entire life in Ukiah and Hopland. **Jeff Joaquin** was about

80 years old when he worked with Stewart. His mother, who died when he was sixteen, was from Yorkville and his father was from Cokoa. He lived most of his life near Hopland. It appears that these are the only informants that Stewart used, and are the same contacts that Gifford and Kroeber listed (1937).

Other Central Pomo informants included **Steve Knight** of the Yokaia of Ukiah Valley. He was about 55, an Indian policeman, living most of his life in Ukiah. Both of his parents were Yokaia. The second Yokaia interviewed by Stewart was **Lucy Lewis**, about 85 years old, who was born and lived in the Ukiah Valley all of her life with the exception of the few years during her childhood that she spent on the Reservation at Fort Bragg. Both of her parents were Yokaia.

Mrs. Steve Perrish (Stewart's spelling) was an informant from the Danokeya of Yorkville. She was 43 when Stewart interviewed her. Her mother was from Stewarts Point (Kashaya) and her father was from Boonville. She lived in Yorkville until she was 16 and then moved to Lake County, where she married and stayed until 1927. Although not discussed by Stewart, Perrish evidently moved back to Yorkville where provided information on the Danokeya.

Four informants were interviewed from the Bokeya of Point Arena. **Harvey James** was 45 when interviewed by Stewart; with his mother coming from Tulare County and his father from Bokeya. Harvey was born at the old Indian Village of Itcetce, and lived in the Point Arena area all his life. **Steve Perrish** was 58 years old at the time of the interviews, and was born and lived his near Point Arena. His father was from Bokeya as was his mother's mother; his mother's father was from Boonville. Informant **Andrew White** was about 45 years old, and lived most of his life in near Point Arena. His parents were both Bokeya. **Susanna Frank** was 58 and her parents were Bokeya. Her father was Chief John Boston, and had been one of Loeb's informants. She lived her life in the Point Arena area and married a Stewart's Point (Kashaya) Indian. While Loeb listed "Boston" (Susan Frank's father) as an informant, and also a "Drew", both from the Central Coast village of Pdahau, no other Central Pomo were interviewed by Loeb.

Heizer and Nissen (1973) published a manuscript on those who were sources for ethnographic information in California and they listed the following informants and the collecting ethnographer for the Central Pomo. The ethnographies included in this manuscript come from a card file catalogued as Ms. N. 428, at that time located with the Archaeological Research Facility at Berkeley, but now housed at the Phoebe Aperson Hearst Museum of Anthropology at Berkeley. The file was compiled by Heizer and Nissen building on the work of A. L. Kroeber who had begun compiling information to serve as an expert witness for the plaintiffs (the California Indians) to testify against the United States at the 1946 Indian Claims Commission Act. (Table 6.1)

Informant	Birth Date (if known)	Ethnographer	Publication Date	Year Interviewed
Sam Allen	c. 1870	Cora du Bois	1939	1932-34
Kate Beatty		P.L. Faye	1923	1919
Tom Boots		C.H. Merriam	ms	1902-38
Boston		E.M. Loeb	1926	1924
Jim Calico	c. 1855	C.H. Merriam	ms	1902-38
Belle Card		A.L. Kroeber	ms	1903-18
Frank Carillo		C.H. Merriam	ms	1902-38
Drew		E.M. Loeb	1926	1924
Susanna Frank	c. 1870	O.C. Stewart	1943	1939-40
James Harvey	c. 1895	O.C. Stewart	1943	1939-40
Rose James		E.W. Gifford	1922	c. 1920
Cecelia Joaquin	c. 1870	Cora du Bois	1939	1932-34
		O.C. Stewart	1943	1939-40
Jeff Joaquin	c. 1947	Cora du Bois	1939	1932-34
		O.C. Stewart	1943	1939-40
Mrs. Lo'leet Johnson		C.H. Merriam	ms	1902-38
Steve Knight	1878	Cora du Bois	1939	1932-34
		C.H. Merriam	ms	1902-38
Lucy Lewis	c. 1855	O.C. Stewart	1943	1939-40
Nancy McDermitt		E. W. Gifford	1922	1939-40
Henry Maximilian		C.H. Merriam	ms	1902-38
Stephen Parish	c. 1882	C.H. Merriam	ms	1902-38
		O.C. Stewart	1943	1939-40
Mrs. Stephen Parish	c. 1897	O.C. Stewart	1943	1939-40
Andrew White	c. 1895	O.C. Stewart	1943	1939-40
Mary Pineut		A.L. Kroeber	ms	1903-18
Mrs. Sears		C.H. Merriam	ms	1902-38
Susie Shoemaker	c. 1850	Cora du Bois	1939	1932-34
Sealion White	c. 1847	Cora du Bois	1939	1932-34

Table 6.1: Ethnographic information collected on the Central Pomo.

I find it interesting that Heizer and Nissen failed to include Gifford's 1928 article that was published in the *American Anthropologist* (Gifford 1928) in their compilation of published literature. In this article, Gifford listed three additional informants from the Hopland Rancheria – Charles Ramon, David Thompson, and Captain Jack, having obtained his data in 1917. Ramon was born in Cloverdale in Southern Pomo territory, and Thompson was born at Upper Lake in Eastern Pomo territory but was at the time considered to be members of the Hopland group. Also absent from the Heizer and Nissen publication is reference to any of Barrett's extensive publications (with the exception of a 1919 article on the Wintun Hesi ceremony).

The majority of Barrett's informants spoke the Yokaia "dialect" (1952:15-17), with the exception of Captain Jack – born c. 1835; Kumula born c. 1820, Captain Tack born c. 1830, and two Spanish “informants’, Shorty Caitadim, born at Yorkville c. 1860, and Jeronimo Pullman (firetender) born c. 1850.

Thus, there is disagreement on the question of the reliability of ethnographic accounts, especially given that much of the ethnographic data was collected a considerable period of time since the first contact of the Pomos and the Euro-Americans. I believe if the same or similar accounts are recorded by multiple ethnographers, this may strengthen the validity of the reporting, especially if the accounts are similar when reported by people from distant geographical locations. Presented below are the published accounts of fertility rituals.

Ethnographic Accounts on Fertility Rituals (published and unpublished)

Several of the early ethnographies present information about fertility rituals and stories within the north and central Coastal Ranges of California, especially from the ethnographic Pomo territory. These may have a direct or indirect relation to PCN production. Some of these accounts involve the ritual removal of powder, which is then used in prescribed ways. Other accounts relate to the production of cupules that are found in many areas in association with PCNs. Barrett noted that sterility was common among the Pomo and was often interpreted by the Pomo to be due to the presence of some type of spirit, or the result of failure to observe a taboo. The sterility was said to be curable by visiting a certain kind of rock that became known as a “baby rock”. These “magic” rocks with certain properties, were called *kū’ kabē*, which translates to *baby rock* in the Central Pomo dialect. The rock types as identified by Barrett were all of the same “soft” rock that was a bluish gray stone that was similar to steatite. This same type of stone is the host material for PCNs and is now usually identified as a chlorite or high talc content schist. Barrett was given the location of five of these rocks by informants. They are 1) at īwī’ kbī dalaū on the coast; 2)at a point about .89 km northeast of the school house in Batchelor Valley, near Upper Lake; 3) near the old village site of katsa’ mugal on the western shore of Clear Lake; 4) in Knight’s Valley, 9.7 km north of Hopland; and 5) on the Elledge ranch, about 13 km southeast of Ukiah (Barrett 1952:385).

I am familiar with most of these boulders, and they contain PCNs underlying other elements (cupules and grooves). Barrett visited the last two sites and took photos. Barrett’s photo of the Knight’s valley rock, on file at the Hearst Museum, is included here (Figure 4.7).

In reading and comparing Barrett’s two publications concerning the baby rocks I found confusing and conflicting information. Note that the 1952 publication was written 48 years after his 1904 field research these sites, while not on the HREC – but close by – are of importance to the research being discussed for the HREC. Both sites have markings that are stylistically similar to those on the marked boulders in the HREC study area, and I believe that Barrett’s ethnographic information may be relevant to understanding the PCN tradition. I will elaborate in detail in the following chapter. In both of his publications Barrett mentioned the baby rocks at the Knight’s Valley site (1908a:177; 1952:385-387), giving the location as two km north of Hopland. This was previously known as the Crawford Ranch and is now the Nelson Vineyard. He also talks of two boulders located on the Elledge Ranch that is about three km southwest of Ukiah. Referred to as the Elledge ranch site, Barrett’s 1908 publication states that there are two bluish rocks a few hundred meters northwest of the “old village” site of *bō’ dōnō* that were used for cures for sterility. He goes on to mention a third boulder that is “situated near the old village *mū yamūya*” (1908a:172) of the bird people of mythological times. This “third’ boulder note *singular* form – is the Knight’s Valley Pomo baby rock. Yet in the later publication, Barrett

(1952:386) writes of two Knight's Valley sterility rocks – *plural* "to insure for its own particular sex" (ibid.). In his 1952 publication, Barrett directs the reader to two photos, one of the Elledge ranch boulders, and the second of what he has termed the larger of the two Knight's Valley boulders (1952:Vol 2, pg. 239, Plate 20 Fig. 2.). This boulder is confirmed by field comparison of the present boulder with Barrett's 1904 photo. Adding to this confusion is that fieldwork presently identifies two PCN marked boulders at the Knight's Valley site. Barrett's boulder is designated as CA-MEN-875, (Miller and Haslam 1975b) with a second boulder located about 150 feet west of the Barrett boulder, at the crest of Burkes Hill, which has been recorded as CA-MEN-874 (Miller and Haslam 1975a). While Miller and Haslem were the first to submit reports on these two sites subsequent indepth reports were submitted by Paul Peterson (1989a, b). Miller had identified CA-MEN-874 as Rock 1, and CA-MEN-875 as Rock 2. I also find it of interest that Barrett only gave one sentence of attention to the Knight's Valley Rock (1908a:177) in the earlier publication, yet he related detailed ethnographic accounts in the later publication (1952:385-387), without offering any information on the smaller boulder. Miller, mentions in her site report that Barrett had referred to CA-MEN-845 as the larger of two boulders (1975a), while Peterson (1989a:4) states that "the close proximity of MEN-874 and MEN-875 invites comparison of the rock art at these two sites." Hedges (1983b:11-12) states that the small boulder was never found. Was Barrett confused 48 years later? Did he say "larger" when he should have said "smaller" (1952:386)? I doubt it. I believe that the two sites are so different that he would have commented on their variability. I do not think he or the Pomo informants were aware of CA-MEN-874, and that Hedges was correct – the smaller boulder of CA-MEN-875 has not been located in recent years.

Barrett's earlier publication (1908a:174-175) mentions the existence of the ancient village of *mū yamūya*. Whether or not the village was actually inhabited by the "present Indians" is not known. One of his informants told the story that *mū yamūya* was the name of a great uglylooking hairy manlike being nine or the feet tall who lived nearby. He was known to do terrible things and the people wanted to kill him and get rid of him, but were unsuccessful – as he always returned until they decided to mash his body against a stone and found a kernel underneath his big toe. Cutting the kernel apart they found a very small heart. When they destroyed the heart, he never returned. In celebration they held a great dance, and at the end of the dance, they were all transformed into birds and flew away. The village has never been inhabited since that time.

Barrett related the following story told to him by his informant of how the marks on Knight's Valley baby rock were made:

> The story goes that in the ancient times a young boy and his sister went out hunting. The girl sat down near one of these rocks and remained there in a pensive mood for a long time. Her brother endeavored to find out what made her do this, and to ascertain what she wanted, enumerating beads and other valuables. Finally he asked if she wanted him, to which she nodded. He then made upon the surface of the stone a large carving representing a genital. This, even yet, is the most prominent of the many marks upon this rock. Since that day this, and other similar rocks, have been employed in the cure of sterility (Barrett 1952:387).

This story relates an incident that took place among the mythical Birdpeople. I have visited this site several times and believe that the "most prominent" mark on the boulder is the PCN element (the "large carving representing a genital"). That the informant told this story about a mythical brother and sister leads me to interpret this as needing to explain the inexplicable – this marking was done long ago and no one knew when – it had always been there.

Barrett gives testament to the power of these rocks as he talked with a man who, having no children from seven wives, did not have offspring until he visited the rock with the eighth wife, and performed the following ritual:

> The sterile pair went to one of these rocks and there first a prayer for fertility was made. Then, by means of a pecking stone, some small fragments were chipped from the sides of one of the grooves or cuppings in its surface. These were then ground to a very fine powder which was wrapped in some leaves and taken to some secluded spot. Here the powder was made into a paste and with it the woman's abdomen was painted with two lines, one running from the top of the sternum to the pubes, the other transversely across the middle of the abdomen. Some of this paste was also inserted into the female. Intercourse at this time positively assured fertility, due to the magic properties of this rock (Barrett 1952:387).

Barrett had also been made aware of at least one tree (a fir) that was located near Upper Lake where a similar power was present. A 1908 account by Barrett concerning the baby rocks by the village of *mū yamūya* related the following:

> A few hundred yards west of this site is a bluish stone which protrudes from the ground but a few inches. The surface of this is filled with small cuppings and scratches or gashes where the rock has been scraped and pulverized as a medicine for sterility". Other rocks of the same kind are located near the old village of bō' dōnō (Barrett 1908a:175).

The rocks near the old village site of bō' dōnō, Elledge ranch were part of a field reconnaissance study by Ken Hedges (1983b). Hedges made a study of the Pomo baby rocks by trying to determine their exact geographical locations based on the ethnographic reports. According to Hedges (p. 12), Curtis included in his book a photo of the Pomo baby rock with the caption "Women desiring pregnancy used to sit on this glacial bowlder (sic) and swallow minute portions scraped from it, the surface is covered with depressions and grooves suggestive of a generative organs. There are in the region several other rocks formerly used for this purpose" (Curtis 1924). One can refer to Hedges's paper for a full description of his findings (1983b).

Loeb's ethnographic work also referenced a fertility ritual (1926:246-248) that was somewhat different from that reported by Barrett. Loeb was told by his informant that it took more than sexual intercourse to get pregnant – "She must do something else besides. She has to make use of a certain tree or rock, the sacred dolls or bull snake. She must also pray" (p. 246). Use of the rock was said to be the preferred method as using the tree for the ritual was known to produce children with small eyes. Loeb thought that the Pomo believed that sexual intercourse was a necessary preliminary to the process, though he cautions that he may be wrong and was aware of a belief by some of a virgin birth. Loeb stated that the Eastern Pomo employed 'carved rocks' called *gawik xabe* – identifying two specific sites, one at Upper Lake and the other, based on his description, the Knight's Valley rock. Loeb provides the following description of the ritual:

> If a woman wants a child she fasts for four days, taking only a little mush after dark. On the fifth day she goes alone to the rock at daybreak, taking with her a small cling knife. She walks around the rock counterclockwise four times, then clockwise four times. Then she stops, facing the carved surface of the rock. She raises both hands and extends them before her, the finger tips level with her eyes, then draws them in and lays them on her breast, finger tips meeting. This is done four times. Then four times she bends her knees. The fifth time she sits back on her heels. With the flint knife she makes four motions as though to cut the rock. The four times she really cuts it and with the dust she ground from it she marks upon her body two long lines from lower lip to the navel, from left armpit to right, and then a circle around the point of crossing, and, to make four, a dab upon the forehead where the parting of the hair begins. Then she speaks to the rock, asking for a child. There are no set prayers for this. She rises and, beginning again with the lifting of her hands, goes through her ritual four times. Then four times she walks about the rock counterclockwise, then clockwise four times. She stops where she has been crouching, turns her head to the left four times and then goes home. Four times on the way she stops and turns her head to the left, but on no account must she look back. All this must be kept secret from every one (Loeb 1926:247).

During two field trips to Mendocino County (192436), Aginsky also wrote a paper on "Population Control in the Shanel Pomo Tribe (Hopland)" (1939). Aginsky quoted Loeb's account word for word (1926) with the addition that he had "checked it in the field". I assume that this means his informants agreed with Loeb's description of the ritual.

Powers includes brief mention of a ceremony that took place with the Senel (sic) couple dealing with sterility: "When a Senel woman is sterile she and her husband go on a long journey into the mountains, where they take upon themselves certain vows, make certain offerings, and perform rites, none of which are proper subjects for description, all this they do in hope of having an offspring" (Powers 1976:64). While this account does not specifically mention the use of a certain rock, this could be the case, considering the other accounts.

Additional records pertaining to the use of certain rocks for cures for sterility and to insure fertility are found in the unpublished ethnographic files of Dr. John Hudson of Ukiah and Henry Mauldin of Little Lake. Mauldin's notes (Mauldin 1951) reiterate the ethnographic accounts mentioned above. At the beginning of a section labeled "Sterility" he does comment that sterility was not infrequent among the Pomos, and notes that this was usually attributed to the presence of a spirit in a woman for not following certain taboos, like keeping away from water during her menstrual period.

The archives of Dr. Hudson's ethnographic work at the Grace Hudson Museum contain unpublished documents that he collected. While there is some order to Hudson's notes, often the pages are not marked, and there are numerous revisions of the same accounts. One such excerpt from Hudson's notes (1889-1936:59) states:

> Kawĭ kabe'. (Baby stone) A boulder of blue sandstone bedded on the summit of Burks hill & 6000' W of the R. R. A childless man becomes potent immediately after painting a stripe across his breast, from shoulder to shoulder & from his chin to pubis, pigment

> derived from the stone. (vid Kawi doo' liin) The surface of the boulder is covered with scorings. Should an impious person attempt to smooth or erase them, they would be restored overnight by the spirits of future children."

The Hudson collection also includes some reports on microfilm, copied directly out of his notebook. While all other notes have been typewritten, the microfilm is of hand written notes, which are often difficult to discern. This reference is well cited and it is easy to identify its location in the collection:

> "Kawĭ kabe' a certain boulder on Crawford range (?) about 200 yds' S W of the RR on summit Burkes hill (7 m S of Ukiah). If a childless man desires children and visits this rock and scrapes off some of its face and paints a stripe from his chin down to his pubes(?) and another S…….(?) to S…….(?) across the breast and fast that entire day he fully potent for conception to any woman. Interpreter. This said this stone is fissured with scratches and if a person (?) them or plaster them over the spirits of future children would remove them that night and the stone loose as (?) (Hudson 18891936:Microfilm #20008 October 23, 1901).

These two reference are the only references to CA-MEN-874, the large PCN marked boulder that is located on the Nelson Vineyard, above and west of Barrett's photo documented boulder (CA-MEN-875).

Hudson's notes (1889-1936) contain another reference to Kawĭ kabe' "(baby stone) a large dark boulder just above the summit crossing of the old road to Tomki northeast of Willits. A childless pair rub their privates on it for fecundity and often sit there to absorb the effects (Ukiah 2)." Hudson's field notes contained one other reference to "Damât' be a certain bedstone deeply incised on John Redemeyer ranch in Potter Valley, where childless women get scrapings for baby conjuring (panther stone)". This narrative is cited as (Potter 3) in the Hudson notes.

There is one more reference credited to Hudson's field notes as a cure for sterility. This citation was found in a paper given by Breck Parkman (1994:25) and referenced to an N. Wilson (1982) who cited Hudson's field notes. This is very intriguing, as Wilson cited the original field notes as being at the Field Museum in Chicago, while I have personally gone through his original notes at the Grace Hudson Museum in Ukiah. He also indicated a page (10) for the reference, while Hudson's notes do not follow this numbering system. This confusion was solved after contacting Parkman (personal communication 2010), learning that Wilson was a California State Parks archaeologist who in 1982 viewed Hudson's field notes in Chicago and prepared an unpublished manuscript of information for use by park archaeologists. The original collection was returned to the Hudson Museum at the completion of their facility in Ukiah. Parkman (1994:25) wrote the following: "In addition, a female effigy made of clay, and called Earth Woman, was given to sterile women to insure conception (Wilson 1982). Apparently, the powers affecting fertility resided beneath the surface of Mother Earth. This mention is the first I am aware of that involved a female figure and making it of more interest is that recently, Alex DeGeorgey, a local archaeologist, who has been working with Shawn Padi of the Hopland Rancheria, shared a photo with me of a broken clay statue that fits this description, excavated not far from the HREC (DeGregery personal communication 2009).

The final reference that I have obtained and that I hypothesize provides information that can be related to the PCN tradition comes from John Peabody Harrington, noted California ethnographer from the early 1900s. In 2004 I was contacted by archaeologist Gary Breschini about a marked boulder. He had received a call from a Los Padres National Forest archaeologist, Brenda Reed, who had been contacted by Boon Hughey and his friend Chris Lorenc, a San Jose private school history teacher. Both men are site stewards. It seems that Lorenc had been using Harrington's ethnographic material (located at Martin Luther King/San Jose State University on microfilm) (Harrington n.d.) to inform his research for an historical novel that he was writing. This boulder seemed to fit the description of the boulder that Hughey had mentioned. He had been informed about a possible second boulder from a rancher in the area, but was unable to visit the boulder before the untimely death of the rancher. After visiting the unrecorded boulder in 2005 with Reed, Breschini, and several other people, I contacted Lorenc and made arrangements to go with him to the King library to look at Harrington's microfilm. Harrington himself had not visited the site, but was told the story by one of his informants. While the microfilm itself did not copy well, the essence of the document is that the name of the place name is Troq'ol and is about ten km south of the Encinales homestead near the border of Monterey and San Luis Obispo counties. I have since had a specialist working with the Harrington Project at U. C. Davis transcribe that portion of the notes, and verify the information (James Sarmento Personal communication 2010). According to Harrington's notes, dust is removed from a rock with holes in it. One of the holes causes sterility and dust from the other is eaten by a woman who is childless. The informants did not know which hole was which. The PCN boulder we visited had three of what appeared to be bedrock mortars, in addition to several PCNs. This places a similar ethnographic account several hundred of miles south of the ethnographic Pomo area where similar mythological accounts related to pitted boulders or PCNs have been recorded.

Power in Rocks

The above section reports on stories or myths that give credit to the power of certain boulders to aid in the conception of children. The concept of power in the rocks is not unique to the Pomo, but is present in many cultures worldwide. In general, in the Native woreldview, many aspects of what we would consider to be "natural" occurrences in the cosmos may be considered to have particular powers or characteristics in the Native world view. Before looking at other examples let me first refer to an article written by Lowell Bean (1975:25) that looks at how California Indians perceived supernatural power before European contact. Bean states that even inanimate things in the universe – like rocks or boulders – possess some amount of power. Power "must also be used in accordance with set procedures" (p. 28) – a ritual. According to Bean (p. 29), "Power could also be tapped and acquired through many channels that brought it into the humans' sphere of activities. These included rocks…" The ethnographic ritual accounts delineated above, referring to the use of certain rocks for fertility or curing rituals for sterility rituals seem to fit with Bean's conception of the source and application of power in some societies of Native California as recorded in the past century. Parkman (1994:25) cites Hudson's field notes (Wilson 1982) that pregnancy could also be attained through the power of "certain springs, trees, gopher mounds, rocks, mud, and snakes."

Beyond the perceived power that certain rocks or the powder obtained from them could affect fertility, the marking of rocks and boulders in some areas of Northern California also served other purposes such as a rain rock that could affect the weather (Heizer 1953). As reported by Heizer, James Bennyhoff and Albert Elsasser related stories that had been told to local "Caucasians" by Indians about a boulder known as the Gottville rock. It was said that a series of long parallel grooves would cause snow and the snow could be stopped by a scratch across the parallel lines. Cupules produced wind and rain and rain was stopped by covering the rock.

Linguistic Data (migration and movement of groups)

In the discussion that follows, I will report what has been published by one key source regarding the hypothesized development of languages and their possible distributions in California, especially as relevant to the study area of this dissertation. It has to be made clear that the "reconstruction" of what languages people might have spoken several millennia in the past in groups that did not have a written language for us to confirm, is a task of considerable hypothetical reasoning. Basically, such "reconstructions" are devised based on similar words found in other linguistic groups.

Moratto referred to what is now California at the time of contact as "the Babel of California" (2004:530), with approximately 90 distinct languages from no fewer than 23 language families, and with an unknowable number of dialects being spoken pre-conquest. While the languages at contact belonged to six language stocks or families that have not always been the case according to some historical linguistic studies. Such studies have suggested that when "the first people"settled in the land, hypothetically, linguistically the landscape was very different and over the millennia since, there have been many changes in languages. This section of my dissertation will review the current thought on the introductions of languages and the movement and flow of groups within the landscape. The spread of linguistic families as spoken by various people in pre-historic and historic California may provide a clue to the spread and distribution of the PCN tradition.

In his field notes (18891936), Hudson presents an ethnographic story that he refers to as a common Poma (sic) tradition as told by an Indian (18891936) giving insight into linguistic roots as explained by a Native.

> All the Indians were once one family and lived back in the northeast. Our fathers say that long long ago all the people were together and spoke the same language. You know Injuns always quarrel and growl and some move one way and some move another way, by themselves and they hate each other and fight. No man stop 'em. Cant (sic). First one tribe then another leave and go off, and they so mad they change the words. They try to find new words for everything,

This same account is also recorded in a microfilm version of Hudson's ethnography (1889-1936: Microfilm # 20008 November 21, 1901 November 3 1901).

The idea that all people at one time spoke the same language is not unique to this account. From an academic standpoint, anthropologists and linguists have pondered this question many times. The first attempt to classify Native peoples in California by language was Stephen Power's map of linguistic families (1891), followed by the work of Dixon and Kroeber (1913, 1919). While recognizing the possibility of a Yukian origin (1925:159) for the first language, Kroeber suggested a great antiquity of the Hokan "peoples" in the preface to the first "Cultural Element Distributions" report (Kroeber 1935:7), noting that they were among the most widely scattered group in California. Taylor (19611962:71) referred to Kroeber's comment and added that "looking at the linguistic map will demonstrate the significantly marginal position of people speaking this tongue. This I take to be a sign of age". Taylor also showed evidence that the "Hokan dispersion" took place a little more than 10,000 B.C. years ago (Moratto 1984:543).

As stated above, Yukian *may* be the basal language of California linguistic families. Golla (2004:81) has suggested that the Yuki language family may, metaphorically, be the "Basques of northern California", based on their documented "hostile" relationship with neighboring groups, and the need to develop a "long term ethnic survival" mode. Golla (ibid.) has cited an unpublished paper by Elmsdorf (1984) that identified 30 or more Yukian words that had shown "sharing" with other adjacent groups (this included the Pomo or protoPomo). Citing other linguistic connections with diverse groups, including Gulf languages, Golla (2004:81) suggests that these languages may "share a remote common heritage" and he argues that they may represent the "earliest stratum of languages" that are found along the Pacific coast. He also includes Chumash in this group. The Chumash are the only other California language group (other than the Yuki) that has no demonstrated linguistic relationship to the languages of any other California groups (p. 80). Chumash was once considered an affiliated language of the Hokan, but they are now considered a "classificatory isolate". Golla further hypothesizes that these two groups (Yuki and Chumash) "reflect early coastal pattern of settlement of the continent" (p. 81). He places their arrival during the Terminal Pleistocene and early Holocene. If my personal hypothesis is correct on the temporal period of the PCN tradition as being relatively early in the cultural lives of native California peoples in the coastal range, it is possible that the "makers of the marks" were part of this earlier but unspecified settlement period and this could help explain the geographical distribution of the PCNs throughout the Coastal Ranges.

Moratto's seminal book (1984), which took into account both linguistic and archaeological evidence, presented a hypothetical model for the temporal distribution of languages in California. Moratto (p. 543) writes that "the model advanced here extends beyond California to trace the spread of languages in larger areas of the West. California was neither an island nor a cul de sac, and its linguistic configurations can be understood only with reference to a larger sweep of prehistory". He suggests that prior to 10,000 B.C. the landscape of California was occupied by speakers of "unknown and probably unknowable" languages (the Yukian?). Moratto's model, dealing with the constant shifts of people is presented, by temporal periods, below. I have only included information that I felt was pertinent based on temporal and spatial data that I consider relevant to my research, and that the following model is hypothetical. It is crucial to keep firmly in mind that the following is a hypothetical model.

10,000 – 6,000 B. C.

Even thought Moratto suggests that ancient languages may have disappeared without a trace he feels it is possible to suggest possible "scenarios". Moratto, in a previous chapter (Chapter 2) had suggested two possible earlier migrations –one, the icefree corridor and the second a coastal migration indicating that some of the peoples in these migrations may have mixed and new stock evolved from these. He also relates the Western Fluted Point Tradition (WFPT) to the emergence and initial differentiation of the Pre-Hokan stock, placing the beginning of these two cultural events (the WFPT and the beginning of the Hokan language root) at about 8000 – 11,000 years ago. The fact that the Hokan language is found in most of Baja California (where there may also be PCNs) is another indication of the time depth, according to

Morrato. The Pre-Yuki (the other contender for the oldest language stock in California) may have arrived with a coastal migration, and Yukian groups may have lived in the North Coast Ranges as early as 9000 – 9500 B.C. (Moratto 2004).

6000 – 4000 B.C.

With a rise in sea level due to global warming, the climate became drier and human populations would have shifted the areas they occupied, and other groups developed and took over parts of the landscape. By about 6000 B.C., it is hypothesized that speakers of Hokan languages occupied almost all of western California (this also follows the geographical distribution of known PCN sites). Moratto also suggests that between 6000 and 4000 B.C., Pre-Karok, Shastan and Palaihnihan groups may have resided in far northern California and possibly southern Oregon. Morrato cites Taylor (19611962) as proposing that the Millingstone tradition (a period of California prehistory during which food processing tools were made by early people that focused on mano and other grinding implements) may have been introduced at this time by the Hokan group. Morrato further suggests that the Pomoan and Yuman groups may have established themselves in northern California as early as 6000 B.C. He further hypothesizes that the Hokans had the "exclusive" control of California with the exception of the small Yuki group in the North Coast Ranges. Known as the midAltithermal period, temperatures were very warm and were responsible for movement of the UtoAztecans (predecessors of the Numic, Takic, Hopic, and Tübatulablic people) into southwestern California (Great Basin area). The ProtoUtoAztecan, Proto Utian, and Proto Maiduan languages could have emerged between 3000 – 2000 B.C. Prior to 2000 B.C., Northern California remained predominately Hokan. Circa 2500 B.C. the Penutian (Utian – ancestral to Miwok and Costanoan) are thought to have entered into the lower Sacramento Valley (Moratto 2004:547-552).

2000 B.C. – A.D. 1

The Altithermal conditions continued until circa 1100 B.C., there were especially warm conditions between 1600 – 1200 B.C., with a cooler Medithermal period between 1100- 200 B.C. During this period, the Utian populations and languages spread and diversified. It is thought that the ProtoCostanoan originated in the interior at this time. Moratto also noted that the Utian occupation seemed to following the development of marshlands. The Pomoans spread from Clear Lake west, displacing the Yukians, entering the Russian River Valley (the Hopland area) and continuing the spread to the coast, after circa 1000 B.C. The UtoAztecans moved into the Mojave Desert from the east about 5000 year ago (Moratto 2004:552-560).

A.D. 11000

During this period, the climate shifted from coolmoist, to wetdry. Moratto also notes that this is the period known as "the ethnographic present ", namely, the time period during which the majority of ethnographic observations were made and recordings of native life at that time took place. The Wappo (Yukian) displaced the Western Miwok. Moratto suggests that after A.D. 1 the Hokan linguistic groups continued to be pushed to the periphery of California and to have lost ground. The Pomos were in place in central California by then (Moratto 2004:560-567).

A.D. 1000 – Contact

Until 1430 A.D. the warmdry climate led to sparse population in the lowlands of California, with the coolermoist conditions leading to growth in population and spread of languages, between this period and contact with Europeans. The UtoAztecan (Numic) groups filled the Great Basin area. Some Athapascans moved from western Oregon and began settling in northwestern California, and the Penutians spread westward and displaced the Pomos and Miwoks on the eastern side of the North Coast Ranges (Moratto 2004:567-573).

With European contact, many of the coastal people fled eastward. The Pomo of my research area appear to have been little affected by the European intrusion until the Gold Rush, beginning 1848-1849. Since my research involves the pre-historic period, I will not go into the postcontact movement of the Pomos and their still ongoing struggle for their homelands.

Olmstead (1985) presented a synopsis of Kenneth Whistler's 1980 paper (a draft of his 1988 publication) that presented two hypotheses of Pomo origins, one suggesting a long time habitation in the area, and the other, a more recent movement into the territory. In the first hypothesis, Whistler was using words for fish to establish whether the Pomo first settled in the Clear Lake area or in the Russian River drainage. Olmsted found Whistler's work inconclusive and suggested that the Pomo had always occupied their locations that they were in at contact. As for the longterm hypothesis, Olmsted does not agree with Whistler's assumption that the Pomo came from the south (Sacramento Valley); rather, he suggests that if the Bering land connection is correct, than it does not make much sense that the early migration would go south and then back to the north. Further research is needed.

In 1988, Terrence Kaufman, of the University of Pittsburg (with a PhD from UC Berkeley) took part in a HokanPenutian Language Workshop at the University of Oregon, reporting on his research of reconstructing ProtoHokan First Groupings (1988). His research convinced him that Hokan was a "valid genetic group" (Kaufman's wording – which I assume means that the group was well established at that time). Kaufman also argued that some languages assigned to this group belonged elsewhere (p. 50). He gives the following list, based on his extensive research, as belonging to the Hokan Stock (p. 5456):Pomo, Chimariko, Yana Language area (includes Yahi), Karuk, Shastan family, Achu, Washu, Esselen, Salina, Yuman family, Cochimi, Seri language, Coahuiteco, Comecrudoan family, Chontal, and Jicaque. He listed the following as being of "doubtful Hokan affiliation": Chumash family, Waikuri language, Tonkawa language, Karankawa language, Cotoname language, Quinigua language, and Yurimangui language.

By comparing the work of several noted linguists, Kaufman hypothesizes a Hokan time depth of possibly 10,000 years, but suggests that a fairly good guess would be around 8,000 years (p. 59). In discussions with Katherine Klar, U. C. Berkeley Linguistics Professor, she directed me to the Kaufman article as the most accurate on the Hokan stock (personal communication 2006).

As discussed above, Golla (2004), in the latest synthesis of California archaeology (Jones and Klar 2004), presents the timeliest reference to California linguistics. Summarizing Moratto's (1984) discussion about California linguistics, Golla had noted that Yukian and Chumash languages cannot be affiliated with any of Moratto's identified language families. In his summaries of individual language stocks, Golla presents the following dates for the time depth of the language stocks in California: Athapascan – 2000 B.P. (p. 71), Algic (Yurok and Wiyot) – 3000 B.P. (p. 72), UtoAztecan – 5000 B.P. (p. 74), Penutian – 4000 – 4500 B.P. (p. 75), and Hokan (Pomo) – 8000 B.P. (p. 78).

Elaborating on his Pomo section, Golla classifies the language into four branches (p.78): 1) Southeastern Pomo – spoken around Clear Lake; 2) Eastern Pomo – spoken around Clear

Lake; 3) Northeastern Pomo – spoken in an isolated section of the western Sacramento Valley; and 4) Western Pomo – spoken along the Russian River.

Linguistic evidence, as cited by Golla (2004:79), suggests that Clear Lake was the protoPomo homeland and has the deepest timedepth, being older than the Russian River group, with the first occupation of the Russian River by Pomo speaking peoples about A.D. 500 (Oswalt 1964). In contrast, Whistler (1988) proposes that protoHokan was spoken as early as 5000 years ago. Whistler also suggests that the first movement by Pomo speakers into the Russian River drainage was 4000 year ago. Golla also indicates that there is linguistic evidence of contact with the Yukians for a long time, with borrowing going both ways.

To briefly summarize the above discussion of linguistics, I believe that the evidence presented above suggests the possibility that a pre or protoHokan language stock (Yukian?) was present going back to what some have hypothesized as a possible temporal period for PCN production – at least 8000 years B.P. But the existence of these languages in this specific area at these dates does not provide empirical evidence that these peoples were responsible for the PCNs.

The Pomo Today

Because little Spanish colonial activity directly reached the Pomo homelands, with the exception of the Russian settlement at Fort Ross, and a few Mexican Ranchos, much of the Pomo culture is alive and well today. They have maintained much cultural continuity, and they still gather to celebrate their culture and maintain their language. Located in Lake, Mendocino, and Sonoma Counties, today there are 19 federally recognized Pomo reservations and rancherias, with 12 of the tribal groups maintaining an economic base from casinos. The Hopland Band of Pomo Indians maintains a small casino, *ShoKaWah*, on their reservation. Through funding provided by the casino, the Hopland Band has maintained a support system for its members that have included health benefits, educational assistance, improved housing and social services. They have also supported numerous nonprofit groups and organizations in their local community. The present Hopland rancheria consists of about 485 hectares, with approximately 750 registered tribal members with 65 presently living on the reservation. Nonetheless, there is no doubt that the impacts of colonialism have left deep scars and irreversible changes.

Conclusions

This chapter has looked at the Pomo viewed through the ethnographic lens and the environment and the world in which they lived. During this ethnographic period, many accounts were recorded pertaining to various aspects of their lives and their relationships with their neighbors. Informants shared with ethnographers several accounts that may pertain to the PCN tradition that related the use of powder from special boulders that were thought to enhance fertility. These special boulders were thought to be imbued with supernatural power. This chapter also discussed the pre-historic movement of peoples based on the study of linguistics. The Pomo are a living culture and continue to occupy the landscape. The following chapter will address pre-historic activity on the HREC landscape, as indicated by identified cultural sites and artifact collections.

VII. Pre-historic Use of the Landscape

> Landscape everywhere in the world is a construct of human beings – whether through human inscription to it of mythological creation or through physical actions by the humans themselves. …Whatever the difficulties of recognizing such special sites from the archaeological record – all societies in the past would have recognized, as do all societies in the present, some features of their landscapes (if not all of the earth) as special. (Ucko and Layton 1999)

Introduction

The previous chapter introduced the ethnographic literature to set the cultural context for this study. A survey of the ethnographic literature and previous research identified the geographical, linguistic, and natural world that contributed to the Pomo worldview. Those that collected and those who contributed the ethnographic material were also reviewed to further inform the research. A thorough examination of all ethnographic material specifically relating to fertility, cures for sterility, and related topics was presented in detail. Status of the Hopland people today, concluded the chapter. This chapter will set the background for the research specific to the physical setting on the HREC property, identifying what pre-historic (and historic) activities have been recognized on the landscape, and across the borders, that would indicate pre-historic use. This information was obtained through observation and surface survey, and was used to determine where subsurface excavation would provide the more detailed archaeological context. Also presented will be a discussion of pre-historic trails and what is known of the trails that served as the connective tissue for movement across the landscape of the HREC and possibly linked the early peoples to identified places.

Survey History on the HREC

As stated in the Introduction (Chapter 1), The HREC was acquired by the University of California in 1951. Prior to that time, in the historic period, the land supported sheep ranching activities. Prior to the purchase of the Pratt Ranch, owned by Roy L. Pratt, an executive of the Del Monte Corporation, the land was owned by a number of pioneers who came to the Sanel Valley in the 18^{th} Century (Timm and Vaughn 2003:xi). Historically the land was part of the Sanel Rancho, given in 1844 to Fernando Feliz (or Felix), by the Mexican government. The Sanel land grant was named after the nearby Sanel Rancheria, home to a large Pomo population (Kroeber 1916:56). Feliz sold his granted land, in parcels, to settlers. Prior to the influx of Spanish and Americans, the land was the ancestral home of the Pomo. Visual evidence identifies the pre-historic landscape as an active place that supported diverse activities through the millennia.

The land adjoining the HREC was settled in 1888 by the Poor family (the great-grandfather of Steven Poor, of the HREC staff). John Poor, Steven's grandfather (personal communication 2011) spoke of the "Indians", he had been told by his father, who walked by the ranch house, up Parson's Creek, and John remembered the Spanish (wood cutters) that lived at the lake (the sag ponds), and remembered the many arrowheads the family has found on the property. Beginning in the 1970s, the HREC began to document and curate a collection of Native American artifacts that were found in various parts of the property, often when it was being prepared for environmental studies. This collection of artifacts is now housed at the HREC and will be discussed in more detail in the following chapter.

The first formal cultural survey on a portion of the HREC is reported in a site report submitted in 1974, documenting two or more housepits and a midden (Orlins 1974), near the sag ponds. During this survey, artifacts were collected from the site and accessioned as Catalog Number 479, and are now part of the collection housed at the HREC, although they are not individually documented. These artifacts are part of the HREC collection mentioned in the above paragraph. The property was surveyed in a more informal method, beginning in 1988 by Mark Gary, Deborah McLear Gary, Francis Berg, and HREC staff personal, Chuck Vaughn and Bob Keiffer, in a quest to identify archaeological sites and petroglyphs. Between 1988 and 1990, they recorded 15 archaeological sites on the HREC landscape. It was not until 1999 that a formal survey was conducted.

In June, 1999, three UC Davis students, under the supervision of Dr. Robert Bettinger, Professor of Anthropology/Archaeology at UC Davis, spent several weeks at the HREC to conduct prefield research. The following information is taken from their report (Sjordal, et al. 2000). Having reviewed the known information of archaeological sites on the HREC, provided by research associate Chuck Vaughn, they first inventoried the known sites to determine if they were at risk of deterioration. After visiting the sites and documenting those not officially recorded, they noted that the Central Pomo often located their sites in the vicinity of water, chert quarries, and flat areas. Visits to the areas near water, chert quarries, and flat areas, revealed two additional sites. Noting that most known sites were identified by those working in close proximity to the narrow saddle where the HREC headquarters are located, and to obtain unbiased information, they decided to field survey two transects across the property. Each transects was 150 meters wide, and they identified and recorded eight additional sites, for a total of 26 sites identified at that time. The group completed nine new site reports during this study. This survey was in preparation for field schools, conducted by the University of California, Davis, that took place for six weeks each of the following three summers (2000-2002). The field schools were conducted as the field research for an unfinished PhD dissertation. Information from the 2000 U. C. Davis Field School was reconstructed from student notebook and maps by the U. C. Davis Archaeology Museum staff under the leadership of Lisa Deitz and Elizabeth Guerra, Principal Museum Preparators. During the first year of the field school, students surveyed 14 transects (south to north, 500 m apart). An intensive surface survey was also conducted between University Road and Sag Pond by 12 crew members on 6/27 and 6/28 2000, led by Chris Morgan. Crew members were spaced 12 m apart and moved very slowly, clearing the ground with trowels approximately every 3 m. Artifacts were concentrated east of the gated, twotrack road that runs roughly northsouth through the site (in the vicinity of the large oak tree), and between the saddle area and the datum, along the southern portion of the gate road. Few tools were noted, with secondary and tertiary reduction flakes, by far, the most common objects. The artifact collection from these field schools has provided the archaeological context for my research. This collection will be discussed in the following chapter.

The summary of known archaeological sites on the HREC, is taken from the above report (Sjordal, et al. 2000), site reports completed and filed before 1999, completed site reports from the field school (that had not been filed), and partially completed reports, drafted during the field schools. During my research period, I filed the completed reports that had not been previously given to the Northwest Information Center and Trinomial and Primary numbers were issued. At the completion of my study, I will finish any remaining partially completed forms and those for newly identified sites and file formal reports with the Center. The sites in the last group are identified by HREC numbers, as opposed to Trinomial numbers as issued by the Northwest Information Center. In my summary below, the Trinomial is followed by the Primary number (the filing system now being used at the Northwest Information Center) and any other name that identifies the site. The information listed before the citation (in the quotation marks) is from the site form as listed in the description area. Comments following the citation are my own. An asterisk (*) following a Trinomial indicates that this site received additional inquiry during the U. C. Davis field school, with either excavation of units or STPs (shovel test units – 50 x 50 cm). Data from these files will be presented in the following chapter. Accessibility limited me from visiting all the identified sites on the HREC, while I did a field survey with Steven Poor, of the five identified chert quarries (one additional quarry has just been identified). My additional notes from that field trip are included at the end of each summary of the individual quarry sites. For general site location see Figure 7.1.

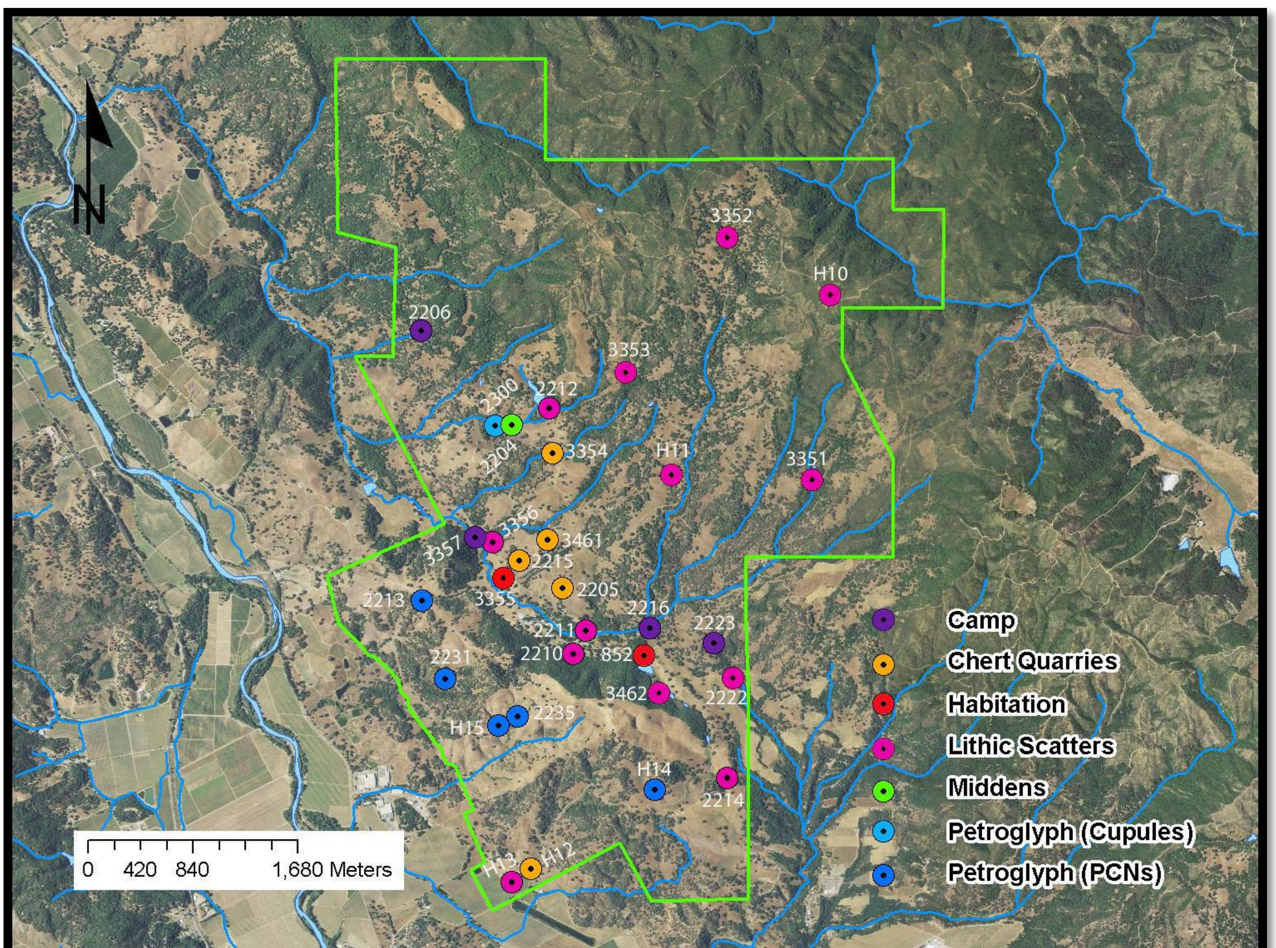


Figure 7.1: Map of the HREC landscape indicating the location of various pre-historic activities that have taken place on the landscape. The rivers and yearround creeks are accentuated in blue. Google map modified by Shane Feirer

Summary of Archaeological Sites Identified on the HREC

CA-MEN-852* **P23000787** Rockpile (Midden, faunal)

"A large midden site located on the south side of a large rock outcrop. It contains chert, obsidian, and groundstone. There is a pond with water yearround just to the southwest of the midden. Rounded cobbles and formed netsinkers have been found around the pond making it an archaeological sensitive area as well. There are also possible house pit features along the base of the rocky outcrop" (Sjordal, et al. 1999a). Many obsidian, chert flakes and tools, bone fragments and possible house pit features were recorded in the 1970s (Orlins 1974), and artifacts from surface collection were accessed into the HREC collection. I have walked this site on several occasions and artifacts and debitage still appear on the edge of the sag pond within the dense midden. It is the largest identified archaeological site on the HREC.

CA-MEN-2204 **P23001934** Parasite (Midden)

"A sparse lithic scatter of chert and obsidian on a poorly developed midden" (Gary, et al. 1988f). An unnamed runoff from Hagan Lake runs through the site.

CA-MEN-2205 **P23001935** Chuck's Chert Quarry

"A chert quarry consisting of a dense pile of mostly blue/green and gray (and lesser amounts of red/white) chert cores, roughed out bifaces, preforms, and flakes, surrounded by a moderate scatter of chert debitage. Source of chert appears to be as bands in schist boulders which have been reduced to a surface scatter" (Gary, et al. 1988g). This site is about 200 + m from Parson's Creek. My field visit identified two reduction areas for this quarry, and an extensive scatter trail, leading away from the quarry.

CA-MEN-2206* **P23001936** Fern Spring (Midden)

"A moderate lithic scatter of chert and obsidian on a well developed midden with at least 2 hopper mortar slabs (placed upside down)" (Gary, et al. 1988h). This site is located at the head of a spring.

CA-MEN-2210 **P23001939** Sealed Spring

"A possible processing site with surface scatter of flaked stone fragments, and manuports, flaked stone dominated by chert, Konocti obsidian, with some Borax Lake obsidian" (Berg, et al. 1988a). Also noted were two pestles, one scraper, utilized flakes, and three obsidian bifaces fragments. The site is located at the base of a hill slope.

CA-MEN-2211 **P23001940** Woodpecker Heaven

"Light scatter of local chert and Konocti obsidian flakes" (Berg, et al. 1988b). This site is very near Parson's Creek, and was further examined during the initial planning for the new research facility on the HREC.

CA-MEN-2212 **P23001941** Hagen Lake Outlet

"Sparse lithic scatter including flakes of Konocti and Borax Lake obsidian and chert. One core of Borax Lake obsidian" (Berg, et al. 1988c). No other artifacts were noted in the area, which lies at the end of the Hagan Lake outlet.

CA-MEN-2213 **P23001942** Huntley Peak Petroglyphs

"Four PCN boulders of chlorite mica schist. No other cultural remains observed. Site is situated near a mountain pass, on a trail system between the Russian River drainage and Parsons Creek drainage. One large boulder (#1) (5 m x 2 m) has 100 – 150 PCNs. Smaller boulders are across the valley, (#2) 6 PCNs, (#3) 12 ovals, (#4) 4 ovals" (Gary, et al. 1988j). The site report places the site on a trail system between the Russian River and Parson's Creek drainage. This site will be fully recorded, and additional boulders may be identified with PCN markings.

CA-MEN-2214/H **P23001943** Vassar Corner

"A sparse lithic scatter, no developed midden, chert and obsidian, historic barn remains" (Gary, et al. 1988i). Also observed were a Konocti obsidian projectile point fragment, a biface fragment, and a chert scraper. An historic barn and outhouse were still present at the recording date (1988). A spring is nearby.

CA-MEN-2215 **P23001944** Talus Chert Quarry

"A talus slope of chert debitage from the production of lithic tools. The parent material at the top of the slope seems to be schist with bands of chert, predominately green, some rose, and white" (Gary, et al. 1988a). Numerous bifaces, tested cores, and waste flakes were present. The quarry is located next to an unnamed creek and about 250 + m from Parson's Creek. Field survey identified a debris flow southeast. Quartz veins were also present on a portion of the quarry.

CA-MEN-2216* **P23001945** Madrone Grove

"Moderate lithic scatter with groundstone tools, observed, on a flat adjacent to Parson's Creek" (Gary, et al. 1988b). A sandstone mano was observed. This site is located on the bank of the confluence of Orchard Drainage and Parson's Creek.

CA-**MEN-2217** **P23001946** Punchline Petroglyph

"A mica schist boulder containing hundreds of lines. Lines are either incised or punched. Boulder has been broken into 3 pieces, the largest has the lines. Boulder with lines measuring 2.5 m diameter, 1.5 m tall. Probably natural lines (per Robert Mark)" (Gary, et al. 1988k). (Documents in the site file contain a letter from geologist Mark, confirming that the marks on the boulder were that of a tractor blade that moved the boulder during construction of the road.) This site record needs to be removed from the list of identified sites.

CA-MEN-2221 **P23001950** Hidden Hill Petroglyph

"A petroglyph boulder split in two bisecting a PCN. Blue mica chlorite schist 1 PCN (25 x 30 cm), 1 crossed circle, 7 PCNs (10 cm), ½ oval (10 cm). 27 cupules" (Gary, et al. 1988c). This is the split boulder that has been the subject of empirical testing during my research. Sitting on a hillside, this boulder has a great view of the Russian River, with the head of a spring 50 m to the north.

CA-MEN-2222 **P23001951** Airstrip

"A sparse lithic scatter of obsidian and chert, some groundstone tools observed" (Gary, et al. 1988d). Observed were two chert scrapers, a metate, a point tip, and bifaces fragments. This site sites on the bank of a seasonal drainage, showing erosion.

CA-MEN-2223* **P23001952** Buck Springs (Faunal, hunting camp?)

"A sparse lithic scatter and a pestle fragment at the head of a spring, surrounded by various kinds of oak trees" (Gary, et al. 1988e). A pestle fragment and an obsidian projectile point were also observed.

CA-MEN-2235 **P23001963** Watershed Down Petroglyph

"Petroglyph boulder split in two. One piece has fallen into drainage below (10 m?). Large piece has 40 PCNs (1220 cm), 1 PCN (40 cm), 3 possible PCNs, and 6 cupules. PCNs also visible on bottom of broken piece" (Berg, et al. 1988a). Boulder is near a spring and drainage.

CA-MEN-2300 **P23002016** Glittering Rock Petroglyph

"Partially buried, dark green, chlorite schist boulder with 14 cupules. The glyph face is slightly domed and nearly level. Has a high mica content. No PCNs" (Keiffer, et al. 1990). The boulder is situated between the confluence of Parson's Creek and an unnamed runoff from Hagan Lake.

CA-MEN-3351* **P23004364** Riley Ridge Scatter (HREC1)

"A sparse lithic scatter located on a flat area between Parson's creek and a seasonal drainage. The lithic scatter is all Konocti obsidian, mostly retouch flakes. An obsidian drill was also found in the area. There is no midden present. The site is located in a stand of oak trees" (Sjordal, et al. 1999j). It is located on a ridge, as the name implies. Parson's Creek and drainage are both nearby.

CA-MEN-3352 **P23004365** Kelsey Cabin (HREC2)

"The site is a small lithic scatter that is also associated with the remains of an historic barn. The pre-historic component contains chert and obsidian flakes. The historic component consists of square nails and broken glass" (Sjordal, et al. 1999b). The site report contains the note that the site consists of chert and obsidian debitage, and that other artifacts had been collected nearby. There is a drainage and spring within 100 m.

CA-MEN-3353 **P23004366** Chaparral Hunting Camp (HREC3)
"Lithic scatter and small hearth feature located along a seasonal drainage. The dense lithic scatter is composed of the local Franciscan chert and Konocti obsidian. Three obsidian projectile points were collected" (Sjordal, et al. 1999c). Site report noted a small hearth feature, and a drainage about 35m away.

CA-MEN-3354 **P23004367** Rattlesnake Chert Quarry (HREC4)

"Green Franciscan chert outcrop (quarry) approximately 10 meters wide and 30 meters long. There are flakes and bifaces present. The lithic scatter is located right next to the outcrop" (Sjordal, et al. 1999d). A seasonal drainage runs by the site. The site appears to be undisturbed. Field survey identified a large debris flow (2030 m). Workable chert from this quarry may have been "spent", or used. Further up the hill a second quarry was discovered (not in original site report). Both CA-MEN-2505, and Duncan's Peak are visible from this quarry site.

CA-MEN-3355* **P23004368** Vineyard Site (HREC6)

"Debitage and groundstone found in an experimental vineyard. Artifacts may have been exposed from trenching in preparation for vineyard" (Sjordal, et al. 1999e). Records indicate a mano and metate, a grooved schist charmstone, a second mano, and two concave chert points. Integrity of the site may be questioned due to disturbance. It is believed this site is very old – no reason given for assumption of antiquity. Adjacent to Parson's Creek.

CA-MEN-3356 **P23004369** Rabbit Pens (HREC7)

"A small lithic scatter that is located between and probably associated with HREC-6, HREC-8, and MEN-2215. The lithic scatter contains chert and obsidian debitage, as well as chert and obsidian bifaces spread out over an area approximately 70 meters (N/S) by 65 meters (E/W). The site is located around a shed that contains some rabbit pens" (Sjordal, et al. 1999f). Report also indicates that other artifacts found in the area include chert and obsidian bifaces and some steatite fragments. This site is also very near Parson's Creek.

CA-MEN-3357* **P23004370** Parson’s Creek Narrows (HREC8)

“This site consists of midden with lithic debris, a metate, and some shell that had been previously collected. The site covers an area that is 60 meters (N/S) by 15 meters (E/W). The site is divided into two parts by a drainage that is approximately 6 meters wide” (Sjordal, et al. 1999g). Report also mentions fire cracked rock. Site is on the edge of Parson’s Creek and is very heavily eroded.

CA-MEN-3461 **P23004827** Madrone Chert Quarry (HREC5)

“The chert outcrop is exposed under the south side of a Madrone tree. There are hammerstones, flakes, and unfinished bifaces. Most of the chert cobbles and artifacts are found within twenty meters of the Madrone tree” (Sjordal, et al. 1999h). There is a seasonal drainage within 25 m. Field survey failed to identify an obvious chert source in the immediate area, but there was definite scatter on the ground. Parson’s Creek is at the base of the hill, and there is a good view of Duncan’s Peak. Continuing up the hill, there was a chert outcrop, with scatter to the south. Further up the hill that was a scatter of higher quality chert with cores present. The scatter from this source continues to the crest of the hill, with lesser quality. A few high quality cores were present.

CA-MEN-3462* Middle Lake (HREC9)

“Lithic scatter along west side of sag pond. The pond holds water all year. The scatter includes chert, obsidian, and some rounded cobbles. There is a mix of Oak and Madrone trees present” (Sjordal, et al. 1999i). Previously collected were one obsidian projectile point, and chert and obsidian debitage. This site is located south of CA-MEN-852, and on the edge of the smaller sag pond, and it was thought that it might be a part of the primary site. Obsidian Hydration tests of obsidian from both sites may indicate if these two sites were occupied at the same or different times. Site report needs to be completed and filed.

HREC-10*

“Artifacts consist of a diffuse scatter of Franciscan chert and debitage. Lithic material is mostly broken and ? cobbles and small amount of primary reduction . Sixtyone flakes and cores were noted. Artifact density is less than one per square meter. A single Borax Lake obsidian that was bifacially retouched with possible use ware” (Carreras 2000). The site report indicates that there has been a great amount of disturbance to this site from fire break, road construction, and a cattle tank. Benmore Creek is less than .5 m away. Site report needs to be completed and filed.

HREC-11*

“Chert scatter and primary reduction having a diffused scatter along east slope. Green Franciscan chert that consists of primary flakes and tested cobbles. The chert is easily fractured and crumbly to fairly consistent and workable. No other lithic materials were found as being culturally modified other than the chert. Twentyfive culturally modified pieces of chert were found" (Snyder 2000). There is a spring on the site. Site report needs to be completed and filed.

HREC-12* Bunny Head Knoll Chert Quarry

Site consists of three chert bedrock outcroppings and lithic scatter of primary and secondary flakes. Density of less than one per meter. 29 flakes" (Hellmer 2000). There is a seasonal drainage adjacent to the site. Site report needs to be completed and filed. Field survey identified a very small quarry area, with lower quality chert, probably not of quality for making tools or projectile points.

HREC-13*

"Primary and interior reduction flakes of Franciscan Chert. And interior reduction of obsidian" (Glich 2000). There is an unnamed creek nearby. Site report needs to be completed and filed.

HREC-14 Chuck's Rock

PCN boulder near drainage, identified in 2007. The boulder contains at least five PCN markings, and is located on the bank of an unnamed creek. Site report is in the process of being prepared.

HREC-15 Bob's Rock

PCN boulder was found in 1988 but never recorded. Site report is in the process of being prepared.

A review of the above summarized archaeological sites on the HREC landscape, identified through surface survey, illustrates the visible evidence of a variety of activities that indicate what events may have taken place in the past. To better understand the observed activities I have divided them into four categories – *midden*, *lithic scatter*, *quarries*, and *petroglyphs*. A *midden* consists of dark soil resulting from the deposit of refuse from human activity, usually indicating a habitation or camp site that has seen repeated use. *Lithic scatter* is the presence of chipped stone (usually obsidian and/or chert) that indicates tool manufacture or reworking, that possibly took place during a brief stop or camping trip. *Quarries* are specific areas where material is gathered for technological use or trade – usually obsidian or chert, or other commodity. A *petroglyph* is a boulder, stone, or outcrop, that has been intentionally marked by human action, often referred to as rock art. Quantitatively the sites on the HREC represent four midden area, 16 lithic scatters, six petroglyphs, and six quarries. The function of these sites was determined by visual survey only; the subsurface investigation during the field schools was based on this information. In the Chapter X, I will discuss how the designation of some of the sites identified as lithic scatter have changed, based on the field school excavations.

Nearby Site

There is one additional site that I would like to discuss at this point. While not on the HREC property, it lies just to the south of the HREC, in McDowell Valley, near a drainage originating on the HREC, very near PCN marked boulders. The site, CA-MEN-1602, was originally recorded as a lithic scatter, with no apparent midden in the 1970s (Origer 1979). This site report was followed by a full Archaeological Investigation conducted by the Anthropological Studies Center Cultural Resources Facility, Sonoma State University (Damon and Fredrickson 1979). I had located this site investigation in a search for sites believed to be very old, that would meet the hypothesized timeframe for PCN manufacture (50008000 years). The site will be more fully discussed in the following two chapters.

Trail

This section of my dissertation looks at trails that served as the connective tissue of the landscape. They allowed and led pre-historic peoples to move from place to place. By following the trails that crisscrossed the landscape, they gained an intimate knowledge of the physical terrain and all the features that were present. They obtained knowledge of the resources available in the area, the chert quarries, potential camping sites, and the location of those special boulders that became part of the PCN tradition. The trails led them to the Clear Lake area, where they secured their obsidian, and to the ocean, where they traveled and traded their goods, and from village to village for social events, and seasonal movement. Numerous trails may have originated as animal trails, and through aboriginal use, evolved into many of the roads and highways of today (Davis 1961b:45).

Organizers of a 2006 conference on *Landscapes of Movement,* at the University of Pennsylvania Museum of Archaeology and Anthropology, produced a volume based on the premise that trails (and paths and roads) are the “manifestation of human movement through the landscape” (Snead, et al. 2009:xv). Timothy Earle, discussant for the conference identified trails as “regional and longdistance routes marked by repeated use, by blazes, cairns, and petroglyphs…” (2009:256), also noting that after humans had began to use the trails, it was animal that kept the trails open. It is not known if the PCN boulders were some of those markers, and I doubt it, but certainly other markers on the landscape, whether creeks, drainages, or distant views let those early people know the correct direction to head on their journeys.

The first trail (and trade) study in California was published in by Leticia Sample and reported that “myriads” of trails crisscrossed California at the time of contact (1950:1). Research by Sample, revealed that many of the old trails were worn up to 60 cm deep, through repeated use, and were visible long after the indigenous use ended. Sample also found that trails normally were in straight lines and took the shortest route. Where brush was thick they ran along stream beds (p. 2). Earlier, Powers (1976:119) had noted that trails sought out the highest part of a hill, to be on the lookout for enemies, with the trail cutting right through chaparral. If the hill was somewhat clear of vegetation, they would travel along the ridge or about a “rod or two” below the crest. Preferring the open ground for visibility, they would traverse on the south side if the range was oriented east and west, and on the east side if it trended to the north and south, due to the increased vegetation on the west and north side of a hill.

In her report, Sample (1950:3) also noted that the Pomo were extensive traders and made long trips within their territory, which took them from Clear Lake to the Coast. She also noted that indigenous groups in California, as a whole, practiced trade from east to the west. Sample’s report included a listing of trade items for many of the California groups indicating who they traded with and the items that were exchanged. She has broken the Pomo into four groups (Clear Lake Pomo, Northern Pomo, Central Pomo, and the Southern Pomo) (Sample 1950:16). Drawing on Stewart (1943:38, 46 ,49, 78), she itemized the trade arrangements for the Central Pomo (including the Hopland group), within the larger Pomo linguistic group, as including the Cokoa Pomo who took pinole or acorn flour to the Bokeya of Point Arena and received dried sea food, and fresh seafood and salt in exchange. They secured whole shells from Bodega Bay, and obsidian and unbaked magnesite and lake fish from the Lake Pomo. The Point Arena people (Bokeya) obtained their shell beads, magnesite money and obsidian from the Lake Pomo (East), and in return gave them sea food, acorns, berries, pinole seed, and deer. The Cloverdale Pomo received salt and sea food from the Southern Pomo of Stewart's Point and clamshells at Bodega (Sample 1950:16). In addition to trading among themselves, the Pomo also traded with the Coast Miwok, Patwin, Yuki, Coast Yuki, and the Wappo.

One additional note on Sample's report - she indicated in her Introduction that she had made an "accurate representation of these trails plus minor ones…drawn on a 1:500,000 projection of California and deposited it in the office of the University of California Archaeological Survey for reference" (Sample 1950:1) I have made repeated efforts to locate this map. According to various reports, all maps reports, etc., were deposited at the Hearst Museum after the California Archaeological Survey (directed by Heizer) was shut down. The Hearst cannot locate the map. This may be a 'jewel" and finding it might inform the research of the trails that undoubtedly crossed the HREC landscape. At the end of her report she provided a very condensed map of the trail systems in California, and it appears to include major trails very near the study area. I will continue to follow any leads that might be available in an attempt to locate this important map.

Finding the Sample report out of print (with no copy machines at the time), a second report was prepared in 1961 (by Davis), which was prepared to serve as a "replacement and supplement" to Sample's work. Davis expanded Sample's original report (again taken from a vast ethnographic and archaeological literature) to show the breadth of trade of the California Indians, citing Pacific Coast shells in various Puebloan sites, various items from Mexico, and citing especially dentalium shells entering California from Vancouver Island. Davis also goes into the timedepth issue of trails, and the difficulty of determining their antiquity. Along this line, Davis (1961b:7) quoted a statement by Elsasser in an undated University of California Archaeological Survey manuscript as stating "It is obvious, of course, that trails, however faint, would have to connect one site with another whether the sites were used synchronically or diachronically." The Davis listing of items that were supplied to and received from each group is much more general than Sample's list, dealing with the Pomo as a whole group, and only listing trade with other people from other linguistic groups. Davis also provided two maps at the end of his report with the first indicating the Indian trails and the second the trade directions. Both maps are of a scale that makes it difficult to discern exact locations.

A more recent trail study, for the Bureau of Land Management, and within the traditional ancestral Pomo area, connected the Clear Lake Basin (obsidian sources) with the Ukiah Valley (DeGeorgey and Mongeau 2005). This trail, known as the No'boralCo'kdjal Trail, or the Norris Trail, connected the Northern Pomo with the Eastern Pomo. Research by DeGeorgey and Mongeau, both archival and in the field, identified that the integrity of the trail still exists in some areas. While the trail was north of the study area, in the Myacammas Mountains, there is reason to believe that similar trails may have crossed the landscape of the HREC, carrying travelers and traders between the Clear Lake area (especially the obsidian sources) and the more western areas inhabitied by the Pomo. In 2008, Michael Newman and Brian Much presented a paper at the 2008 Society for California Archaeology in Burbank, entitled *A Century After Barrett.* Their study was based on the ethnographic information from Barrett's publications, and identified 13 trails or segments of trails in the Central Pomo area. Their paper is on file at the Northwest Information Center. Their study area, while in the Central Pomo area, was west of my research area (Newland and Much 2008).

Currently, Mary Gerbic, graduate student at California State University, Sonoma, is conducting M. A. research to identify trails that traversed the HREC landscape. Gerbic knew that a trail existed, based on information in the local literature (Gibbs 1853a; Mauldin 1951:19511534). John Poor, the matriarch of the Poor Ranch, founded by his grandfather John in 1887, which borders the HREC, had also shared with us his knowledge of a trail, and stories told by his father (personal communication 2010). John related how his father George had remembered the Indians walking by the front porch of the farmhouse as he sat facing east. He remembered being told that some had waved, as they followed the route up and down Riley Ridge (a path now marked by powers lines). The trail would have continued downhill and across Parsons Creek below the Poor ranch house, and along the Parson's Creek past the current headquarters for the HREC. John related how the Indians from Clear Lake and Hopland were well aquainted and knew each other by nicknames. The men were reported to carry sticks to kill rattlesnakes and the women carried burden baskets on their heads. There is a spring near the Poor ranch house, and was know by the Indians as a medicine spring, having reportedly cured a woman of a rash. The Indians would stop on ocassion at the spring. John thought that a trail decended down Riley Ridge from Benmore Valley, to an unknown destination. One possible destination could have been to the Apple Tree Village (at that time the location of the Hopland tribelet), which was just over the hill from the Duncan Ranch (one of the earlier ranches in the immediate vicinity). In 1951, Henry Maulden, Lake County Historian, (1951:1533-1534) recorded the memories of Franscisco John, an Eastern Pomo, who recalled a trail that led from Hopland to Lakeport "long ago". He reported that it followed Scott Creek into Benmore Valley, up the Valley to where the power poles are now located, going up and over the hill and decending to the Russian River, near the old Apple Tree Rancheria, about 3km north of Hopland.

The current road leading to the Poor Ranch, exits the HREC property just north of the sag ponds, and CA-MEN-852. While John did not recall any stories of Indians living in the area, he was aware of Spanish woodcutters who lived in tents, on the location of the archaeological site. The evidence of these may be the house pits identified by Orlins (1974). In her search for the trail, Gerbic, and Steven Poor have walked the proposed trail a couple of times, and while not able to positively identifiy a trail, they have found a wellworn foot path in a section north of Benmore Valley and up the tributory to Riley Ridge.

Utilizing current computer generated modeling, Gerbic applied GIS (Global Information System) methodology through Esri ArcGIS 9.3 to generate possible trail locations. GIS are computer generated systems that store, manipulate, analyze, and present information about geographic space (Gillings and Whearley 2005). Computeraided mapping is but one of the facets of GIS methodologies.

Conclusions

Adding to the difficulty of identifying trails on the HREC is the use of the land for sheep grazing, and the many other animal trails (deer, etc.) that are present, and many modern roads probably not related to Native activities . Understaning pre-historic trail systems may provide additional information on how the various archaeological sites identified on the HREC landscape happened to be where they are located. Are the lithic scatters on a trail that leads from Clear Lake, to the west? Did they stop to camp and hunt as they were returning to the home village? And retouching their tools as they sat by a campsite? By understanding the archaeological sites and types of sites that have been identified on the HREC we can gain a better understanding about the lives of those who passed by. Chapter VIII will discuss the field research of this study, and the methods of labrotory analysis applied to a selection of the specimans. By looking at the data available for consideration, both on the HREC and the nearby McDowell Valley including the artifact collections that contributed to understanding the archaeological context of the sites, will set the stage for later analysis and synthesis. With the review in this chapter of the surveys that have taken place on the HREC, I will next turn to what the sites themselves revealed through subsurface investigation, and discuss the laboratory methods that have been applied through various testing techniques.

VIII. Field Research, Archaeological Context, and Testing Methods

An archaeologist starts at the top and works down.

(Anonymous)

Introduction

The previous chapters of this dissertation have set the stage for the field research, with Chapter VII summarizing previous surface surveys that identified archaeological sites on the HREC. The individual sites were briefly summarized and the concept of trails as a connective tissue was presented. This chapter will begin a brief review of archive research, and a summary of excavations, both previous and those from my field research, that have provided the archaeological context for this study. I have approached my research from multidisciplines to identify the broadest spectrum of information accessible on the HREC landscape. Concluding this chapter will be an introduction to the field methods and laboratory testing methods that were applied in my research. The information presented in this chapter provides the data, elicited from the field methods, laboratory testing, and artifact analysis, that will inform us about the pre-historic activities that took place on the HREC.

Archival Research

In preparation for the field research, information was gathered from various sources to provide the background information. This included a broad survey of known ethnographic material concerning the Pomo, and specifically, the Central Pomo. Site reports and written reports at the Northwest Information Center provided much needed background information on previous documentation and studies in archaeology. Also studied were John's Hudson's unpublished personal notes at the Grace Hudson Museum, and Henry Mauldin's unpublished archive of the *Mauldin Chronicles* at the Lakeport Historic Courthouse Museum at Clear Lake. The boxes of Samuel Barrett's notes at the Bancroft Museum were also examined.

Access to the Davis Collection

Previous to beginning my research at the HREC, I had visited the site a couple of times on field trips with the Bay Area Rock Art Research Association (BARARA). I looked forward to those visits as they gave me the opportunity to once more observe some of the many PCN sites in the Coastal Ranges of California, which had become my research interest. In selecting my area of dissertation study, the HREC presented a controlled study area, with a concentration of PCN marked boulders, administered by a researchfriendly staff, which provided the perfect scenario for pursuing indepth research on the PCN tradition.

In 2002, as I was researching the location for study, I visited the HREC and the field school that was being conducted by UC Davis, under the leadership of Taren WiseHarthorne. Students were in the process of excavating units and in discussing my potential research with WiseHarthorne, we talked of sharing my rock art knowledge and her excavation results to enhance both of our studies. When Wise-Hathorne withdrew from her PhD studies, Dr. Robert Bettinger, of U. C. Davis, approved my access to the collection (U. C. Davis Catalogue #504) that resulted from the three years of field schools. At the time, much of the collection needed to be processed and accessioned, and the catalogue grew from just over 1200 entries to over 2200, as bags were further sorted and reidentified. During this period, I worked with U. C. Davis

Museum staff, Lisa Deitz and Liz Guerra, to sort, identify, and document the collection, including the student notebooks, assorted maps, and other associated items.

HREC Field Research

The following section will briefly summarize the field research that produced the artifact collections. Acronyms used to describe the testing methods identified in the following section include augers – a hand tool that provides information on the subsurface sediments, soils, and the stratigrify with a minimal invasive method (Stewart 2002b:243). Sampling with augers is often used to check depth of a deposit and artifact density to determine site boundaries. The term STP refers to shovel test pits which are a small unit excavation, with a restricted depth. The dimensions of the STPs used in the HREC excavation were .5 x .5 m by 25 cm. The usual excavated unit is 1x1m, with no specified depth. Units are usually excavated in 10 cm levels and reported as Level 1 (110 cm), Level 2 (1020 cm), etc. Units may be extended several meters in both directions.

Davis Field Schools

As reviewed in the previous chapter, the Davis field school excavated for three summers (18 weeks). The extent of the field school investigation is summarized as follows: **CA-MEN-852 (**2000/2001 field schools) 10 Augers (2000),14 STP (2000), 7 (1 x 1 m) Units (14 2000), (57 20 01), and 6 (6 x 0.5 m) Trenches (2001. **CA-MEN-2206 Fern Springs (**2000 field school) 3 (1 x 1 m) Units. **CA-MEN-2216 Madrone Grove (**2001 field school) 2 (1 x 1 m) Units. **CA-MEN-2223 (**2002 field school) STPs (no number indicated in records), 5 (1 x 1 m) units, unit 4/5 Wall. **CA-MEN-2235 (HREC1) Riley Ridge Scatter** (2001 field school) 12 (1 x 1 m) units. **CA-MEN-3355 (HREC6) Vineyard Site (**2001 field school) 1 (1 x 1 m) unit. **CA-MEN-3357 (HREC–8) Parson's Creek Site (**2002 field school) 1 (1 x 1 m) unit. **CA-MEN-3462 (HREC-9) Middle Lake (**2001 field school) 2 (1 x 1 m) units. **HREC-10 Thank God for Obsidian Saddle (**2000 field school) uo Units, Surface Survey/Collection. **HREC-11 Guard Lama Site (**2000 field school) No Units, Surface Survey/Collection. **HREC-12 Bunny Knoll Site (**2000, 2002 field schools) 37 STPs (2002). **HREC – 13 Barbara's Bump (**2000 field school) no units, Surface Survey/Collection.

Sonoma State University Field Work

The specimens in the Sonoma State University Collection were generated from a 1979 study by the Anthropological Studies Center at Sonoma State University to test the site (CA-MEN-1602) and to evaluate its significance (Damon and Fredrickson 1979). Located just south of the HREC, this site *may* be of temporal association with the PCNs on the HREC. At **CA-MEN-1602,** 60 Auger Units, and 4 (1 x 1 m) Units were excavated.

Gillette Field Work

My original research design called for field studies at two of the PCN sites**, CA-MEN-2213** and **CA-MEN-2221**. The plan for CA-MEN-2213 consisted of mapping with a total station, STPs, and excavated units near and around the horizontal marked boulder, at present ground level. After attempting to penetrate the surface soil, it became obvious that the use of the land for decades as a sheep pasture, and the deer trails had compacted the soil to a degree that it was nearly impossible to remove any soil. After consulting my committee it was decided that any data generated from such investigation would not be of significant value to warrant continuing with further subsurface investigation at this site. It was decided to concentrate further research at CA-MRN-2221. The subsurface investigation at CA-MEN-2221 consisted of augers, to acquire samples for phytoliths studies and unit excavations, primarily to determine the bottom of the boulder and collect soil samples for laboratory use. At CA-MEN-2213 (Huntley Peak), 4 STPs (50 x 50 cm) were tested and 3 (1x1m) Unit (partial around boulder) were excavated. At CA-MEN-2221 (Hidden Hill), 6 STPs (50 x 50 cm), 6 Augers, and 6 (1 x 1 m) Units (1 full unit and 5 partial units around boulder), were excavated.

Artifact Collections

The specimens that form the archaeological context derive from the subsurface investigations described above, and surface finds. The major collection is Accession #504, the U. C. Davis Field School Collection, comprised of 2248 catalogue numbers, the HREC collection, Accession #479, with 366 catalogue numbers, and the Sonoma State University collection, Accession # 799 with 248 catalogued numbers. My field excavations in 2009, at CA-MEN-2221, produced only thirteen catalog items which will be accessioned to the HREC collection at the completion of my research. The following sections will summarize these collections.

Davis Collection Accession # 504

The U. C. Davis Collection consists of chipped stone tools, debitage, faunal material, groundstone, a small amount of shell, a few mineral specimens, and a few artifacts (glass, etc.). Lithic material is obsidian from both Mount Konocti and Borax Lake, with a few specimens from miscellaneous quarries, and a large amount of chert, probably acquired on or near the site. Considering the large amount of units excavated (23 1x1m), from 12 sites, plus a trench, and nearly 100 STPs and augers, the number of collected specimens is very low.

HREC Collection Accession # 479

The collection of artifacts from the HREC is unique from the other two collections. It did not result from archaeological investigation, with the exception of surface collection during the 1999 survey of the HREC by students from U. C. Davis. The collection has been amassed since the 1950s when the University of California purchased the property. Individual items (often the more 'showy' variety, such as full projectile points), have been picked up by HREC staff and researchers during routine research and in the preparation of study areas. Through the years, the items have been accessioned to the collection, making careful note of provenience, and the circumstance of their finding, and placed in a computer data base, and stored in archival boxes. Items consist primarily of chipped stone projectile points and tools, groundstone, two shell beads, and two charmstones. In addition, a cache of large ceremonial blades was collected in the 1980s and reburied. These will be discussed in the following chapter.

Sonoma State University Accession # 799

The artifacts resulting from this field work consisted of 975 pre-historic specimens, predominately lithic "debris". Of these chipped stone specimens, 34 were classified as artifacts, with 589 of chert, 384 of obsidian, and two of basalt. Sixteen of the artifacts were flake tools, 13 were bifaces fragments, and one was an intact chert projectile point. The investigators identified this site as a specialized activity area, probably exclusive of habitation. Based on the relatively

Field Methods, Recording Methods, and Laboratory Testing

As mentioned earlier, my research has engaged a multidisciplinary approach to retrieve the broadest possible data from the landscape to inform us about pre-historic activities. As a result several tried and true methods were employed along with some new, more innovative and less proven methods and techniques. Some of the utilized methods resulted in usable data that enhanced the research, and others were tried and discarded as not being a productive or accurate testing method. This section will summarize the recording and testing methods that were used, both those that produced usable results and those that were discarded.

Survey and Mapping

As covered above, the HREC has been surveyed several times, both informally, by Mark Gary, members of the HREC staff, and others, as well as formally by students from U. C. Davis. To assist in the mapping of the PCN sites on the HREC, fellow grad students Lee Panich and David Cohen visited the sites in 2008 to carry out Total Station Mapping. At a later date, my crew was staking out the site in preparation to excavate the Huntley Peak Site (CA-MEN-2213). In laying out a 1 m grid, discrepancies became obvious. As we staked out the ground contour in 1 m sections, the Total Station provided a birdseyeview, with a failure to line up with the ground squares. Shortly after, the decision was made to abort the excavation at this site, as explained earlier in this chapter. The use of the Total Station did produce accurate and usable maps for the CA-MEN-2221 site (Figure 8.1 and Figure 8.2). The Total Station maps will be submitted with the updated site reports.

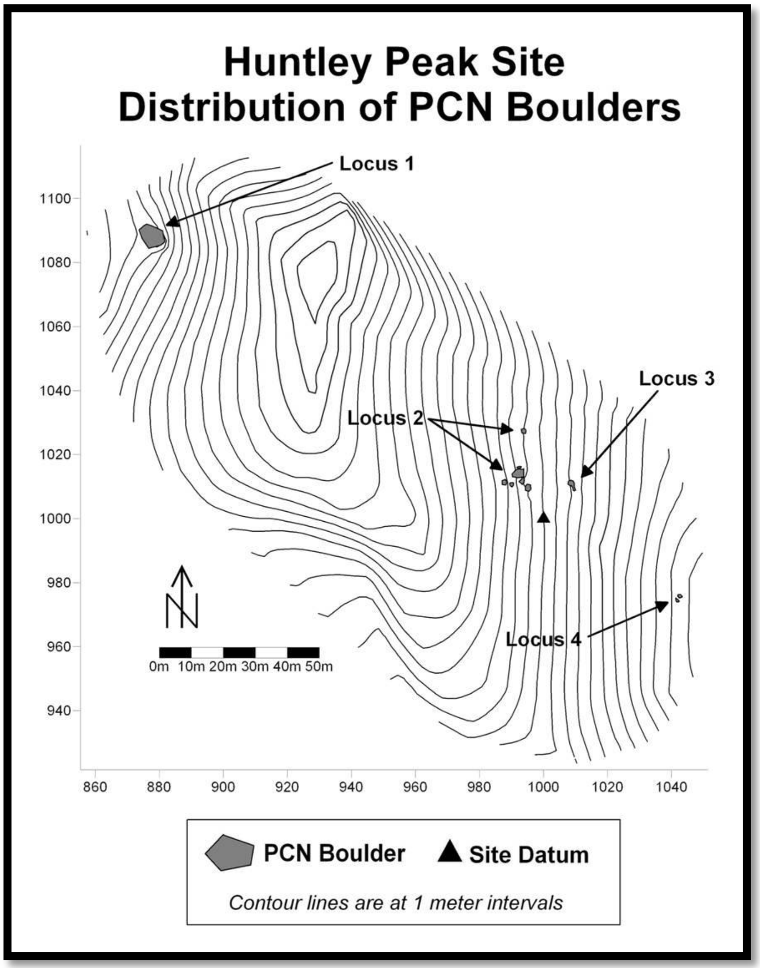


Figure 8.1: Total Station mapping of CA- MEN-2213 by Lee Panich and David Cohen.

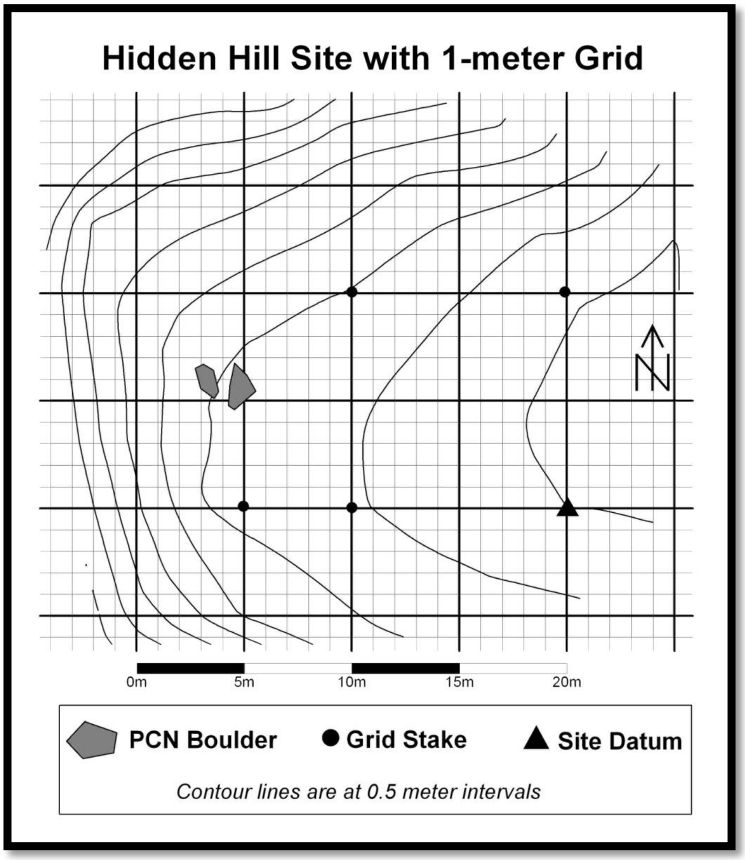


Figure 8.2: Total Station mapping of CA-MEN-2221 by Lee Panich and David Cohen.

Recording the Sites

Traditionally, site reports in California are filed with the Information Centers, as part of the Office of Historic Preservation, and consist of descriptive text, maps, drawings, photographs, and any related reports. In the recording of PCN sites on the HREC, I decided to take advantage of “cutting edge” equipment available through the Archaeological Research Facility at U C Berkeley, to obtain precise photographic documentation of the sites. Utilizing a new method of a very accurate 3 D Laser Scanner, operated by Justin Barton, a U C graduate, then engaged in graduate work at the University of London, we experimented with the process at a couple of sites. The first site was a PCN boulder on private property in the East Bay, and then at the HREC (sees Gillette and Barton 2006) (Figure 8.3). The 3 D laser scanning technology was first developed in the 1990s to aid the architecture and engineering professions in surveys of buildings. In 1998 Cyra Technologies of California commercially launched the first survey grade laser scanner. Since that time, various other technology companies have climbed aboard, and other professions, including archaeology, have recognized the potential for laser scanning. In the Hopland field work, we used two cameras, the Cyrax Scanning Camera and a Minolta Scanning Camera. The longrange system uses a Cyrax 2500 3-D Laser Scanner (a.k.a the Leica HDS2500). This portable scanner uses a "timeofflight" method in which a laser pulse is sent from the scanner and the time it takes for the light to reflect off a surface and return to the scanner is used to determine the distance of the object from the scanner. This pulse is repeated quickly and with a high density, sending 1 million pulses in about 15 minutes within a 40 degree field of view, both in the horizontal and vertical. This generates a "3-D point cloud" of the surface geometry of the target. The scanner has a maximum range of 100 m and is accurate to within about 5 mm. With the attached laptop you are able to see realtime results from the scanner. With the scanner's small field of view it is necessary to take several scans, ensuring at least a 20% overlap in scan data to allow for the processing and "stitching" of the scans together to create a complete data set. The scanner also has a built in digital camera which can be used to color map the resulting point cloud. The software used to control the scanner and process the scans, Cyclone, is capable of importing images from any digital camera and through a process similar to that of stitching the individual scans, we can photo texture the scan data with high resolution digital images, giving us photo realistic point cloud 3-D models. The camera is powered with a portable battery.

Figure 8.3: Placement of the Cyrax camera for the 3-D scanning at CA-MEN-2221.

The second camera used in 3-D scanning is the Konica Minolta VIVID 910 scanner and uses a slit beam laser; the light that is reflected back to the scanner's camera is then triangulated to calculate distance. The VIVID 910 scanner can acquire 307,200 points in about 2.5 seconds. The close range scanner only has a range of 0.6 m 2.5 m. This optimal range can provide an accuracy of (8/1000 mm). This scanner also has a built in digital camera used for color mapping. This scanner as a whole was not designed for portable, outdoor use and as a result, works best with filters, and in some cases, placement of a tarp or umbrella is used to reduce the bright outdoor light. The VIVID 910 is AC powered which required us to provide electricity in the field via a portable generator. Use of the equipment produced some very interesting results, and may be useful in measuring such things as the rate of slippage between the two pieces of boulder at CA-MEN-2221. The scanning process also produces a level of recording that makes visible marks that are not discernable to the naked eye.

The 3 D Laser Scanning process has been used at several World Heritage sites and has been reported in other rock art research projects (Barnett, et al. 2005; Simpson, et al. 2004; Trinks, et al. 2005).

In addition to the hightech recording, experienced rock art recorder, Paula Reynosa, is in the process of an indepth recording, using the traditional methods. These amended site reports will be submitted to the Northwest Information Center when completed.

XRF

In 2009, fellow graduate students Anna BrowneRibeiro and James Flexner joined my crew at the HREC to experiment with taking portable XRF (X Ray Florescence) readings of the schist boulders to see if we could retrieve geochemical data to determine the mineral content of the boulder and the resulting talc powder, that might provide clues to the use of the powder for sterility cures. While the first day of testing seemed to go well, on the second day, we experienced an equipment failure that precluded any further testing. There was a software problem, and the equipment needed factory attention. The XRF procedure will be explained below. We have not returned to the field with the handheld equipment at this time, but such tests could possibly provide interesting data.

LiDAR

Another promising opportunity presented itself in 2007 when a colleague told her brother about my research. It seems he was part of a team from the USGS that was taking LiDAR (Light Detection and Ranging) scans for earthquake research, and were mapping a swath along fault lines in my research area. Being grounded by weather for the day, he contacted me while I was at the HREC to visit the site. He had studied the Mayacamas Fault that runs through the HREC for his M.A. thesis (Sickler 2003). In talking, I was interested in the prospect of the LiDAR mapping perhaps revealing trails that might be some of that connective tissue. LiDAR is a technology that uses pulses of laser light to hit the earth's surface and bounce back a signal, measuring the time that it takes to return. The technology, using GIS layers, allows vegetation to be "peeled away", which might expose any trails on the ground surface.

Laboratory Testing Methods (Analytical)

In my quest to elicit as much possible data from my artifact collection, several laboratory techniques were employed. In understanding the dynamics that took place on the landscape, Chemical XRF sourcing was used to determine the geographical source for the obsidian that was found in the collection, obsidian hydration testing placed the lithics in temporal patterns, and faunal analysis enlightened the study about what was taking place at what sites, and determining some food consumption. A limited amount of AMS dating also was completed. These laboratory tests were made possible by the 2007 James Bennyhoff Award from the Society for California Archaeology.

XRF Chemical Sourcing

Knowing the source of the obsidian specimens from the collections would assist in understanding where the pre-historic people were obtaining their material, and could provide clues to the activities that took place on the HREC landscape. Testing for the chemical sourcing was by two sources, Richard E. Hughes, Ph.D. RPA, Director of the Geochemical Research Laboratory, and students in the Anthropology 135A class at the U C Berkeley, under the direction of Steven Shackley, Ph.D. RPA, and Professor at U C Berkeley. Testing by the use of XRay Florescence (XRF) is a method of determining a group of elements that compose a nonorganic material. In this nondestructive process, the sample being analyzed is subjected to irradiation with primary X rays from a highvoltage Xray tube. The primary X rays "excite electrons from the inner energy levels of the constituent atoms, and, when these vacant energy levels refilled by outer electrons, secondary, or florescent, X rays are emitted" (Ellis 2000:672). These energies or wavelengths, which represent specific elements, provide the basis for the identification of the elements, and thus, the source for the sample. XRF results can vary, dependent on the "calibration of elemental proportions as a function of the matrix (the overall composition)" (Lanbert and Chippendale 2005:479). I submitted a total of 139 samples for sourcing.

Visual Sourcing

In addition to the XRF sourcing, many of the specimens were sourced by visual sourcing. Many types of obsidian have a very distinctive appearance. Fortunately, this is the case in comparing obsidian from Mt Konocti and the Borax Lake sources near Clear Lake. The Borax Lake obsidian is quite flawless with an even, translucent look, as compared to the nearby Borax Lake quarry where the obsidian contains specks of white that makes it very identifiable. As part of the Obsidian Hydration, Tom Origer visually sourced the samples that were tested by his lab, and also visited to HREC site and visually sourced most of the HREC collection (#479). Visual sourcing identified 214 specimens. Visual sourcing as part of obsidian hydration will be covered below.

Obsidian Hydration

Obsidian Hydration is accepted by most archaeologists as a relative dating technique, but is nearing acceptance by some archaeologists as a chronometric (absolute) dating method (Sutton and Arkush 1996:308). The theory behind hydration testing is based on when a surface of obsidian is broken; a substance (very similar to water) diffuses into the matrix of the obsidian (glass). The longer the exposure, the deeper the fluid penetrates into the obsidian break. Under a microscope, the color is different and the hydration rim can be measured in microns. The obsidian sample must be partially destroyed to obtain a "chip" for analysis. The area to be chipped is selected to have two sides that will be perpendicular to the mounting glass, for the microslide. The chip is prepared by grinding down to the proper thickness to be transparent so that hydration bands may be measured. The complete processes used by the Origer Obsidian Laboratory are included in his reports in Appendix #2. It is necessary to know the temperature history of the specimen to correctly calibrate the measurement. Four to six measurements are taken of each chip, and the readings are averaged. The biggest problem is that it is unknown if hydration occurs at a steady rate, or temperature has remained static (Anovitz, et al. 1999; Hull 2001; Rogers 2008, 2010). Obsidian samples have been submitted from the U. C. Davis collection (#504) and the Sonoma collection (#799). In addition, 30 obsidian pieces were sent to Tom Origer for sourcing early in the U. C. Davis field school days, and were never accessioned into the U. C. Davis collection. Hydration readings totaled 186 from all sources, and 205 pieces were visually sourced. While the specimens from the early U. C. Davis testing are not to be found, Origer was able to supply the results. While the readings do not provide an absolute chronometric date, with numerous specimens tested, I believe they will give an indication of the temporal periods and can add usable data to my research.

AMS Radiocarbon Dating

The most common form of absolute dating used in North America is radiocarbon (C^{14} dating) (Sutton and Arkush 1996:30-67). Small samples of organics can be dated by using the accelerator mass spectrometry (AMS) technique. This method directly counts C^{14} atoms in a nuclear accelerator. Three samples were submitted for AMS dates from the U. C. Davis excavations.

Faunal Identification & Analysis

The analysis of faunal remains refers to the study of animal remains found in the archaeological context. The two main goals in conducting faunal analysis are 1) to reconstruct human subsistence, including behavior and technology, and, 2) to reconstruct paleoecology and biogeography (Sutton and Arkush 1996:235). Sutton and Arkush have included the following paragraph from Lyman to further explain the questions that can be asked through faunal studies:

> Which taxa [species] are generally eaten, which were rarely eaten, and which were never eaten [and why]? Which taxa contributed most to the diet? When were particular taxa hunted? How much food did different taxa provide? Were particular age groups or one sex of a taxon preferred over others? Did age, sex, or individual selection vary intertaxonomically? Where were food animals hunted and how were they hunted?
> (Lyman 1987:335)

All the faunal parts were not eaten, as some appear in the archaeological record in other forms such as bone awls, whistles, sandals, and items. With faunal analysis, the animal kingdom is divided into two main classifications – Invertebrates (mollusks, insects, and other), and Vertebrates (fish, amphibians, reptiles, birds, and mammals) (Sutton and Arkush 1996:236-45). All the faunal specimens from the field schools were analyzed by U. C. Davis student Cassandra Manning under the direction of her professor Christyann Darwent, Ph.D., a specialist in faunal analysis. A total of 8119 specimens were analyzed, with 2031 being able to identify to a specific species.

Soil Dating

The PCN site at CA-MEN-2221 presented a unique opportunity to try different soil dating methods to determine an earliest possible date for the placement of marks on the boulders. Upon my first glimpse of this marked boulder, during a tour of the HREC, I was struck with the idea of trying some soil dating techniques. The boulder is about one and onehalf meters in circumference, and at some past time, the boulder split into two pieces, with one edge bisecting a PCN element. Probable natural forces gradually separated along the crevice and through a soil building process, the split widened and there was a deposition of about 50 cm of new soil that built through the millennia up from the Paleo level. I immediately envisioned this as a way to place the PCN tradition in a firmer temporal context, rather than the proposed 5,000-8,000 year spread that many of us have come to believe, realizing if we could get a date for split, which obviously took place after the boulder was marked, that we could obtain a latest possible date for the markings. In my search for soil dating methods I have applied three different techniques to see if similar results could be obtained Optical Stimulated Luminescence (OSL), Oxidizable Carbon Ratio (OCR), and a new method which I will refer to as the Gordon method, which dates organic matter found in the same level as the dust or "flour" that results from the pecked debris that falls to the ground surface during the manufacture of the PCNs.

OSL soil dating was first introduced in 1984 (Huntley, et al. 1985), by researchers at Simon Frazier University in Canada. A form of luminescence dating, OSL is based on mineral grains (usually quartz and feldspar) that were exposed to sunlight and then buried. It was developed primarily for windblown and waterborne sediments (Ellis 2000:414), such as the alluvial context of the CA-MEN-2221 site on the HREC. When exposed to daylight, the sediment grains release any trapped electrons from their crystal structure. When the grains are buried, this resets the clock and they again begin to absorb electrons, or are recharged. This charge is from environmental radiation; through radioactive decay and the release of alpha, bets, and gamma particles (Lipo and Sakai 2011). When the sediment is again exposed to a beam of light in the laboratory, there is a release of luminescence. Called the dating signal, it is proportional to the elapsed time that the sediments were buried. In OSL dating, the sediment is exposed to an introduced beam of light, hence the "stimulated" in OSL. The method of taking samples is crucial in this process, and must take place in the absence of light. An opaque plastic column (plastic tubing about 25 cm long and 8 cm in diameter), with a cap on one end, is driven into the wall of the unit to be tested. It is carefully removed and the open end is then quickly capped. This process is done under an opaque cover, such as a drop cloth. For my OSL soil test we obtained six samples, at varying levels in the excavated unit. These samples were sent to the Institute for Integrated Research in Materials, Environments, and Society (IIRMES) Lab at California State University Long Beach, under the direction of Carl Lipo. While in the past, there was some skepticism on the results, OSL is gaining more acceptance as an option for dating (see Feathers 2003:1493). I plan on additional OSL testing at the site.

OCR soil dating is a relatively new approach to soil dating (Frink 1994, in press). I became aware of the method through a web search. Contacting Douglas Frink, the originator of the process, I arranged for him to visit the site from Vermont, and personally retrieved the samples to be tested. Frink, in a personal communication (2008) has supplied the following, concise explanation of the method:

> Once organic matter enters the soil system it begins to be degraded (oxidized) through both biotic and abiotic processes that are normal to soil formation processes. The end products of this degradation are lignite (brown coal) and carbon dioxide. The OCR procedure models soil formation processes (climate, organisms, relief, and parent material), and calculates a site specific age of the soil carbon based on its degree of oxidation along the continuum between raw organic matter and lignite.

For this method a “sample” of at least 100 grams of soil is collected with a trowel, at 5 cm levels and put in a plastic specimen bag (See Figure 9.19).

The OCR dating method being relatively new, as such, has been met with some skepticism, as voiced in a PointCounterpoint article in the *Society for American Archaeology Bulletin (*Killick, et al. 1999). Calling the method into question, those questioning the process based much of their criticism on the lack of published material in peer reviewed journals, and Frink’s failure to provide a scientifically acceptable demonstration of the accuracy and precision of OCR dating. In his defense, Frink notes that “it is normal for any new idea to undergo a process of ridicule, critique, and, eventually, testing, prior to its ultimate acceptance or rejection”. This was also the case for decades of criticism of the CarbonDating procedure. Since Frink conducted the testing at my site, he has received a Ph D. from Arizona State University, based on his OCR dating, and has now published numerous articles on the method, and applying his method worldwide.

In April 2011, Bryan Gordon, Curator Emeritus of the Canadian Civilization Museum in Calgary traveled to the HREC and conducted field work at the CA-MEN-2221 site, utilizing some of his newly devised testing methods (2008, 2010) to determine associated dates for rock art production, and specifically for the cultural markings (PCNs) at my research site. Gordon refers to his method as *Dating Petroglyphs Using Natural or Archaeological Carbon Associated with Art Debris in the Underlying Soil*. His method is based on excavation to retrieve any hammerstones or their chips, line grinders and the rock “flour” they make, plus fallen chunks of parent rock to determine the stratigraphic level. Using air vent screens to capture larger debris from pecking the rock and finer screens like flour sifters and tea strainers for rock flour and tiny hammerstone particles, Gordon is also looking for organic material in the same soil layers that can be AMS radiocarbon dated to provide a relative date for the making of the markings. Flotation is also used in the recovery of materials, in a clay matrix. This method has also been used with pictographs by recovering paint fragments, and associated organic material. For the first time, Gordon also and my crew also excavated a control unit to verify that materials found in the test unit were not common to other portion of the site. When results of these three soil dating methods have been applied to my site, it will be interesting to compare the outcome. Since this is, to my knowledge, the first time soil dating methods have been applied to similar rock art scenarios; this study will provide a model for future research.

One other soil based test was also used in my quest for datable material. Phytoliths research has been a ongoing project on the HREC by Rand Evett, a Research Assistant in the Department of Environmental Science at U C Berkeley. It is the study of intercellular and extracellular opaline silica bodies and other mineral inclusions that form inside and between plant cells when silica dissolved in ground water is transported as monosilicic acid through roots and into stems and leaves. During the decay of the plants, phytoliths are released into the soil (Ellis 2000:816819). Phytoliths are very resistant to decay. This research is relatively new, being developed in the 1980s, by Delores Piperno (1988). Although a botanical study, it is most often used by archaeologists to determine pre-historic use of plants and the natural vegetation of the area. While individual phytoliths cannot be directly dated, some have organic inclusions and a method has been developed to process archaeological soil samples to produce “clean” phytoliths that can be sent for AMS dating. In an attempt to try this method, 12 soil samples were sent to Evett.

Obsidian Quarries

As will be presented and discussed in the following chapter, the vast amount of obsidian that was recovered from the sites is sourced to two nearby obsidian fields in Clear Lake, Mt. Konocti and Borax Lake, about 5.5 km to the southeast. The Borax Lake site (CA-MEN-36) was originally excavated and published in the 1940s (Meighan and Haynes 1970). Mark Harrington was the first to work at the site (1948) and originally the projectile points were identified with the Folsom tradition, and he estimated the date of the site as 10,000-15,000 B. P. Identification of the Clovis-like fluted projectile points and crescents, places the Borax Lake site in the PaleoIndian period (Fredrickson and Origer 2002:148). This early date identification caused a reconsideration of the migration of early peoples through the Great Basin and when this original settlement of the West Coast occurred (Meighan and Haynes 1970:1214) (Figure 8.4). While the Borax Lake source is identified with the earliest use, archaeological literature often reports obsidian simply from Clear Lake or from Mt. Konocti which is most often identified in regional sites (Barrett 1952:176; Silliman 2005:80). It is believed that the Borax Lake source was used throughout pre-historic times (Parker 1993:311), and artifacts are identified at many sites in the North Coast Ranges, and into the Sierra Foothills, while the Mt. Konocti obsidian use is mainly restricted to Mendocino County (Skinner and Thatcher 2007a, b). The Borax Lake sources produce a clear black glass while the Mt Konocti has white inclusions. Both sites have various locations where obsidian was quarried.

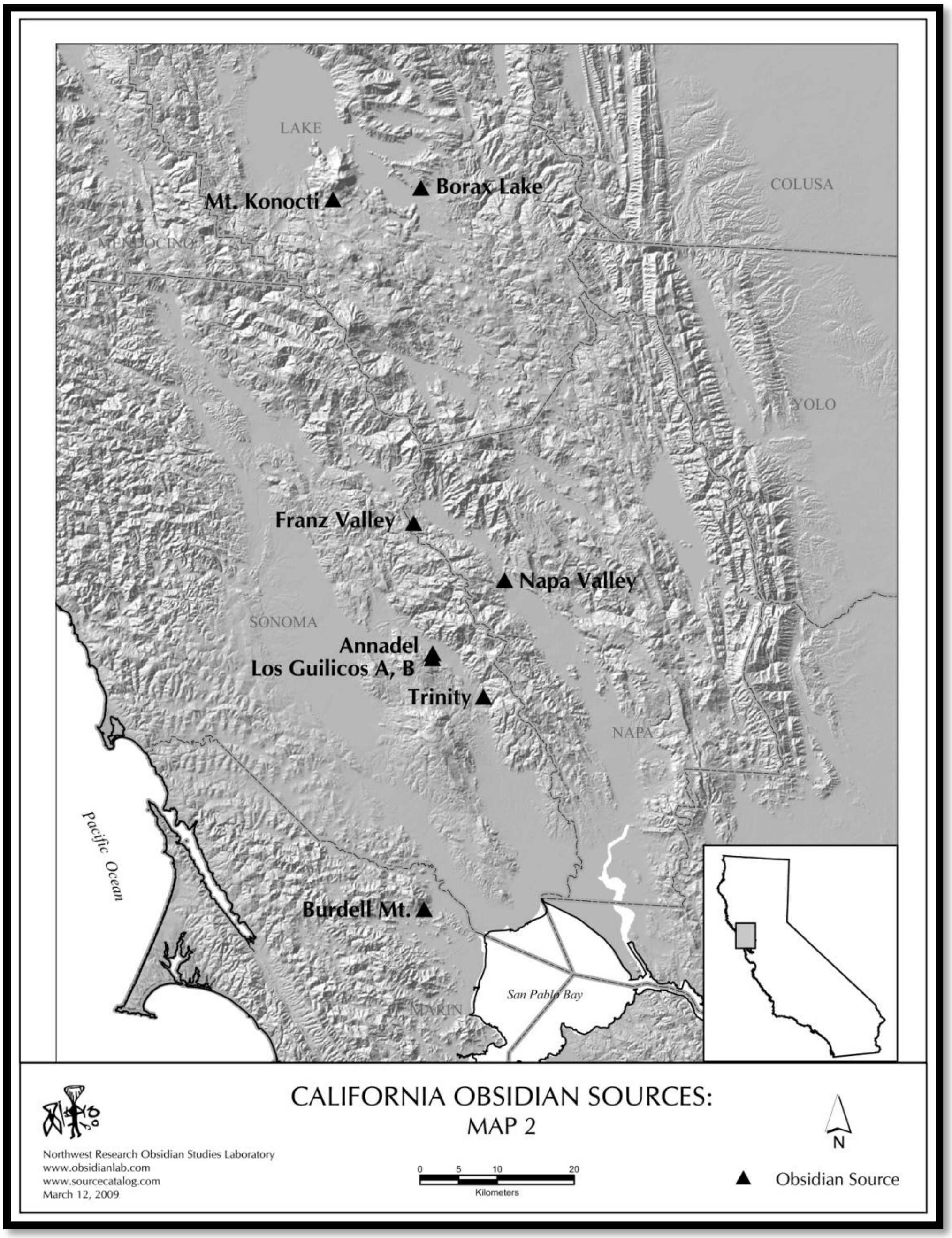


Figure 8.4: Map identifying the obsidian quarries that are referred to in this study. Map used by permission from the Northwest Research Obsidian Studies Laboratory.

Conclusions

In preparation for the reporting of results of the field work, this chapter began with a brief review of archival research and a summary of the excavations, both by others and myself, that have provided the archaeological context for this study. This being a multidisciplinary approach, the various field methods and empirical testing methods were presented, including brief descriptions of testing methods. The next chapter will present the findings of my research, through analysis, discussion and interpretation.

IX. Results and Discussion of Field Work

> Since the very beginning of this study, 'What is the exact age of the painted caves' is the question asked by persons who are not great adepts at Prehistory and ignorant of the difficulties specialists have to face to give a satisfactory answer. (Breuil 1952: 32)

Introduction

The previous chapter introduced the field portion of my research and the analytical methods that were used in the analysis of archaeological materials. A summary of the field work conducted at the HREC was also included. In this chapter I will report and discuss the results of various analyses of archaeological materials and the methods that I have applied in my research. Material recovered in all field work and laboratory work is presented through various tables and charts of collected artifacts, including those from the faunal analysis reports. The following description of the U. C. Davis field school excavations will not provide a complete analysis of the artifact collection, nor provide the details of their excavation methods and strategies, including a detailed report of what is available about the differentiation of levels. Some of this information is available at U. C. Davis. The purpose of providing the following report and discussion was to gain an understanding of the pre-historic activities that took place on the landscape of what we now know as the HREC. While the excavation of a 1 x 1 m unit will yield some insight into activities, this is only a very small sample of the potential of an artifact assemblage that may be present. While my study can contribute to a wider understanding of the archaeological landscape, a full report of the field school(s) is warranted. My research will also present the results from obsidian hydration and sourcing analysis, and the Carbon14 AMS determinations. Artifacts that are in the collection at the HREC are reviewed. The recording methods for MEN-2221 will be reported and discussed, followed by a summary of the reported data to place the information in the broader context of the archaeology on the HREC. Complete reports of laboratory studies will be found in the Appendix. Catalogs of the collections used in this study are available to researchers on a CD, on request.

Results of U. C. Davis Field School

As stated in the previous chapter, the number of artifacts was very low for the amount of subsurface testing undertaken at 12 sites, including 33 (1 x 1 m) units, a sidewall, one 6 x .5 m trench, 71 STPs, and 23 auger (usually .5 x .5 m, 25 cm deep) testings (listed in the catalog) (Lisa Deitz personal communication 2005). Artifacts were only recovered from subsurface excavations (including STPs), during the field schools. Artifacts observed during surface surveys were noted and the amount estimated. The U. C. Davis museum staff has worked diligently to extract information from student notebooks, with some notes incomplete and no notes or summaries available from the field school director.

During the survey portion of the field school one new site was identified, HREC-13 (Barbara’s Bump), a lithic scatter. According to student notebooks, a map was generated but the location of this document is not known at this time. In the future, a complete survey map of the HREC will be pieced together by the U. C. Davis Museum staff (Lisa Deitz personal communication 2011). An intensive surface survey was conducted between University Road and the sag pond (adjacent to CA-MEN-852), in 2000. Few tools were observed, and flakes were noted (although the report does not indicate if there was any collection). Surface surveys were also conducted at HREC-10, 11, and 13, with some observation and recording of estimates of surface artifacts, but no collecting. Field crews also conducted a surface investigation of HREC-12, with artifacts recovered in the STPs and catalogued. There was no indication in the student notebooks or in any records, that decisions on where to place augers, STPs, and units to be excavated were decided by a random sampling method or judgmental strategy.

Available information (from student notebooks and the catalog) indicate 10 auger samples were taken (CA-MEN-852). Augers were used to identify artifact density and midden area. In the artifact catalog there is no indication that any specimens were catalogued and retained from the auger testing (CA-MEN-852), although screening in a .32 cm screen is mentioned. Augers tests were also taken from the lowest excavated level at 11 units from four sites and will be reported and discussed in the site summaries, below.

There may be some confusion on the naming and numbering system of sites on the HREC. As mentioned earlier in this dissertation, all site reports had not been filed with the Northwest Information Center at the completion of the field schools. As a result, some sites are reported by designated trinomials (ex. CA-MEN-852) and others by the number assigned by the HREC (ex. HREC-8). I submitted the completed site reports at a later date, and trinomials were issued for HREC-8 & 9 (CA-MEN-3357 and CA-MEN-3462, respectively). When various artifacts were submitted to laboratories and testing facilities for MEN-3357 and MEN-3462 they were sometimes reported with different identifiers (HREC-8 and HREC-9).

In 2000 the HREC prepared a site map classifying the various archaeological sites on the HREC as Midden, Lithic Scatter, Quarry, or Petroglyph. These classifications were based on known archaeological sites and those identified in the 1999 survey of the HREC by U. C. Davis students (Sjordal, et al. 2000). As a result of my analysis of recovered data from the 20002002 U. C. field schools I have reclassified some of these sites. The criteria for my designation are as follows:

Camp – Indication of an overnight stay based on evidence of fire and modified bone (burned and cut marks), also presence of debitage.
Chert Quarries – Lithic material, debitage, evidence of removal of lithic material.
Habitation – Archaeological evidence that this site was used over a period of time for extended stays. This evidence includes a deep, developed midden, evidence of fire (fire affected rock, burned clay, charcoal), food preparation items (mano, millingstone, etc.), and faunal material (modified by fire and cut/impact).
Lithic Scatters – Presence of lithic material, and no evidence of camp fire. Future excavation may alter this classification.
Middens – Identified midden with no excavation.
Petroglyph – A culturally modified boulder (rock art/cultural markings). For the purpose of my study these have be classified separately as PCNs or Cupules.

The artifact types identified in the catalog list are the standard items that U. C. Davis uses in their catalogs (Lisa Dietz personal communication 2011). For further clarification, a biface refers to a lithic that has been flaked alternately on both surfaces, and a uniface refers to a lithic that has only been worked on one side. Projectile points are worked lithics used as tips of arrows and spears. Bifaces are often included as projectile points, but are listed separated by U. C. Davis. Scrapers are lithic tools used to remove fat from animal skins and to smooth wood.

Drills are used for perforation of shell beads, hides, etc. Flaked tools have been chipped or knapped from a core of lithic material (chert, obsidian, etc.) A roughout is a piece that still has a cortex (the outside weathered rind on a chert or other lithic nodule), indicating that there has been some removal of flakes; some roughouts may have been discarded because of mistakes or flaws in the material. A used flake may be a flake that was used for various applications because of its modified edges. Cores are a chunk of the parent material that is struck for the removing of flakes for making of points and tools. Cores are also portable and may be transported to make additional points at a later time. Debitage is a byproduct of stone tool manufacture and core reduction, and in the case of the U. C. Davis collection, they are known as waste flakes. Hammerstones are used to remove flakes from a core, and, in the case of my research, were used in the pecking of the elements of the PCNs. Millingstones are used for processing plant material and seeds, with the mano and pestle used as the pounding or grinding tool. U. C. Davis has chosen to use the term groundstone to refer to any stone material that was too small to be classified (i.e. mano, pestle, millingstone, etc.). Fireaffected rock indicates a rock that came into direct contact with a fire – a fire pit – and is usually identified by its discoloration, and may be cracked from the heat. Fired clay is clay soil that has been in contact with fire and intense heat, identified by its reddish color. And, charcoal refers to burned wood. Shell, identified in the catalog can refer to either isolated pieces of shell – as an indication of consumed shellfish, or as material for the making of beads. The listing of *other* refers to items that cannot be classified using the above classification, and are listed independently, in the text. Euro-American refers to historic items such as nails, glass, or other objects comprised of introduced material.

Results of the units excavated by the U. C. Davis field schools are summarized and discussed below, site by site. See Table 9.1 for master artifact table for all sites referred to in this chapter; with artifact counts totaled at the bottom of each site column; MEN-2221 and MEN-1602 are also listed, and will be discussed separately as they were not part of the U. C. Davis field schools. Table 9.2 is a master table for the faunal material recovered from the HREC excavations, listed by taxa). U. C. Davis faunal studies separate unidentified bone from the NISP count. The master tables for lithic raw material distributions for all sites, artifact and debitage, are found toward the end of this chapter in Table 9.33 and Table 9.34. When percentage amounts are included, they have been rounded off to the nearest 1%.

Item	MEN-852	MEN-2206	MEN-2216	MEN-2223	MEN-3351	MEN-3355	MEN-3357	MEN-3462	HREC-12	MEN-2221	MEN-1602	Total
Biface	104	2	0	23	43	1	3	22	0	0	16	214
Proj. Pt.	45	8	1	11	2	0	2	8	0	0	2	79
Uniface	7	0	0	1	0	0	0	0	0	0	0	8
Scraper	10	0	2	2	0	0	0	1	0	0	3	18
Drill	5	0	0	0	0	0	0	1	0	0	0	6
Knife	0	0	0	0	0	0	0	1	0	0	0	1
Flake Tool	16	0	1	0	0	0	0	3	0	0	16	36
Roughout	27	0	1	2	3	0	0	4	0	0	0	37
Used Flake	89	0	0	7	5	1	4	4	0	0	2	112
Core	25	0	3	14	17	2		2	4		3	70
Debitage	42,093	584	4,671	6,437	9,322	134	754	7,548	3,404	3	938	75,888
Hammerstone	5	0	0	1	2	0	0	1	0	5	0	14
Millingstone	1	0	0	0	0	0	0	0	0	0	0	1
Mano	2	0	0	0	1	0	0	0	0		0	3
Pestle	1	0	0	0	0	0	0	0	0	1	0	2
Groundstone	9	2	0	1		0		6	0		0	18
Fireaffected Rock	4	1	0	7	1	0	0	0	0	0	0	13
Fired Clay	404	10	0	0	0	0	0	0	0	1	0	415
Charcoal	17	1	0	0	0	0	4	0	0	2	0	24
Shell	7	1	3	6	0	0	0	0	0	0	0	17
Other	7	1	1	2	0	0	0	2	0	1	0	14
Euro-American	13	0	0	18	0	0	0	4	0	0	0	35
SubTotals	42,891	610	4,683	6,532	9,396	138	767	7,607	3,408	13	980	77,025
Faunal	5,328	99	95	850	0	0	67	1779	0	0	0	8119
Total	48,219	709	4,778	7,382	9,396	138	834	9,388	3,408	13	980	85,144

Table 9.1: Master Artifact Table for all sites on the HREC.

Taxa		**NISP**	**%NISP**
Freshwater clam	freshwater clam species indeterminate	6	.30
Saxidomus nuttalli	California butterclam/Washington clam	1	.05
Land snail	land snail species indeterminate	2	.1
Castotomus occidentalis	Sacramento sucker	4	.2
Lavinia exilicauda	Hitch	2	.1
Minnow	Cyprinidae species indeterminate	12	.59
Fish	fish species indeterminate	10	.49
Clemmys marmorata	Pacific pond turtle	4	.2
Eutamias spp.	Chipmunk	1	.05
Thomomys bottae	Pocket gopher	12	.59
Lepus spp.	Jackrabbits	2	.1
Sciuridae	Squirrels	0	0
Bird	Bird species indeterminate	0	0
Microtus spp.	Voles	0	0
Rodent	rodent species indeterminate	2	.1
Small mammal	lagomorphrodent size mammal	8	.39
Canis cf. *latrans*	Coyote	1	.05
Antilocapra americana	pronghorn antelope	1	.05
Odocoileus sp.	Deer	29	1.43
Cervus elaphus (canadensis)	elk (wapiti)	30	1.48
Artiodactyl	clovenhoofed mammal	45	2.22
Large mammal	deersize or larger mammal	473	23.29
Mammal	mammal species indeterminate	1386	68.24
Total NISP		**2031**	**100**
Unidentified bone	vertebrate species indeterminate	6088	

Table 9.2: Master chart of the fauna recovered during the U C Davis field school excavations.
Analysis and table by Cassandra Manning

Results and Discussion by Sites

CA-MEN-852 Rockpile

CA-MEN-852, also known as Rockpile, is the largest and most extensive site on the HREC, located next to the large sag pond, and adjacent to the entrance road to the research center. This site was also the most intensely studied by the U. C. Davis field schools. Excavations included seven (1 x 1 m) units along with a 6 x. 5 m trench, 14 STPs, and 17 auger tests. As mentioned above, a 10.1 cm auger was used for the auger testing, and the testing reached a depth of 4060 cm or less if further penetration was blocked by a solid object. Auger testing was conducted to identify site artifact density and midden area. In the artifact catalog there is no indication that any specimens were recovered and catalogued. Although there is a mention in student notes of screening with a .32 cm screen. The seven units were excavated to a level of 140150 cm and then auger tested another 1030 cm, to the sterile level. This is one of the only two sites (also MEN-3355) that were excavated to a sterile level. The trench was excavated in one segment, to a maximum depth of 100 cm. Unit 4 encountered two ash pockets (at 10 cm and 50 cm). A total of 48,219 specimens were recovered from this site (including debitage and meter bone fragments). The recovered artifacts are detailed in Table 9.1 with the faunal material in Table 9.2.

Lithic material consisted of 104 bifaces, with the majority made of obsidian (86), with five complete bifaces. Other identified lithics included projectile points (45), unifaces (7), scrapers (10), drills (5), flake tools (16), roughouts (27), used flakes (86), and a substantial amount of cores (25). In addition, there was a small amount of quartz (103 pieces of debitage) and a smaller amount of worked basalt (37). Raw material of individual artifact items is shown in Figure 9.1, excluding the debitage. Other catalogued items included hammerstones (5), a millingstone (1), mano (2), pestle (1), groundstone (9), fireaffected rock (4), fired clay (404), charcoal (17), and shell (7). The other item in the catalog is one polished actinolite nodule, and the Euro-American items are six miscellaneous pieces and 12 pieces of wood.

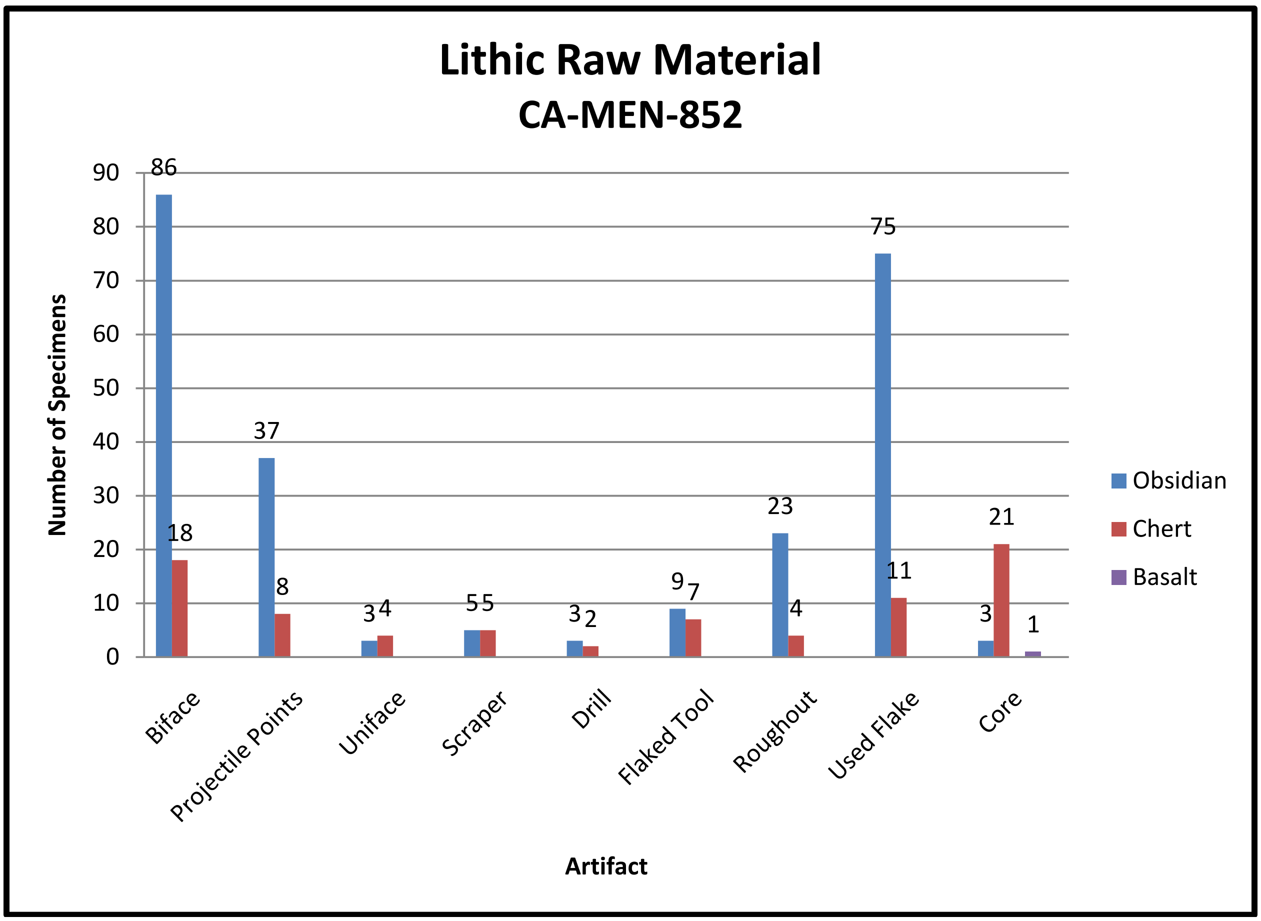


Figure 9.1: Chart of raw lithic material used for artifacts from CA-MEN-852.

Faunal analysis of material collected at CA-MEN-852, was analyzed by Cassandra Manning, a student at U. C. Davis, under the supervision of Christyann Darwent, Ph.D., Associate Professor of Archaeology. **NISP** in the faunal charts refers to the **N**umber of **I**dentified **S**pecimens **P**resent. Faunal tables for each site will include only the specimens collected at that site. The table of identified faunal on at CA-MEN-852.

Taxa		NISP	%NISP
Freshwater clam	freshwater clam species indeterminate	2	.13
Saxidomus nuttalli	California butterclam/Washington clam	1	.07
Castotomus occidentalis	Sacramento sucker	4	.27
Lavinia exilicauda	Hitch	2	.13
Minnow	Cyprinidae species indeterminate	12	.81
Fish	fish species indeterminate	10	.67
Clemmys marmorata	Pacific pond turtle	4	.27
Eutamias spp.	Chipmunk	1	.07
Thomomys bottae	Pocket gopher	12	.81
Lepus spp.	Jackrabbits	2	.13
Rodent	rodent species indeterminate	2	.13
Small mammal	134anadensisrodent size mammal	7	.47
Canis cf. *latrans*	Coyote	1	.07
Odocoileus sp.	Deer	22	1.47
Cervus elaphus (134anadensis)	elk (wapiti)	10	.67
Artiodactyl	clovenhoofed mammal	38	2.55
Large mammal	deersize or larger mammal	375	25.13
Mammal	mammal species indeterminate	987	66.15
Total NISP		**1492**	**100**
Unidentified bone	vertebrate species indeterminate	3836	

Table 9.3: Hopland fauna, number of identified specimens (NISP) and relative frequency of identified specimens from CA-MEN-852. Analysis and table by Cassandra Manning

Of the 5328 faunal fragments analyzed from this site, 2721 displayed obvious burning, with 13 being modified by either cut marks from butchering or impact and/or spiral breaks, possibly due to removal of the bone marrow (Figure 9.2). With 1492 of the specimens identified to taxa, the majority were of a species of deersized or larger mammals that could have been hunted and used for food.

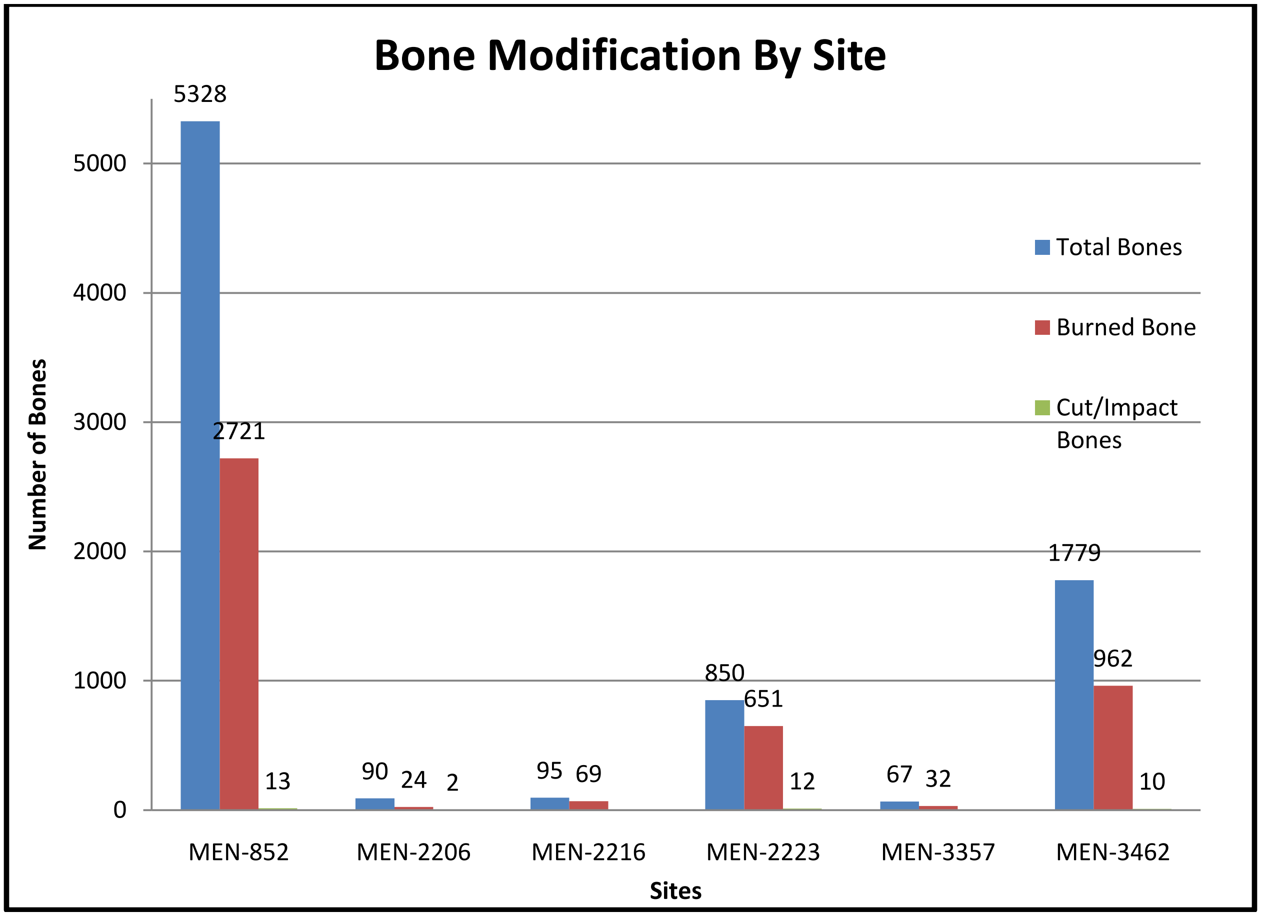


Figure 9.2: Master modified bone chart.

The faunal studies do not always reflect the total number of faunal specimens listed in the U. C. Davis catalog (5437 in the case of CA-MEN-852). Due to student counting errors there are some small discrepancies in the faunal counts. If only a very few faunal specimens were collected, Prof. Darwent did not include these in the faunal analysis.

While obsidian hydration is not accepted by all archaeologists (Anovitz, et al. 1999; Hull 2001; Rogers 2008, 2010), I believe it can be taken as an indication of temporal range, if a substantial sample is tested (see Chapter VIII for a discussion of obsidian hydration testing). The obsidian hydration testing for MEN-852 included 166 specimens. The temporal placement of the artifacts that were tested with obsidian hydration method by Origer's Obsidian Laboratory, are shown in 500 year increments reported in Figure 9.2. The obsidian hydration table in Appendix c shows the rim measurements (a mean from six readings), for all specimens, reported as microns, and calibrated dates are shown as a range. One measurement that calibrated to ~11,200 was discarded and will be discussed below in the general summary of data (p.). The full Origer reports are found in Appendix B.

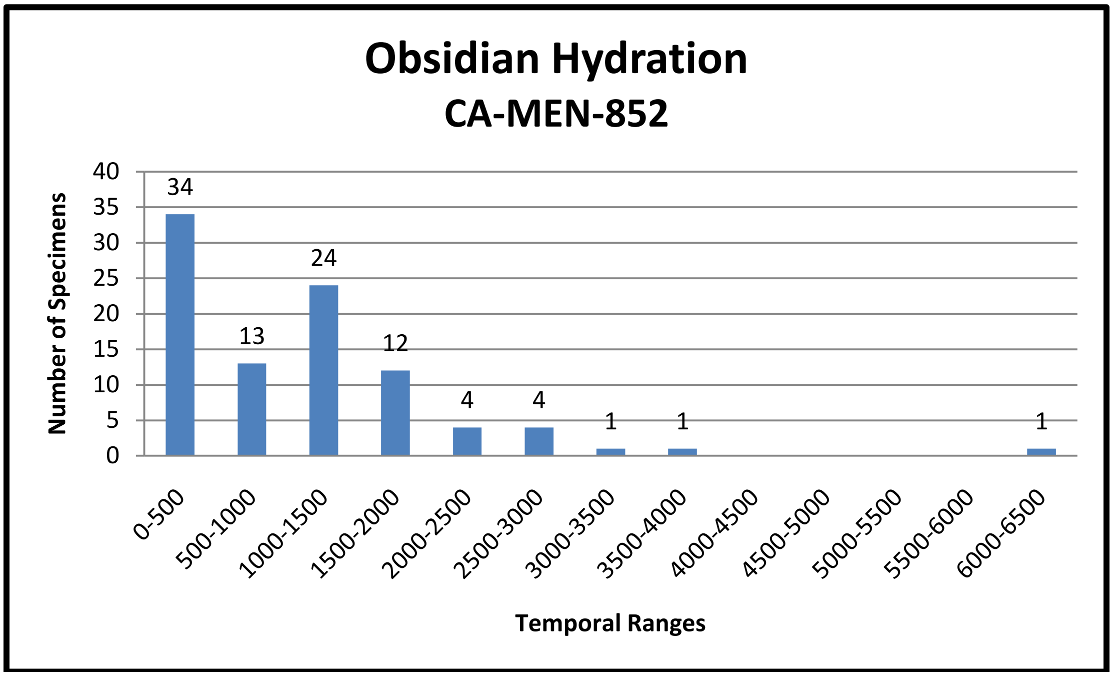


Figure 9.3: Temporal periods, in 500 year increments, for artifacts recovered from CA-MEN-852, and tested with obsidian hydration.

Obsidian artifacts at this site were sourced through XRF (Chemical) testing by Richard Hughes and by Professor Steve Shackley's class at U. C. Berkeley. The results are reported in Table 9.14. Of the 39 specimens from MEN-852, submitted to Hughes that were of adequate size to generate needed element distributions, 36 could be sourced through the trace elements to Mount Konocti and two others to Borax Lake. One specimen plotted outside the profile for Mount Konocti, but, Hughes provisionally placed the specimen within the Mount Konocti source. The 44 specimens for MEN-852 were submitted to U. C. Berkeley, with 35 sourcing to Mount Konocti and eight to Borax Lake, and one to Annadel. Of these 44, the students had difficulty in assessing the trace element distribution of six of the specimens and Hughes was asked to make the determinations. His results are included in this total Table 9.14.

The report on obsidian hydration by the Origer Laboratory also includes visual sourcing. A discussion and tables for a comparison of XRF and Visual Sourcing is found later in this chapter in the General Discussion of Data section on page 176. Complete reports on both the Hughes and U. C. Berkeley XRF sourcing are located in Appendix D.

Results of excavated specimens and obsidian reports indicate that this was the most utilized site on the HREC, and, with the deepest reported time depth to possibly ~ 6100 B.P. based on obsidian hydration dating (see Figure 9.3). Only one obsidian hydration specimen dated to this temporal period, with the next reported earliest dates ~2500-5000 B.P. (6 specimens). As reported earlier, I disregarded the ~ 11,000 B.P. date. The obsidian hydration studies from CA-MEN-852 indicate that the heaviest use of the site has been in the last 1500-2000 years , with 71 of the rim widths calibrated to between ~1500 B.P. and the and historic period, with intermittent earlier use. There are 18 readings that place human presence at the site in the past 250 years, into historic times, with 33 readings in the past 500 years. Hydration studies indicate the most recent use date was about 100 year ago. This would indicate that there was Native presence when settlers first arrived in the area and began ranching. The hydration dates also indicate a heavy use of the site between ~1250-1500 B.P.

Recovered specimens indicate that this was a habitation site. I believe this was not yearround, but rather a seasonal hunting camp where folks returned year after year. The possibility does exist that at an earlier date this may have been a yearround habitation site. Catalogued items include a vast array of lithic material; indicating point manufacture, tool making, and meal preparation (see Table 9.1). My suggestion that CA-MEN-852 was more of a seasonal camp (although a habitation site) is derived from reviewing the artifact assemblage. I do not believe that preservation is an issue, as a great amount of faunal material was recovered (Table 9.2). Shell beads represented an important means of exchange, yet no beads were recovered during the U. C. Davis excavations. There were six pieces of shell. The HREC collection (assembled by the HREC staff), does include the only two shell beads (clam), both from CA-MEN-852, that have been recovered on the HREC (Figure 9.4). The few Euro-American artifacts collected five pieces of glass, one nail, one metal wire, one bullet, and five other metal pieces, indicate an historic presence at the site. Groundstone included a millingstone, two manos and one pestle found at the site. Recently, Bob Keiffer of the HREC staff alerted me to the presence of a portable mortar, located near the site, turned upside down (Keiffer personal communication 2011). While it was no longer at the location where it had been originally located, this may be another indication of seasonal use. The mortar may have been left in that position when the owner returned to the home village with it being too heavy to transport but the owner would return to use at a later time. While the U. C. Davis field schools did excavate to a sterile level in all the units at MEN-852, there is the possibility that an unexcavated portion of this site may date to an earlier time.

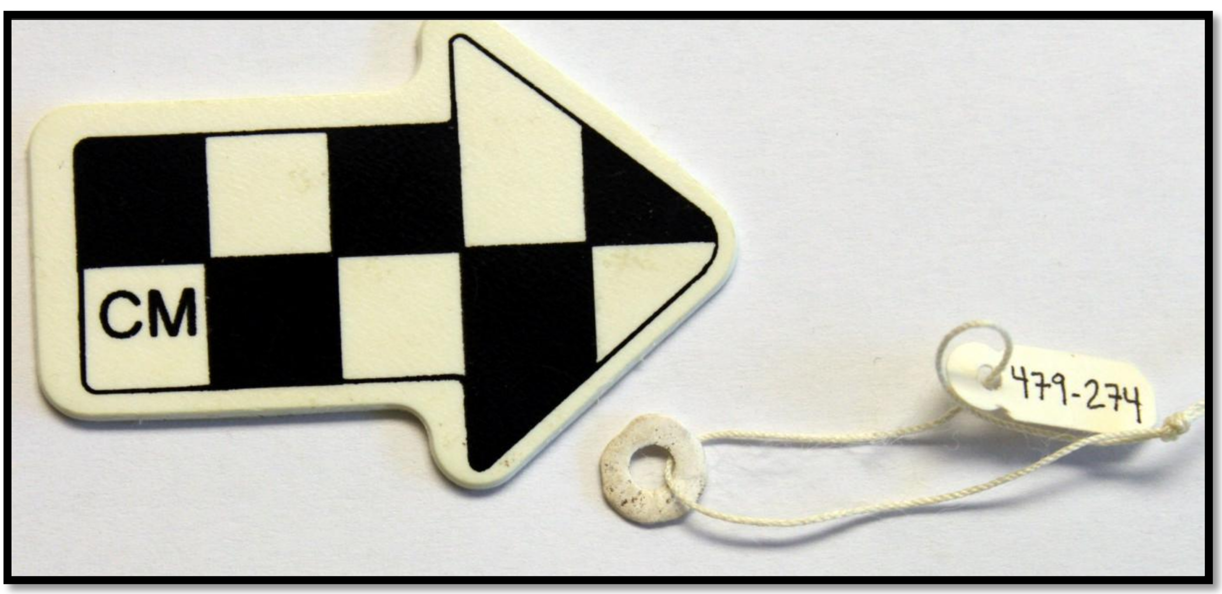


Figure 9.4: One of two shell beads from the HREC collection. Photo by Garry Gillette

The occurrence of baked clay, charcoal, and fireaffected rock, manos, millingstone, a pestle and the presence of many faunal remains (including modified), that included game animals (deer, and other subsistence species), indicates that the site was the scene of many pre-historic meals. Missing from the assemblage are bird bones. This was a surprise to me, as the site is on a flyway, with a year round sag pond adjacent, with ducks always present. Was this because it was a seasonal camp, with migrating ducks and people not here at the same time? I do not think this is a case of preservation as the presence of small rodents is part of the faunal assemblage.

In the early years of the HREC (1950s), staff members found many "tools" stuffed in rock crevices on the side of the Rockpile that borders the site, shown the Figure 9.5. (Keiffer personal communication 2009). Many of the catalogued items in the HREC collection (138) are from this site. This might also be an indication of seasonal visitors who planned to return, and left useful tools behind. There is also no ethnographic recording of a village in the area.

Figure 9.5: Bob Keiffer pointing to where artifacts have been recovered by HREC staff from the rock crevices.
Photo by Garry Gillette

Lawrence Livermore Laboratory perform Carbon14 AMS dating on three bone specimens from this site, and dated them in the last 1000 years (275-690 B.P.). (see Table 9.4). While these samples came from levels 8090 cm, the results indicate younger ages. The dates are reported as standard Radiocarbon dates. The full report from Lawrence Livermore Laborartory is found in Appendix

Site #	Catalog #	Material	Calibrated Age
CA-MEN-852	#921	Bone	C^{14} age – 690 +/ 90
CA-MEN-852	#727	Bone	C^{14} age – 280 +/ 35
CA-MEN-852	#702	Bone	C^{14} age – 275 +/ 35

Table 9.4: CA-MEN-852 AMS Results from Lawrence Livermore Report.

The 1974 site record (Orlins 1974) indicated the presence of house rings. It was commented by John Poor, (personal communication 2011) whose grandfather settled the property adjacent to the HREC in 1887 that Spanish wood cutters camped at the site. The physical evidence that Orlins observed – house rings – may have been the remains of the Spanish camps . We do know, from conversations with John Poor, that in historic times Indians were known to traverse the property.

Some years ago, I was informed of the existence of a cache of "ritual" obsidian blades that were unearthed during the digging of a ditch for a waterline near the CA-MEN-852 site. They were later reburied by a staff member. This was reported to have taken place in the mid1980s. Bob Keefer (personal communication 2010) remembered the cache to consist of probably four blades (each approximately 3050 cm long) of which two were complete. Since that visit, HREC staff members have been probing the soil to try to relocate the blades, without success. Reported photos of the blades have also failed to materialize.

From the discussion above, MEN-852 this can be classified as a habitation site (the only one that I have identified on the HREC at this time).

CA-MEN-2206 Fern Spring

Three units were excavated at this site, and little was recovered (709 total specimens, including faunal remains). (see Table 9.1 and Table 9.2) The units were excavated to a depth of 5080 cm, with no indication in the records if they reached the sterile level. The majority of the items consisted of debitage (584), with obsidian being the most represented (366), and then chert (210). The assemblage also included bifaces (2), projectile points (8), and some indicators of a campfire (see below). The distribution of raw lithic material is shown in Figure 9.6. Other catalogued items include groundstone, fireaffected rock, shell, and a piece of schist, listed as other.

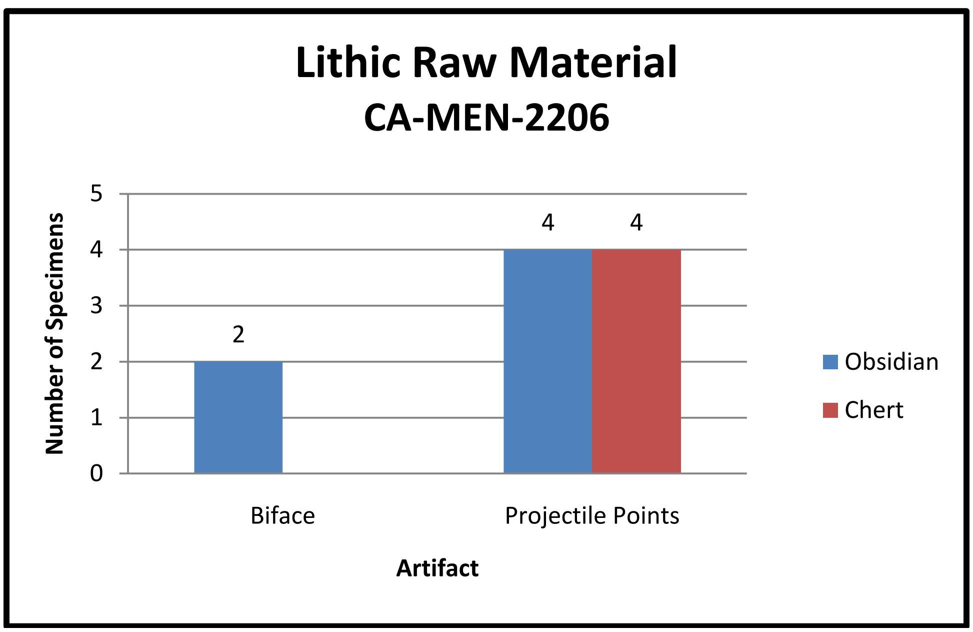


Figure 9.6: Chart of raw lithic material used for artifacts recovered from CA-MEN-2206.

I determined that this site had been overlooked when the faunal items had been picked up from the U. C. Davis museum for analysis. Subsequently, on a visit to the lab in April 2011, Prof. Darwent was available and briefly analyzed the specimens. Table 9.5 does not follow the format of the other faunal reports due to lack of indepth analysis, but does give some insight into the faunal assemblage. There is limited evidence of fire (cooking) activities fireaffected rock (1), fired clay (10), a piece of charcoal, some burned bone (24), and a spiral fractured bone(2), with samples of ash patches also collected. Most artifacts were recovered from upper levels.

Site #	Total	Large Mammals	Indeterminate	Burned	Cut/Impact
CA-MEN-2206	99	23	76	24	2

Table 9.5: CA-MEN-2206 Faunal Analysis.

There was no obsidian hydration, XRF sourcing or AMS testing of the artifacts from this site. The above reported evidence (burned and modified faunal material, and the fire related materials) indicate that this site may have been a littleused camp site, and is so classified.

CA-MEN-2216 Madrone Grove

Two (1 x 1 m) units were excavated at this site to a depth of 70 and 110 cm, with no report that they had reached a sterile level. The artifact assemblage is very limited, consisting almost entirely of debitage (4671), with one projectile point, two scrapers, a flake tool, one roughout, and three cores (Table 9.1), for a total of 4778 items. Raw lithic material for this site was represented almost evenly between chert and obsidian Figure 9.9. Other catalogued items include three pieces of shell, and a battered quartz cobble (as the other item).

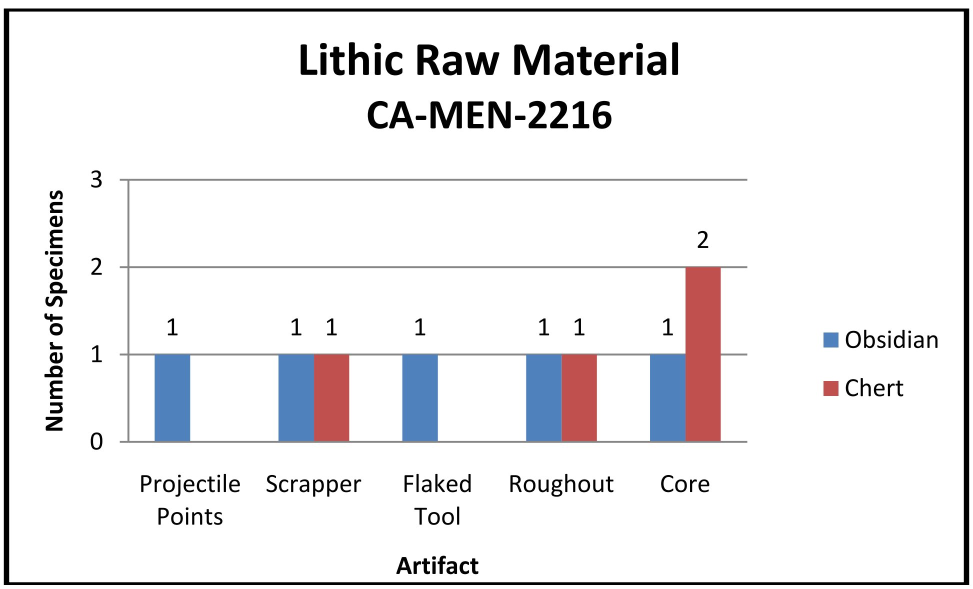


Figure 9.9: Chart of raw lithic material used for artifacts recovered from CA-MEN-2216.

The faunal analysis is detailed in Table 9.6, and consisted of a small amount of identified mammal bone, and a land snail. The majority of the faunal material (85 specimens) could not be identified. Of the 95 faunal fragments, 69 were modified and classified as burned bone (Figure 9.2).

Taxa		NISP	%NISP
Land snail	land snail species indeterminate	1	10
Mammal	mammal species indeterminate	9	90
Total NISP		**10**	**100**
Unidentified bone	vertebrate species indeterminate	85	

Table 9.6 Hopland fauna, number of identified specimens (NISP) and relative frequency of identified specimens from CA-MEN-2216. Analysis and table by Cassandra Manning

WiseHawthorn sent nine pieces of lithic material to the Origer laboratory for hydration readings and sourcing. The calibrated obsidian hydration readings indicate that this site was used in the last 1500+ B.P. years, and into historic times (Figure 9.8), with three readings in the last 250 years.

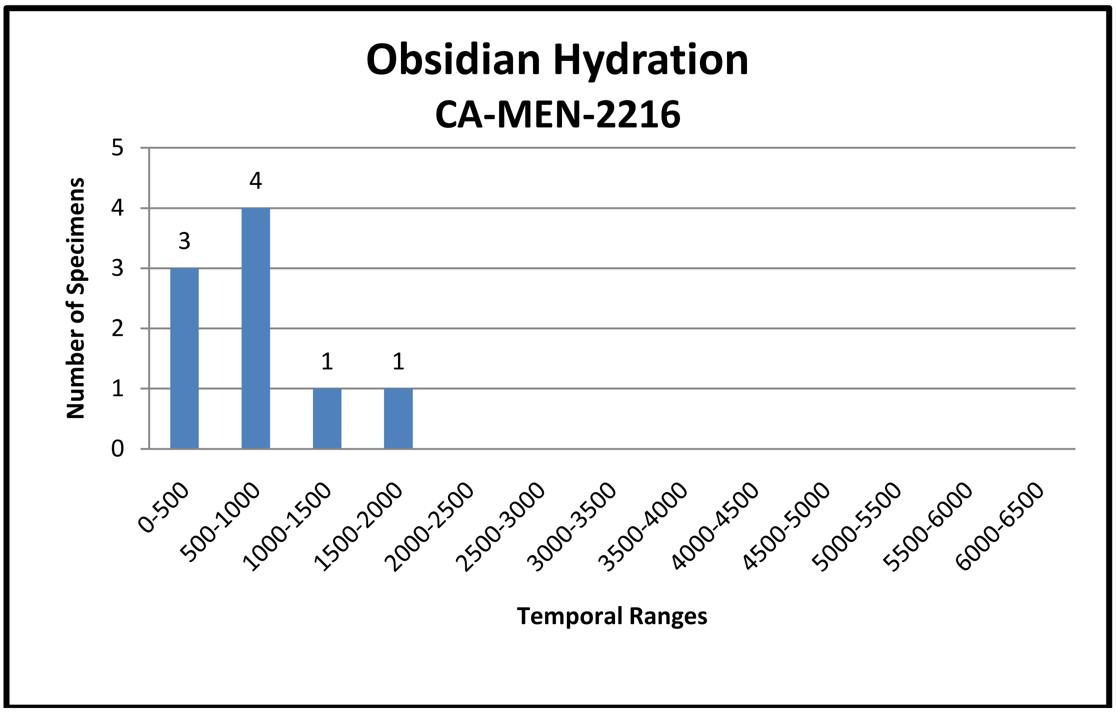


Figure 9.8: Temporal periods, in 500 year increments, for artifacts recovered from CA-MEN-2216, and tested with obsidian hydration.

One falls into the 500-750 B.P. range, three into the 750-1000 B.P. year range, one between 1000-1500 B.P., and one near 1750 B.P. The prevalent lithic material for the debitage is obsidian, with nine visually sourced to Mount Konocti and one to Borax Lake, with a much greater amount of debitage (40-45 pieces) to chert (607) pieces. As indicated, the smaller amount of chert present, compared to the obsidian, may show the pre-historic people were traveling through after they had obtained their obsidian at Clear Lake, and stopped to camp for the night.

There was no obsidian hydration or sourcing of the lithic material at this site. With just two units excavated, and no STPs or augers, the collection may not totally reflect the activities that took place on the part of the HREC landscape. Considering the proportion of burned bone, I have classified this site as a camp site, on scant evidence, with very limited use, perhaps just a few brief stops, in the last ~ 1500 years.

CA-MEN-2223 Buck Springs

The Buck Springs site was the focus of a more intense investigation by the U. C. Davis field school, with 18 STPs and five excavated units, yielding a total of 7375 recovered items. In addition, the sidewall between units four and five was excavated (width of wall not detailed in notes). From the recovery depth listed in the catalog, the excavations of the units ranged between 80 - 110 cm, with no mention of reaching a sterile level. No auger tests were conducted at the bottom of the units, as was the case in MEN-852. A small amount of faunal material was recovered from the units, and was analyzed (Table 9.7) and will be discussed below.
The recovered artifacts consisted mainly of lithic items and debitage (6437 fragments) (Table 9.1). Many bifaces (23) were recovered as well as projectile points (11), a uniface (one), scrapers (two), a flake tool (one), and a roughout (one). Also recovered were three cores. The lithic raw materials are reported in Figure 9.9. The predominat material was obsidian for the bifaces, and, as in other sites, the cores were chert. There was also a small amount of quartz and basalt represented. The debitage count totaled 9322, with chert at 1182 (18%), obsidian at 5207 (81%), quartz at 29 (1%), and 19 pieces of basalt (less than 1%).

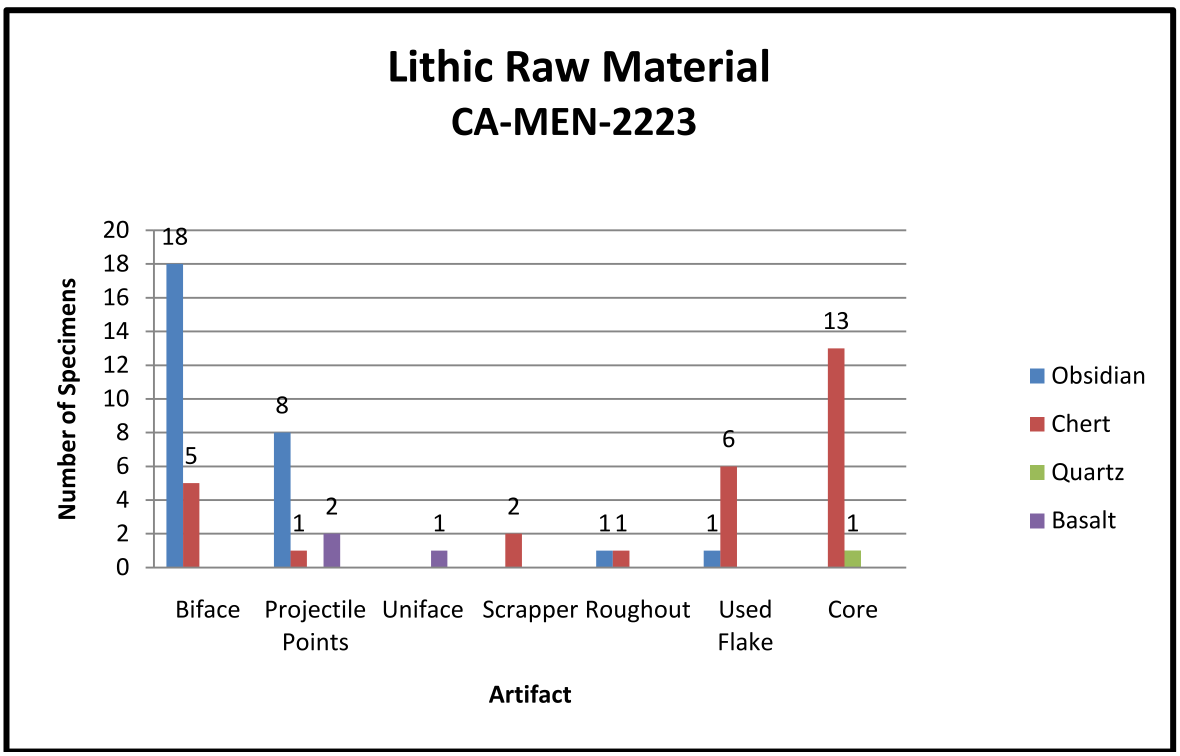


Figure 9:9: Chart of raw lithic material used for artifacts recovered from CA-MEN-2223.

Other recovered material consisted of a hammerstone, groundstone, seven fireaffected rock, six pieces of shell. Also listed was one polished actinolite nodule and a grooved stone (other), and 18 Euro-American specimens, including a nail, a pipe, a metal washer, a piece of metal, two piece of historic glass, and 12 pieces of wood.

The faunal analysis of CA-MEN-2223, reported in Table 9.7, identified 199 specimens, leaving 651 as vertebrate species indeterminate. There also was a high incidence of burned bone (621), and several exhibited cut or impact marks (12) (Figure 9.2). With the majority of bone being modified by burning or butchering marks, this must be the remains of meal consumption.

Taxa		NISP	%NISP
Freshwater clam	freshwater clam species indeterminate	4	2.01
Saxidomus nuttalli	California butterclam/Washington clam	0	0
Land snail	land snail species indeterminate	1	.50
Artiodactyl	clovenhoofed mammal	1	.50
Mammal	mammal species indeterminate	193	96.98
Total NISP		**199**	**100**
Unidentified bone	vertebrate species indeterminate	651	

Table 9.7: Hopland fauna, number of identified specimens (NISP) and relative frequency of identified specimens from CA-MEN-2223. Analysis and table by Cassandra Manning

MEN-2223 appears to be a seasonal camp, or stop over on trips to Clear Lake for obsidian, indicated by the proportion of obsidian debitage over chert as indicated in Table 9.33. The burned faunal material (651 fragments) with evidence of modification (12 cut marks) indicates an overnight stop, with a camp fire. The 14 cores, and bifaces, including fragments, indicate that some modification took place. Excavation depth reached 100 cm in one unit, indicating this may have seen repeated use, probably on the trail from Clear Lake. Located near a spring, this location would have been an ideal place to camp.

There was no obsidian hydration, XRF sourcing or AMS dating of this site. Based on the above evidence I have classified this site as a camp site.

CA-MEN-3351 Riley Ridge Scatter

There were 12 (1 x 1 m) units excavated at this site. The choice to excavate 12 units is a bit puzzling. There were 9396 catalogued specimens. Surface survey had identified this site as a lithic scatter, of primarily obsidian debitage, with no evidence that there might be more revealed through excavation. Perhaps the field school concentrated on this relatively flat site under a stand of oak trees (in the heat of summer), near Parson's Creek, as a "classroom" for excavation techniques (this was suggested by an anonymous participant). The units were excavated to a maximum depth 90 cm, with an average depth of 50 cm. Of the 9391 specimens collected, 43 were bifaces (1 complete), two projectile points three roughouts, and five used flakes. There were also five cores (see Table 9.1). The lithic material was primarily obsidian (Table 9.10). Other material recovered included two hammerstones, a mano, a piece of fireaffected rock, and the other was listed as an obsidian nodule.

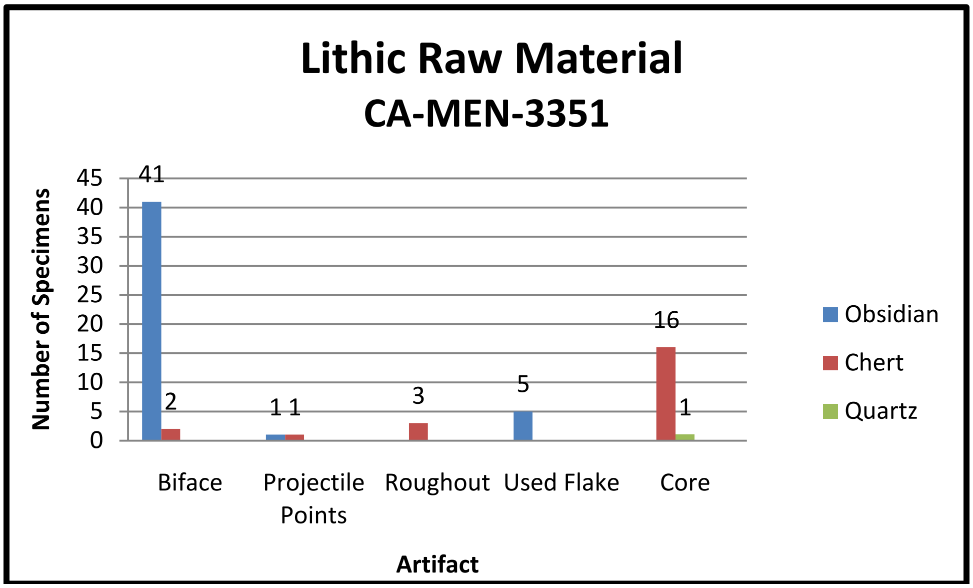


Figure 9.10: Chart of raw lithic material used for artifacts recovered from CA-MEN-3351.

There is no evidence of a camp site, but being on one of the identified trails (by Mary Gerbic p. 112) through the HREC, this probably was a stopping spot for those returning from Clear Lake. The obsidian debitage count exceeds the chert 8504 (91%) to 776 (8%) pieces, with 36 quartz flakes (1%), and six basalt fragments (Table 9.13). Several cores were recovered (17) and 43 bifaces, with only one complete. This site had repeated use through the millennia, with debitage reaching to the 90 cm level. No XRF or Obsidian Hydration was done on artifacts from this site, thus there is no indication of the temporal period that this site was used, other than statigraphy. No faunal material was present, or evidence of a fire pit that would indicate this was a camping site. Perhaps, as the field school experienced, this location was a cool place to escape the summer heat and manufacture some obsidian bifaces on the trail between the Clear Lake obsidian sources and their next destination. It would be interesting to know the source of their obsidian, but, unfortunately, no sourcing was done for the material from this site. Based on the obvious evidence, this site will remain classified as a lithic scatter.

CA-MEN-3355 HREC-6 – Vineyard Site

Only one unit was excavated in the Vineyard site, to a depth of 120 cm, with a 20 cm auger test at the bottom (with no indication if sterile sediments were reached), to a depth of 140 cm. The site report from the 1999 survey of the HREC noted this site might be very old. During the survey they recovered two manos, a metate, a charmstone, and some concavebase points of chert. The catalog consists of 138 specimens collected (Table 9.1). The recovered lithic tools consist of one biface, a used flake, and two cores, all chert (Figure 9.11). No additional items were recorded. The 134 pieces of debitage consist of 118 (88%) chert, seven (5%) obsidian, and 9 (7%) quartz. The planted vineyard, with years of cultivation, made subsurface investigation very difficult. The recovered artifacts were believed to have come from an old, buried site. This hypothesis was further advanced by looking at the catalog of items in the HREC catalog #479. These items consisted of five projectile points, 16 bifaces, a uniface, five pieces of debitage, three pieces of worked stone, five cores, five manos, a pestle, three millingstones, and a charmstone (rare find on the HREC).

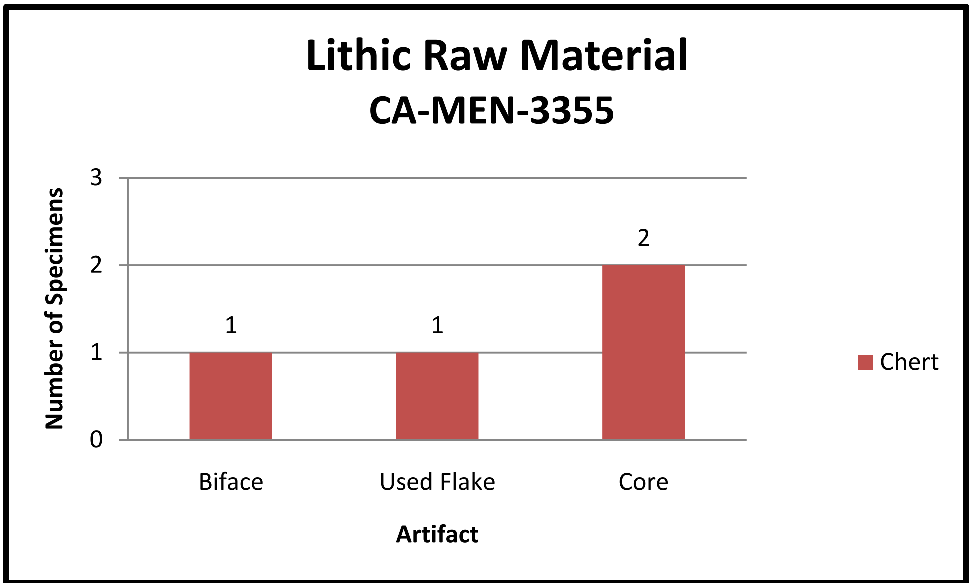


Figure 9.11: Chart of raw lithic material used for artifacts recovered from CA-MEN-3355.

There was no faunal material recovered from MEN-3355, or evidence of fire. The HREC staff believes this is a very old site indicated by the items they collected during the cultivation of the current vineyard. The chert recovered by the U. C. Davis field school may be recent evidence of trips to the local chert quarries, with evidence of a village or camp site buried well beneath the current ground level. There was only one biface fragment recovered during the excavation. I believe that this site needs further investigation. There was no obsidian hydration, XRF sourcing or AMS testing of this site. While no faunal material was collected, this may be a preservation issue if this site is indeed possibly ancient in age.

Future intense investigation of this site (not probable with the vineyard planting), might yield important data to the pre-historic use of the HREC landscape. There is also the possibility that this site was the location of a very early group that inhabited the area – and may possibly be related to the PCNs, although, this is purely speculation. Without further archaeological investigation, I will tentatively classify this site as a habitation site, although there is no indication of cooking activities. This classification is based, in large part, to the presence of the manos, millingstones, and pestles collected by the HREC staff, and, hypothesizing that the main site is buried beneath the vineyard.

CA-MEN-3357 HREC-8 Parson's Creek Narrows

This site, located on both sides of drainage was the subject of one (1 x 1 m) unit excavation, to a depth of 120 cm and an additional auger test reaching 140 cm. There were 834 specimens collected (Table 9.1), including three bifaces, two projectile points and four used flakes. All the worked lithic material was obsidian except for one flake (Figure 9.10). Debitage contained 663 flakes of obsidian (88%), 81 pieces of chert (11%), nine pieces of quartz (1 %), and one flake of basalt (Table 9.13). Also recovered in the excavation were four pieces of charcoal. HREC staff had previously collected a metate and pieces of shell. They believed it to be a midden. The drainage may have caused significant disturbance to the site with the integrity of this site very compromised.

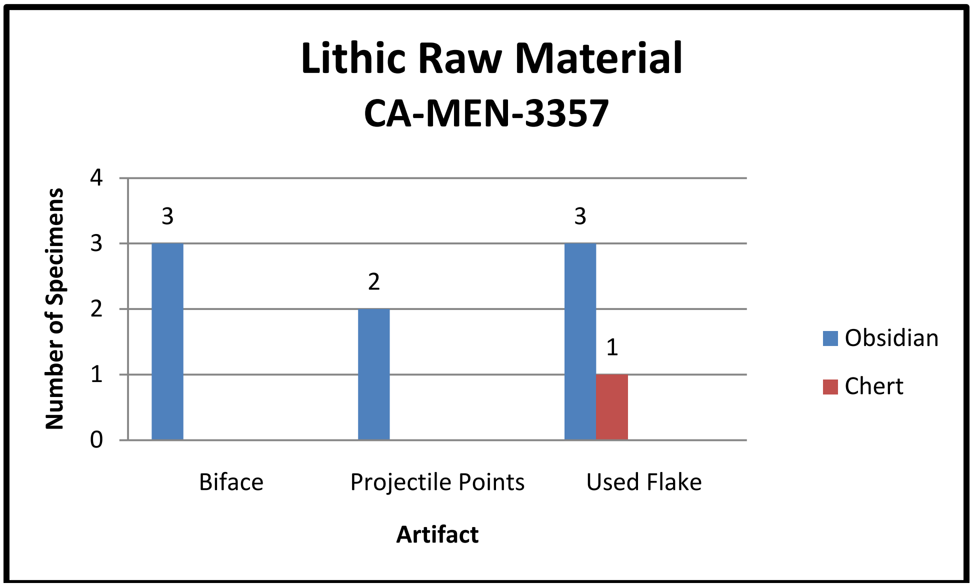


Figure 9.12: Chart of raw lithic material used for artifacts recovered from CA-MEN-3357.

Faunal specimens recovered were minimal (67 fragments), with only 10 classifiable to taxa (Table 9.8), with 37 of the specimens burned. None were modified with cut/impact marks. Preservation of the faunal material may be in question due to the disturbance of the drainage.

Taxa		NISP	%NISP
Mammal	mammal species indeterminate	10	100
Total NISP		**10**	**100**
Unidentified bone	vertebrate species indeterminate	57	

Table 9.8 Hopland fauna, number of identified specimens (NISP) and relative frequency of identified specimens from MEN-3357. Analysis and table by Cassandra Manning

With the unit excavated to a depth of 140 cm, and a "feature" a fire pit identified at the lower levels (below 80 cm), this may indicate why students identified this site as being buried. Some shell and a metate were previously collected by HREC staff.

This site is located near a PCN area, approximately 650 m to the northeast, and I chose some of the obsidian samples for hydration and sourcing. The XRF testing was included in samples tested by the U. C. Berkeley students (Table 9.11). All eleven of the submitted pieces of obsidian sourced to Mount Konocti. Of the 18 specimens submitted for obsidian hydration, the majority (14) were calibrated to ~ 1000 B.P. or younger, with six indicating the historic period. The oldest rim measurement, obtained from obsidian hydration, calibrated to ~2050 B.P. (Figure 9.13).

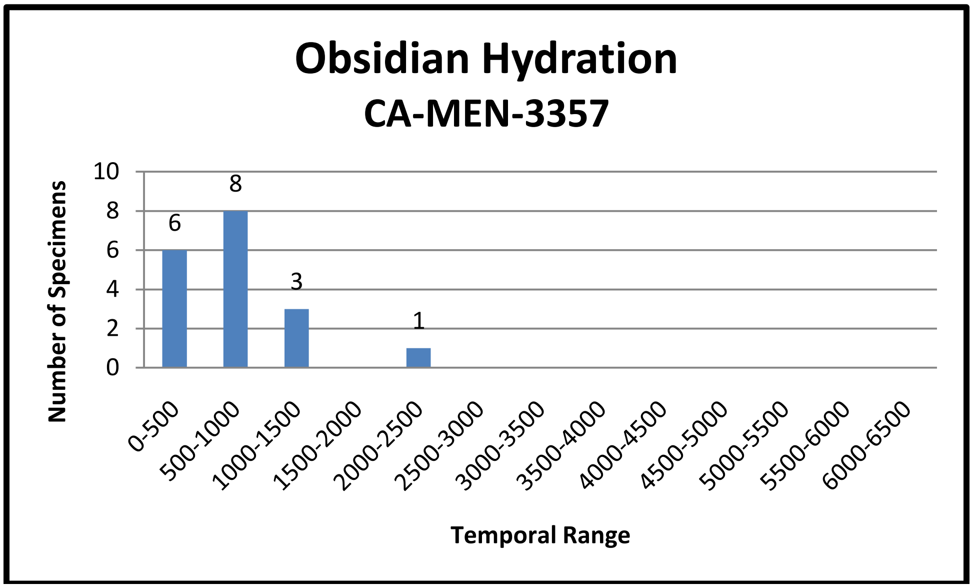


Figure 9.13: Temporal periods, in 500 year increments, for artifacts recovered from CA-MEN-13357, and tested with obsidian hydration.

With the combination of the original report of the site being a midden, with the fire pit, burned faunal material, and charcoal, I am classifying this site as a campsite, again possibly on the route from Clear Lake obsidian sources.

CA-MEN-3462 HREC-9 Middle Lake

Two (1 x 1 m) units were excavated to a depth of 190 cm. Two auger tests were taken at the lowest level in each unit, and reached 200 cm – the deepest investigated site on the HREC. There is no indication if they reached a sterile level, although the catalog does not indicate any recovery of artifacts below 170 cm. This site is located approximately 300 m to the south of MEN-852, and, because of the proximity to the location on the southwest side of the sag pond, it has been suggested by the HREC staff that this site might be a part of the MEN-852 site, although I question this due to the distance. The recorders also suggested that the site might be much larger due to the dense vegetation in the area.

There were 9,384 specimens collected, including 22 bifaces, eight projectile points, a scraper, a drill, a knife, three flake tools, four roughouts, three used flakes and two cores (Table 9.1). Most of the recovered material consists of debitage (7548 flakes) with 6121 (81%) obsidian, 1319 (17% chert), 196 (2%) quartz, and two flakes of basalt. Raw material of worked lithics was predominately obsidian Figure 9.14. Also recovered were one hammerstone and a piece of groundstone. The articles listed in the catalog as other include a piece of schist, and one rodent tooth. The Euro-American items are two pieces of wood.

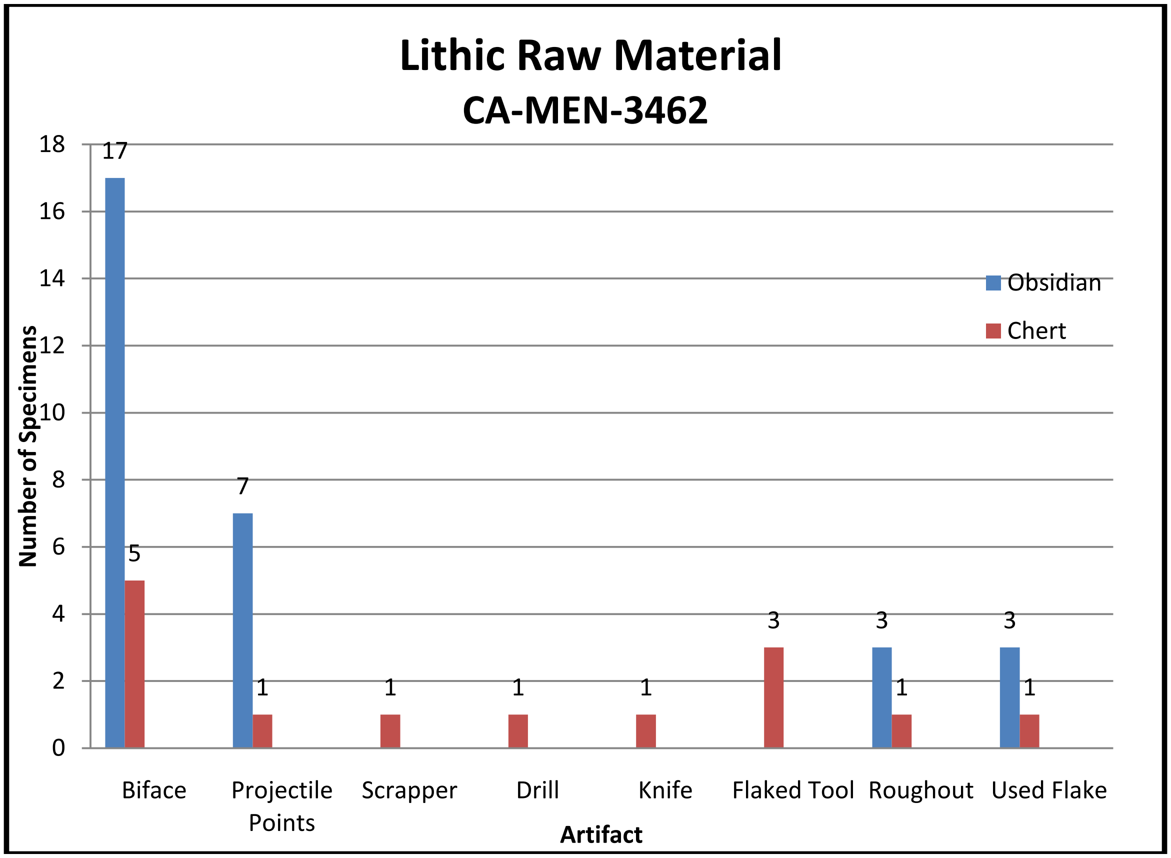


Figure 9.14: Chart of raw lithic material used for artifacts recovered from CA-MEN-3462.

A considerable amount of faunal material was recovered at MEN-3462 (Table 9.9). More than half of the 1779 fragments were modified, including 962 burned and 35 exhibiting cut or impact marks (Figure 9.2) indicating meals had been consumed at this site, but there was no indication of a fire pit. The faunal material consisted entirely of common game animals (deer, elk, pronghorn, etc.

Taxa		NISP	%NISP
Small mammal	lagomorphrodent size mammal	1	.31
Antilocapra americana	pronghorn antelope	1	.31
Odocoileus sp.	Deer	7	2.19
Cervus elaphus (canadensis)	elk (wapiti)	20	6.25
Artiodactyl	clovenhoofed mammal	6	1.88
Large mammal	deersize or larger mammal	98	30.63
Mammal	mammal species indeterminate	187	58.44
Total NISP		**320**	**100**
Unidentified bone	vertebrate species indeterminate	1459	

Table 9.9: Hopland fauna, number of identified specimens (NISP) and relative frequency of identified specimens from MEN-3462. Analysis and table by Cassandra Manning

Seven of the lithic samples were sent to Hughes for XRF testing, with all sourcing to Mount Konocti. Thirty pieces of lithic material were sent to U. C. Berkeley and 23 were sourced to Mount Konocti and seven to Borax Lake.

Fortysix lithic specimens were sent to the Origer's Laboratory for hydration readings. The calibrated rim measurements identified 35 of the specimens to the last 1000 B.P., with seven of the measurements indicating use of the site into historic times (Figure 9.14). The oldest readings indicated a calibration to ~2250 B.P. Origer visual sampling placed 40 of the lithic specimens as being from Mount Konocti, with six sourced to Borax Lake (Figure 9.14).

Without sampling between the two sites (MEN-852 and MEN-3462) it is not possible to link the sites as one (to see if there is a continuum of artifacts). Based on the obsidian hydration rim measurements, MEN-852 appears to have a much deeper time depth (see Figure 9.2).

Calibrated hydration measurements indicate this site may have been used periodically, primarily in the past 500 years, as a camp site, possibly when returning from procuring obsidian at Clear Lake, indicated by the debitage being primarily obsidian (Figure 9.15). Earlier hydration dates indicate that materials were sourced to both Mount Konocti and Borax Lake.

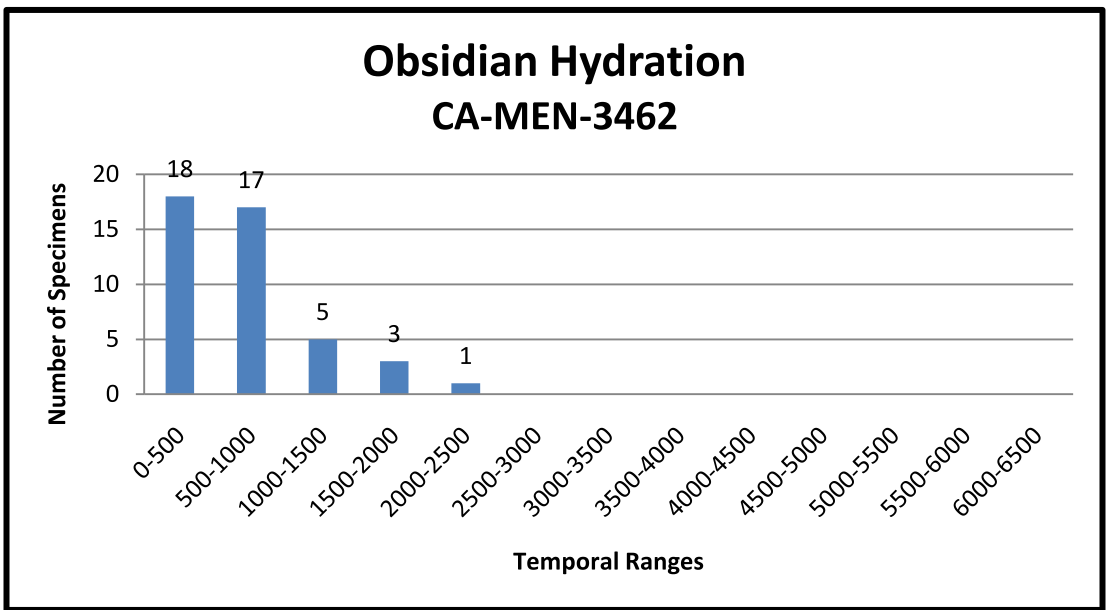


Figure 9.15: Temporal periods, in 500 year increments, for artifacts recovered from CA-MEN-3462, and tested with obsidian hydration.

With the large amount of bifaces being mostly fragments (104), this may indicate that pre-historic people stayed at this site for extended periods of time, working with the lithic material. The recovered faunal material is consistent with consumption of food. Based on this evidence, including the larger amount of obsidian, I have classified this site as a camp site.

HREC-10 Thank God for Obsidian Saddle

A surface survey is the only archaeological investigation at this site, defining the site as a lithic scatter. No specimens were collected, although 5060 artifacts, consisting of Franciscan chert cores, assay cobbles, and debitage were noted. One retouched Borax Lake biface was also documented. With no excavation or temporal information available it is difficult to say much about this site, other than the debitage indicates a small amount of primary reduction of chert, probably related to a nearby quarry. No faunal material was noted at HREC10. This site is classified as a lithic scatter.

HREC-11 Guard Lama Site

A surface investigation of the site recorded 25 chert artifacts, but none were collected, and not all of them were culturally modified. This appears to be a very sparse lithic scatter, possibly from one visit, and is classified as such.

HREC12 Bunny Head Knoll

Field work at this site included a surface survey and the excavation of 37 STPs. The site has been identified as a chert quarry, with three small outcroppings of potential lithic material that exhibited assay marks. Breaking from the usual method of excavating STPs used at other sites by the field schools, the maximum depth was 30 cm, and the area examined consisted of much smaller pits – approximately 25 cm x 25 cm. This subsurface testing recovered 3404 pieces of chert debitage and four chert cores (Table 9.1). While the chert does not appear of high quality, it is located at the lowest elevation, found by entering the area from the Russian River, while the other chert quarries are located at a higher elevation. This site received considerable subsurface testing without identifying any additional artifactual material. From the chert material that was recovered, this chert outcrop was utilized, to some degree, pre-historically, but only as a quarry site, with no evidence of other pre-historic activities.

HREC13 – Barbara's Bump

This site was the last site identified during the U. C. Davis field work. While nothing was recovered during the surface survey, approximately 50 pieces of chert and obsidian debitage were noted. This site has received a great amount of agricultural disturbance, and, without subsurface testing, can only be classified as a lithic scatter.

Results and Discussion of Gillette's Field Work

As was presented in the previous chapter, my field work took place at two of the PCN sites on the HREC, CA-MEN-2213 (Huntley Peak) and CA-MEN-2221 (Hidden Hill).

CA-MEN-2213 Huntley Peak

No specimens were collected at the Huntley Peak site, as field work at the site was curtailed (see pp. 115-116), and all efforts were concentrated on the Hidden Hill site. The Huntley Peak site, located on a hillside that experienced alluvium/colluvium movement of the soil, produced no artifacts to the depth of the subsurface testing by augers, STPs and excavated units (Figure 9.16). Selection of the placement of these tests was based on a random sample design using a random number chart from the internet.

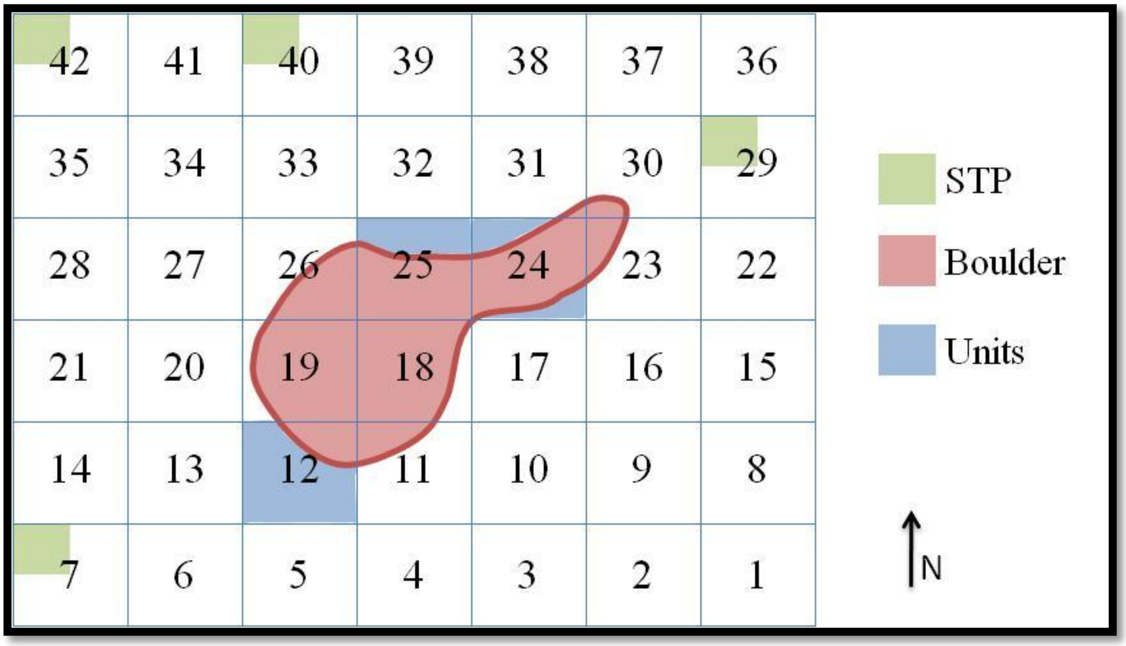


Figure 9.16: Chart of units that received subsurface study at CA-MEN-2213. Drawing by Jessica Meadows

CA-MEN-2221 Hidden Hill

This is the site on HREC where my research has been most concentrated. The six units and partial units, two STPs, and six auger excavations yielded, however, only 13 artifacts Figure 9.17). Units were excavated to a maximum of 50 cm.

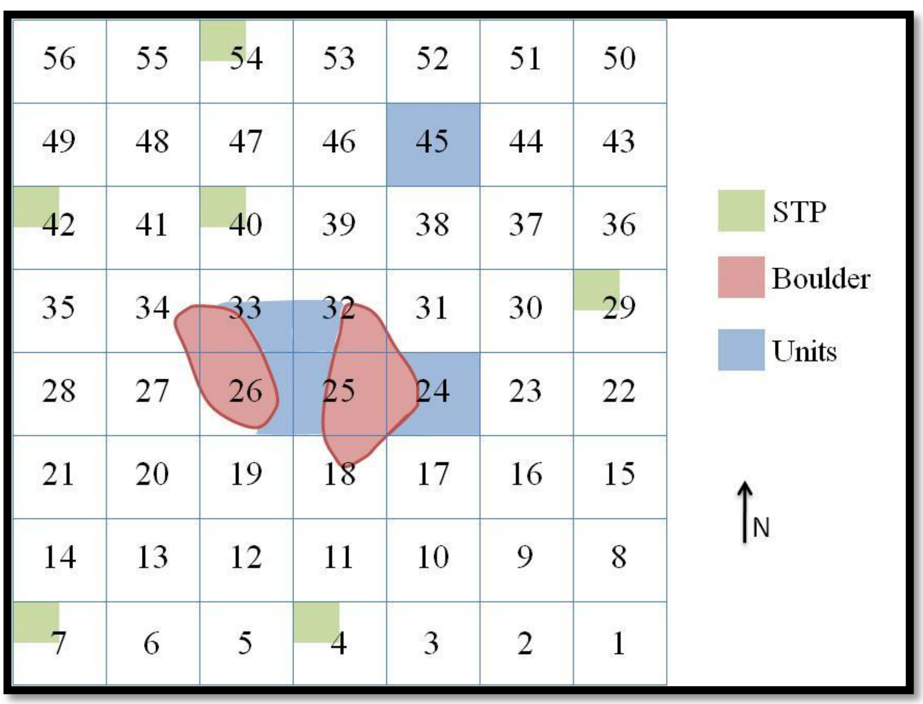


Figure 9.17: Chart of units that received subsurface study at CA-MEN-2221. Drawing by Jessica Meadows

The recovered artifacts consisted of three pieces of debitage, five hammerstones, one pestle fragments, a piece of fired clay, reported in Table 9.1. Three of the hammerstones were recovered from STPs. One hammerstone is of most interest, because it exhibits a high level of hand polish (Figure 9.18). Several of the hammerstones was found in the immediate area surrounding the marked boulder. Additional artifacts (mostly hammerstones) were recently (March 2011) identified and collected during the soil testing employing the Gordon method, as described in Chapter VIII. The results will be fully documented and reported on at the conclusion of the soil testing, and will be accessed into the HREC artifact collection (Catalog #479).

Figure 9.18: Hammerstone recovered from CA-MEN-2221 showing hand polish.
Photo by Garry Gillette

Soil Dating

As mentioned in Chapter VIII, after viewing the split boulder at the Hidden Hill site, I determined that it might be possible to identify a latest possible date for the markings if we could determine a date for when the boulder split apart. Two dating methods, OCR (Oxidizable Carbon Ratio) and OSL (Optical Stimulated Luminescence) were used to attempt to place the splitting of the boulder into a temporal period. A third method, the Gordon Method, has recently been tested at the site. The results OCR and OSL testing are presented below, with a discussion and comparison of results at the end of this section.

OCR

The OCR samples were taken by the researcher who has developed this relatively new method, Douglas Frink (1994, in press). Frink collected 10 soil samples of at least 100 grams, with a trowel, at 5 cm levels, and put in a plastic specimen bag (Figure 9.19). He took the samples to Vermont to run the testing. The dates are reported as B.P. The results of Frink's finding are reported in Table 9.9, with the complete report in Appendix F. On the table below, the years reported by Frink, are highlighted in yellow.

Figure 9.19: Douglas Frink taking soil samples for OCR testing.

Soil Depth	pH	% Organic Carbon (LOI)	Ocr Date	Very Coarse	Coarse	Medium	Fine	Very Fine	Coarse Silt	Fine Silt	Sample Id	Mn
5	7.2	15.309	79	32.363	12.671	7.705	17.637	16.096	8.048	5.479	7546	10.9
10	7.2	8.550	437	30.011	16.119	7.741	14.316	16.437	9.650	5.726	7547	5.0
15	7.1	7.469	808	21.498	12.760	13.731	13.592	12.621	13.037	12.760	7548	7.1
20	7.0	8.107	1611	13.801	8.543	12.596	21.139	22.892	13.034	7.996	7549	4.2
25	6.9	6.983	2511	17.293	21.160	12.997	17.938	16.219	9.452	4.941	7550	3.0
30	6.7	6.371	4150	29.750	13.724	13.340	12.764	13.916	11.324	5.182	7551	6.1
35	6.7	6.848	7532	33.030	17.925	14.468	13.740	10.009	6.278	4.550	7552	7.6
40	6.6	6.173	7825	26.586	17.422	12.487	9.768	11.380	16.012	6.344	7553	8.4
45	6.4	5.967	9423	33.184	18.962	13.327	10.733	8.855	5.814	9.123	7554	8.8
50	6.5	6.286	11543	45.234	16.984	11.698	6.759	10.312	3.380	5.633	7555	7.5

Table 9.10: CA-MEN-2221 OCR results.

Frink has offered the following further explanation of the results of his testing:

> "Discussion of OCR Data for CA-MEN-2221. The paleosol (buried soil) was covered by the "knocker" sometime soon after 9423 YB.P. (AD 1950) based on MN, pH, OCR Ratio, and textural data. These data are all consistent with normal pedogenic development under conditions slightly wetter and cooler than present. These soils are at least 11,543 years old, with older expressions likely illuviated and mixed into the unexcavated sapolite below.
>
> The deposits located at 35 and 40 cm below surface suggest a secondary context; likely having developed nearby then washing in when the "knocker" first split apart. This interpretation is based on the inverted MN, pH, and OCR Ratio values. I would date the splitting of the rock sometime soon after 7825 Y.B.P. (1950), but likely before 7532 Y.B.P. (1950). Assuming the carvings on the rock were implemented after the "knocker" settled at this location, but before the rock split, this data would place the age of these glyphs at between 9423 Y.B.P. (1950) and 7825 YB.P. (1950).
>
> The two uppermost soil packages (515 cm and 2030 cm) represent two independent infilling events followed by stable, in situ pedogenic development. It is likely that development of the 2030 cm soil package had begun to weld onto and began to alter the characteristics of the sediments contained in the sample from 35 cm.

The results that Frink obtained from his soil dating method are interesting. He took soil samples at 5 cm levels beginning at the surface (Horizon A), and continuing down until he reached the paleosol or the ground level where the boulder rested. All of the dates are in chronological order, from youngest to oldest. He was dating the soil that was deposited through the soil building process that filled between the expanding crack in the boulder. A soil profile (see Figure 9.20), based on the change in the color of the soil, indicates that the split was slow at the beginning, and the distance between the boulder sections accelerated at about 810 cm below the present soil level. I cautiously suggest the consistence of the sequence of his dates may be validation of the creditability of his method. It will be necessary to confirm these temporal results with other soil dating methods.

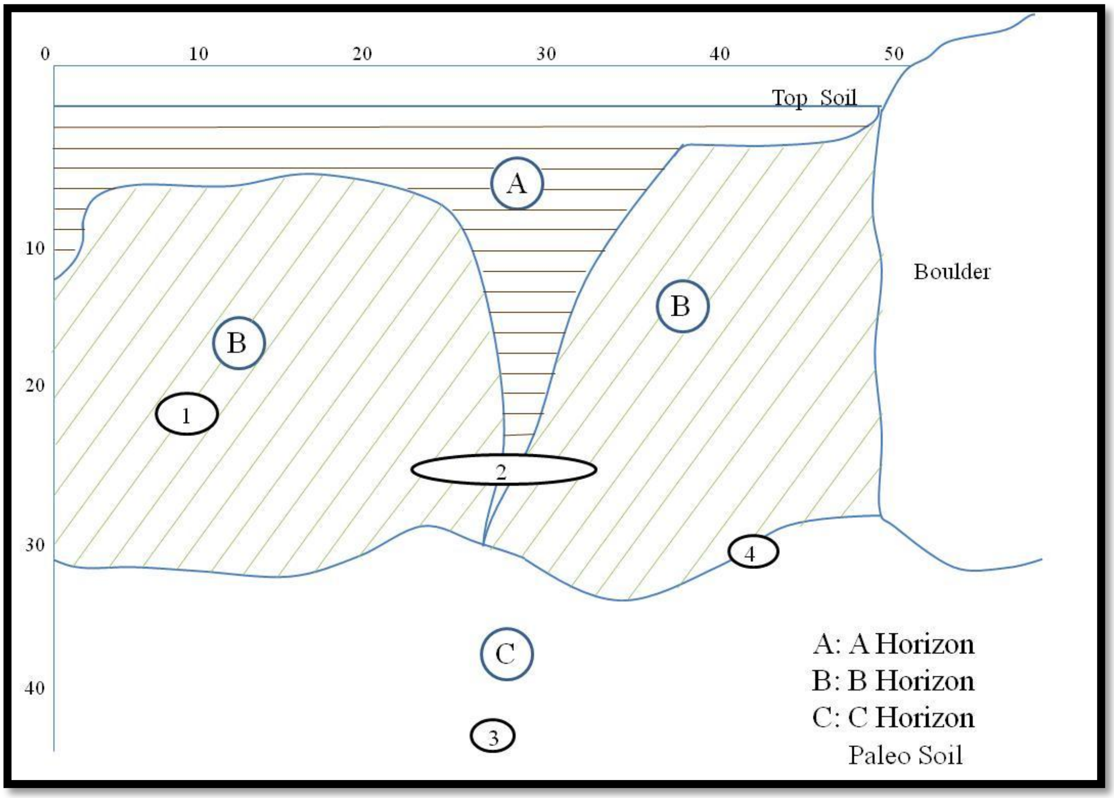


Figure 9.20: Profile of CA-MEN-2221 showing soil horizons (A, B. C) and numbers showing rock obstructions (1, 2, 3). Drawing by Jessica Meadows after a profile sketch by Mary Gerbic and Elyssa Figori.

OSL

The OSL samples were obtained by my crew, in a darkened environment as explained in chapter VIII. The samples were then tested by Sachiko Sakai, a student under the direction of Dr. Carl Lipo, of the IIRMS (Institute for Integrated Research in Materials, Environments, and Society) Lab at California State University, Long Beach. Six soil samples were analyzed. The summary of the resulting dates is in Table 9.11. The results were inconsistent and incomplete and will be discussed below. The OSL dates will be repeated at a later date with a different lab.

Sample ID	Horizon	Number of Aliquots	Average Dates	Range of Dates
Sample 1	Horizon A	7	AD 1060 ± 163	AD 798±334~AD 1131±138
Sample 2 young	Horizon B	4	AD 141±191	BC119±167~AD258±161
Sample 2 old	Horizon B	3	BC 1814±531	BC2374±859~BC1198±199
Sample 4	Horizon B	1	BC 1371±514	
Sample 6	Horizon C	6	BC 3269±1865	BC4405±6421~BC2350±813
Sample 3	Horizon C	1	BC 4836±1312	

Table 9.11: CA-MEN-2221 OSL results from OSL report by Sachiko Sakai (Appendix G).

Gordon Method

I am in the process of using another new soil dating procedure developed by Dr. Bryan Gordon, Curator Emeritus from the Museum of Civilization in Gatineau, Quebec, Canada. The soil samples have been taken by Dr. Gordon and the results will be reported at a future date, in a followup report.

Summary of Soil Dating Experiments

As mentioned above, the possibility of placing the PCN tradition in a temporal period had come to me when I first viewed the split boulder at CA-MEN-2221. There was a buildup of soil between the two sections of the split boulder. A portion of a bisected PCN element was visible on the top of the larger section of the boulder (see Figure 9.21), suggesting that the split took place after the boulder was marked.

Figure 9.21: CA-MEN-221 split boulder showing PCN element that split along the fracture line.

My quest to determine a date for the split in the boulder, and thus the latest possible date for the marking of the boulder, has not ended. While the method is still not receiving broad acceptance, the OCR dates are somewhat promising, although additional confirmatory evidence is needed. PCN researchers have long placed PCN's in the 5000-8000 B.P. range, without th support of widely accepted chronometric methods in archaeology today (Miller 1977; Parkman 1993b) and so this is still a hypothesis in search of supporting evidence. The splitboulder on the HREC provides the most promise to yield some scientific evidence for a temporal placement of the tradition. As indicated by the report (Table 9.10, Appendix G)), the suite of ten dates (every 5 cm) were consistently older with each level sampled, dating from 97 B.P. to 11,543 B.P. for the paleosol, with the oldest date indicating when the soil beneath the boulder was buried and did not continue with the normal soil building process. Frink placed the placement of the markings on the boulder as between 7825-9423 B.P.

The OSL dates concur with the horizon dates with the OCR method, within a reasonable range. One problem with the OSL dates is that the lab person was unable to secure needed information from the samples for three of the six submitted soil samples. During the time they had laboratory equipment failures, and with various other complications more than two years elapsed. Since we also obtained the samples, were they extracted correctly? As a result, I am going to have another lab go on site and take samples, and then run a second series of tests. These results will be reported at a later date. As mentioned earlier, in recent field work, samples were taken to test with the Gordon Method and I am waiting for the results. These too, will be reported at a later date. I believe that it is only through applying multiple innovative testing methods whose results correlate with accepted chronometric dating methods, that we will be able to accurately place the PCN tradition in a pre-historic temporal period.

Phytoliths

I had contacted Rand Evett, an Assistant Researcher at U. C. Berkeley Department of Environmental Science to conduct phytoliths studies at the site to see if we could isolate carbon that could provide a relative date for the levels of soil. Soil for his examination was obtained from the auger testing that I had completed at the Hidden Hill site. Rand was unable to extract enough phytoliths from the 12 samples he was sent to be able to use the phytoliths for possible dating. With the low number of grass phytoliths, he suggested that the landscape had pre-historically been oak woodland. While the site is now in a more grassland zone, the grasses were introduced in historic times. This seems to be consistent with other the pre-historic landscapes.

CA-MEN-1602 Excavation and Results

As reported earlier, the CA-MEN-1602 excavation was under the direction of Damon and Fredrickson. The study was on private property (the Middleridge Ranch), just south of the HREC, in McDowell Valley, with the purpose of study to test the site and evaluate its significance (Figure 9.22). Following mapping and surface examination, three testing methods were used in the investigation – auger units, excavation, and soil sampling. The 60 auger units were 30.5 cm in diameter, with a depth to approximately 80 cm. The four units were 1 x 1 m, and excavated to a depth of 40-130 cm, with no indication if sterile was reached. Excavated samples were screened (6 mm). Soil samples were collected at every 10 cm of each unit and wet screened (3 mm). Recovered artifacts numbered 975 lithic objects according to the written report. Auger samples yielded 189 specimens, excavation 698 and soil samples 89. The report indicates that 34 of the items recovered were termed artifacts, yet only 30 are identified in the report. These include 16 flaked tools (15 chert, one obsidian), 13 bifaces (eight chert, five obsidian), and one complete projectile point (chert) (Figure 9.23).

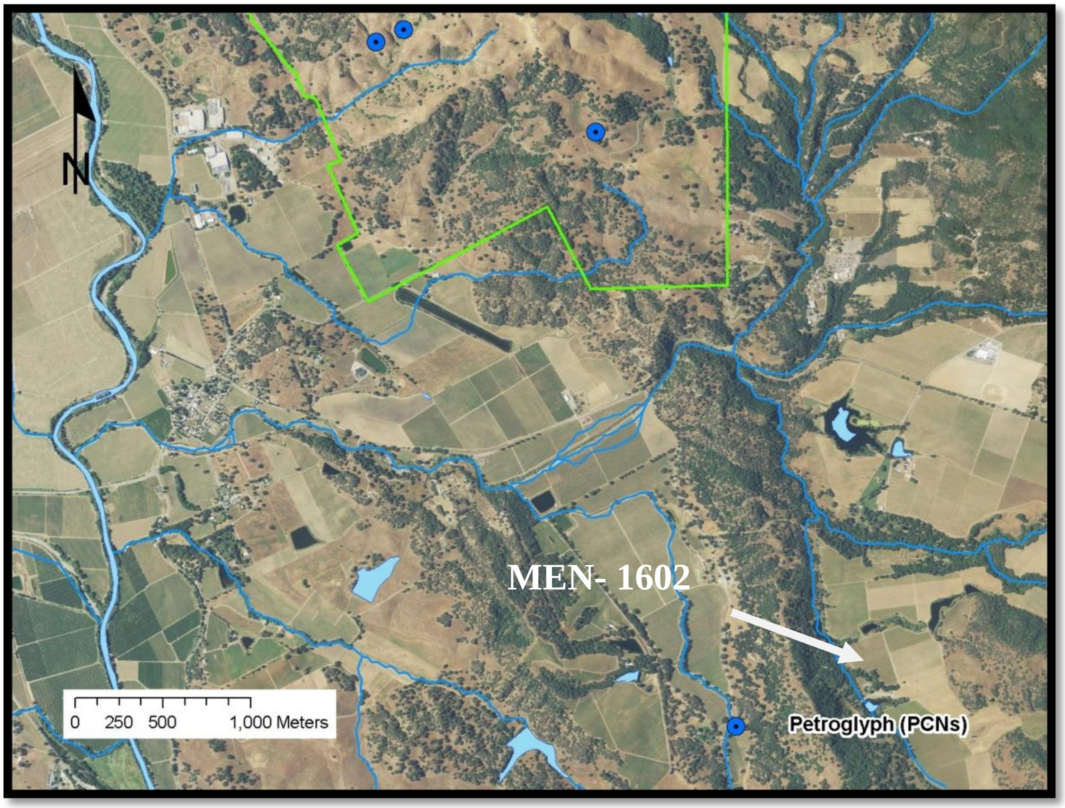


Figure 9.22: McDowell Valley in relation to the HREC. The arrow indicates the location of CA-MEN-1602.
Google Map modified by Shane Feirer

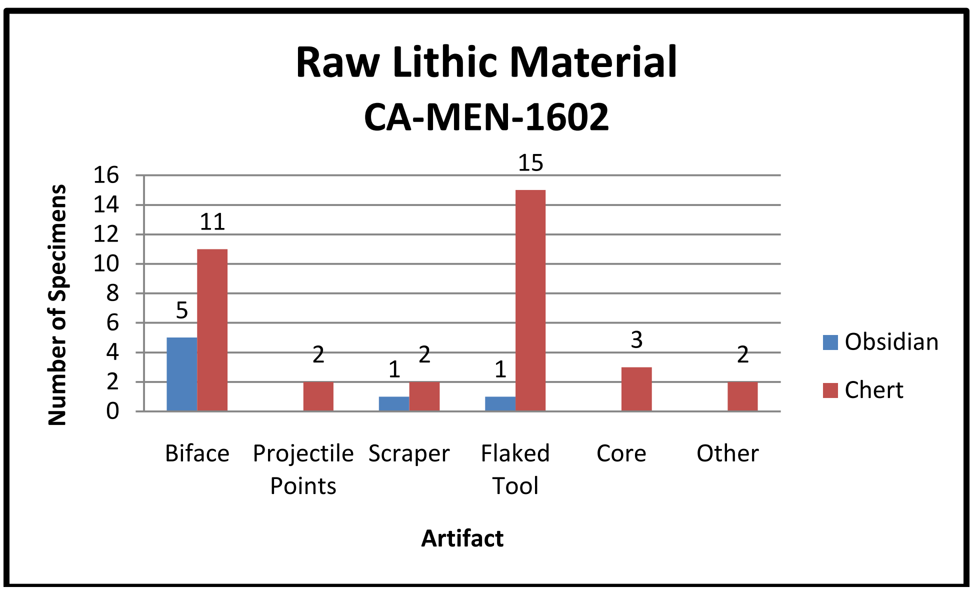


Figure 9.23: Chart showing lithic raw material of artifacts from CA-MEN-1602.

Twenty obsidian specimens were subjected to trace element analysis using xray fluorescence. The specimens were sourced to Borax Lake and Mount Konocti area (Figure 9.24).

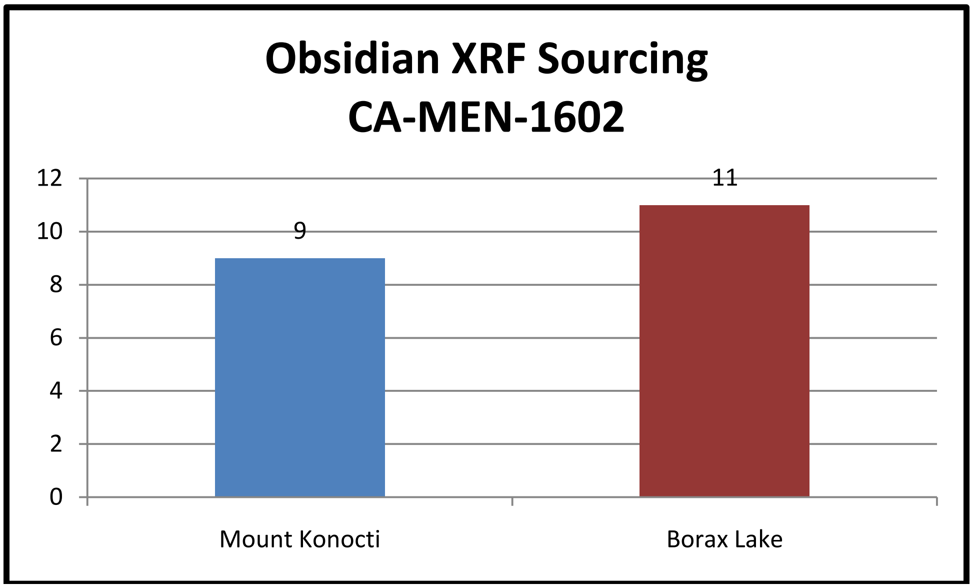


Figure 9.24: Chart showing the obsidian sources for artifacts recovered from CA-MEN-1602 and sourced by XRF.

There is no indication in the report as to what laboratory did the testing. Nine of the specimens were sourced to Mount Konocti and 11 to Borax Lake. Obsidian hydration studies of 18 samples yielded dates for the manufacture of the obsidian artifacts that dated the site to as early as ~6000 B.P. (see Figure 9.25). The rim measurements range from 1.95 – 8.55 for the Borax Lake Obsidian and 3.5 – 8.62 for Borax Lake, and they note the slower hydration rate for Mount Konocti. In their report they place the relative dates as between 50007000 B.P. Three of the artifacts included bifacially worked chert projectile points (a contradiction to their listing of artifacts) – all showing evidence of fluting or basal thinning, and were similar to those assigned to the Borax Lake Complex or Early Borax Lake Pattern. These pints may date to as early as 6000 – 8000 B.P. The earliest date for fluted points in the North Coast Ranges is 12,000 B.P. (Fredrickson 1973:189). I have since obtained the catalog of artifacts from Sonoma State University, and the numbers and items do not match. The master table at the beginning of this chapter (Table 9.1) reflects the artifacts that are archived at Sonoma, as I have personally examined the collection. The assemblage of archived artifacts consist of 16 bifaces, two projectile points, three scrapers, 16 flake tools, three cores, and three used flakes, in addition to 938 flakes (debitage).

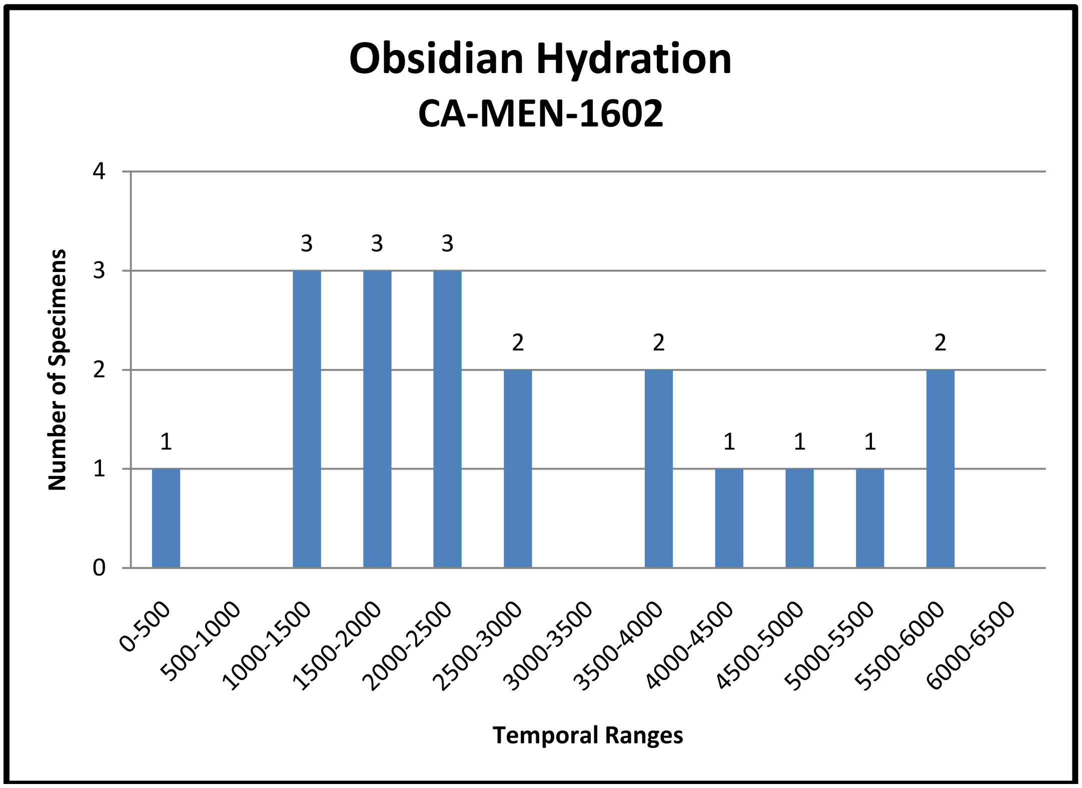


Figure 9.25: Temporal periods, in 500 year increments, for artifacts recovered from CA-MEN-1602, and tested with obsidian hydration.

This is the oldest documented site that I have identified near the HREC. The report does not indicate, as stated above, that the units were excavated to a sterile level, in fact, an obsidian flake was identified at Level 13 (130 cm), and the catalog lists artifacts from the lowest levels. Because of a change of soil color, it was decided not to pursue deeper excavation. Cultural levels may continue below this depth.

I am interested in this site as a possible connection to the HREC PCN sites, as they fit temporally within a hypothesized period for PCN manufacture. The physical location of the site is also just south of the HREC in McDowell Valley, with drainage that flows near some of the PCN sites on the HREC. The most recent identified PCN on the site (HREC14) is also located on a drainage that empties out to the Russian River through McDowell Valley. Perhaps the early folks were traveling up the drainages to locate chert quarries, prevalent on the HREC landscape, when they found the correct type of boulder to perform what we think to have been fertility rituals, and shared the locational knowledge with their group. This site does provide human presence at a very early date, and does put people in the area that might have been responsible for the marks on the boulder, if they are indeed from an early period.

Review and Discussion of Artifacts in the HREC Collection (#479)

The 366 specimens that are presently catalogued into the HREC collection have been recovered from 17 of the 31 identified pre-historic archaeological sites on the HREC, as well as 65 objects considered isolates, from various areas on the HREC landscape, and 10 have no recorded provenience. Items continue to be accessed to the collection. Since this collection has been amassed through the years, it does not represent a sample of sites, but rather it is skewed by objects that “caught someone’s eye” while traversing the landscape. In other words, much of the collection consists of many complete biface points, pestles, tools, and other “recognizable” objects. While important, and presenting a view of what has taken place over the millennia, the collection does not provide information of all of the activities that took place at specific sites. For this reason, I will not go into further detail on the collection in this paper. I will mention a few pertinent items. Two shell beads (see Figure 9.4) are part of the collection. Their significance will be discussed below. Also included is a unique fishshaped charmstone (see Figure 9.26). The vast majority of the collection consisted of projectile points or some quite large and bulky blades

Figure 9.26: Fishlike charmstone from the HREC collection. Photo by Garry Gillette

Results and Discussion of Recording Techniques

Most archaeological sites on the HREC have been recorded, with limited data included, especially pertaining to the petroglyph sites. More precise and complete information will be submitted to the Northwest Information Center at the completion of my research. The previous chapter explained the 3-D Scanning process that was used at CA-MEN-2221 (Hidden Hill site). Utilizing a 3-D Scanning method did provide some useable information such as measurements. This method does provide usable measurements (Figure 9.27). By repeating this process at a later time, it may be possible to infer something about the rate of movement of separation of the two pieces of the boulder, although this may be such a small movement within the time frame of our lives that we could no pick up any movement. This process could also provide precise measurements of the images.

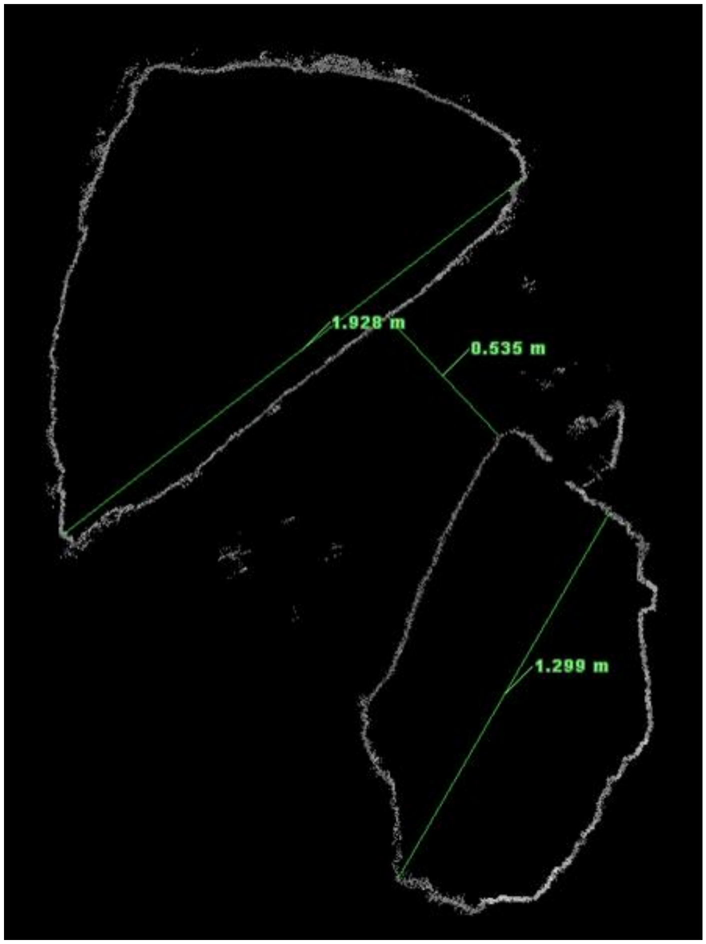


Figure 9.27: Measurements of split boulder from CA-MEN-2221 based on point cloud produced by 3-D scanning.
3-D rendition by Justin Barton

Perhaps the most useful result of the 3-D scanning is that the methods allows for a view through the lichen and moss to reveal a better observation of the markings (Figure 9.28). The results are similar to the LiDAR (Light Detection and Ranging) which is able to “peel away” extant vegetation. This process could be very useful in the future for accurate recording of rock art sites.

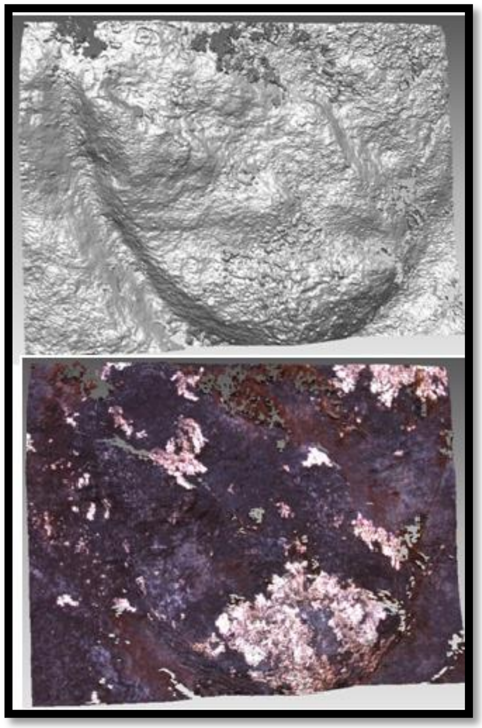


Figure 9.28: Example of visibility of PCN element when filmed with 3-D scanning compared to regular photograph. Note the ability to “see through” the lichen. 3-D rendition by Justin Barton

Using traditional rock art recording methods (accurate sketches drawn with a 10 cm string grid, photographs, and recorded measurements), all of the petroglyph sites on the HREC are in the process of being more fully documented (Figure 9.29).

Figure 9.29: Paula Reynosa recording cupules on CA-MEN-2221 with a 10 mm string grid.
Photo by Garry Gillette

To mitigate the problem of having to try to "see" through lichen and moss, which are prevalent in the Northern Coastal Ranges, to accurately record cultural markings, I am presently experimenting with a process that consists of covering a petroglyph boulder with a large tarp. By keeping the boulder from being exposed to rain, I am trying to diminish the growth of lichen and moss. Before I experimented with this method, I contacted Shawn Padi of the Hopland Shokowa Band to be sure we were not violating any of their beliefs, by interfering with natural processes. After gaining his approval, the HREC staff checked to make sure there were no lichen studies being conducted on the boulder lichens. After clearance was given, Bob Keiffer covered the boulder on December 8, 2010 (Figure 9.30). When the boulder was uncovered for the Gordon method soil testing in April 2011, a significant reduction of lichen and moss on the boulder could be observed. We will continue to keep the boulder covered to observe changes as the season's progress and the temperatures rise. Observations at this time point to success in using this method as a noninvasive way to remove or lessen the impact of lichen and moss from a petroglyph site. I will continue to monitor the boulder after the removal of the tarp to record new and returned growth.

Figure 9.30: CA-MEN-2221 split boulder covered with tarp for experiment to see the effect of covering a boulder to reduce or remove lichen and moss from a boulder, for easier recording. Photo by Robert Keiffer

Additional Contributing Studies to my PCN Research

The principal methods of analysis or consideration of data have been summarized above. There are a few other approaches and analytical frameworks that I have used or experimented with in the course of my study of the HREC landscape.

Composition of Boulders

Early in my research (in the mid1990s) I submitted 18 rock specimens to the Thin Section Lab in Bellingham, WA, to be made into thin samples for content analysis. These specimens consisted of pieces of charmstones obtained from Pete Rhode during his research with Albert Elsasser for their manuscript on charmstones (Elsasser and Rhode 1996), and from small pieces of schist that I had recovered adjacent to PCN sites (not from the boulder's themselves). The charmstone pieces had no known provenience, and thus, value for other research. It was hypothesized by some, at the time, that charmstones were made from the nucleated centers of PCNs. The thin samples were then visually examined by Andrea Jayco, a geologist, formally of the USGS in Menlo Park. Her findings indicated that the thin specimens of the charmstones could only be identified variously as greenstone, amphibolites, blueschist, actinolite schist, chlorite schist, and talcserpentineactinolite schist. With the heterogeneous nature of schist, it is now obvious to me that in order to obtain specimens that might produce useable information, the specimens need to come from the parent rock that contains the PCN markings. Any removal of pieces from a PCN marked boulder need to be done as part of a project with a research design, and with the full consent of the tribal group that considers themselves to be a descendant group. While this was not part of my study, I did recover a piece of schist material that had exfoliated from CA-MEN-2221, and will place it in the HREC collection (Catalog # 479), for future study. At a later time such research may provide information that might be used to identify any mineral content of the boulders that may have medicinal qualities, or enlighten the fact that only certain boulders are sought out for the placement of PCNs.

Boulder Replications

During the course of my research, I have experimented with replication studies of PCN boulders, to better understand the process of creating the PCN markings. Findings indicate that the process is quite easy by using a hammerstone of a harder material (basalt, chert, quartz) to strike the boulder with a repetitive rhythm (Figure 9.31). Such pecking produces a fairly large amount of "talc" powder in a short period of time (about ¼ cup from a 40 cm element, with a relatively shallow groove). The studies show that the form of the PCN (round, oval, or elongated), is largely due to the formation of the crystals of the parent rock. It was also noted that the nucleated center of the PCN can be "accidently" removed as a result of striking the boulder at a particular angle. Thus, the purposeful removal of the nuclei of a PCN is highly unlikely, and when PCNs are reported to have their centers "missing", it is more likely from natural processes, or during the actual original pecking of the boulder.

Figure 9.31: Replications of PCN elements to demonstrate the ease of manufacturing. Photo by Garry Gillette

General Summary of Data

In this section I will summarize the results of the testing within the context of all the sites on the HREC, referring to the data obtained through obsidian hydration, XRF and visual sourcing to better understand the activities that were taking place on the landscape.

Collection Catalog #504

As mentioned earlier, the HREC collection of artifacts provides an interesting insight into the span of activities that have taken place through the millennia on the landscape. With most of the "interesting" collected artifacts found on the surface – which would indicate a more recent representation of activities. Several of the collected items represent of food preparation – metates, manos, pestles, and portable mortars. These are items that are often collected, and without provenience, are of little value to research.

Faunal Identification

Summarizing the results of the faunal analysis, a total of 8,218 bone fragments (including the later data from CA-MEN-2206) was examined (Figure 9.32). The identifiable mammal fragments for all sites are reported in Figure 9.30.

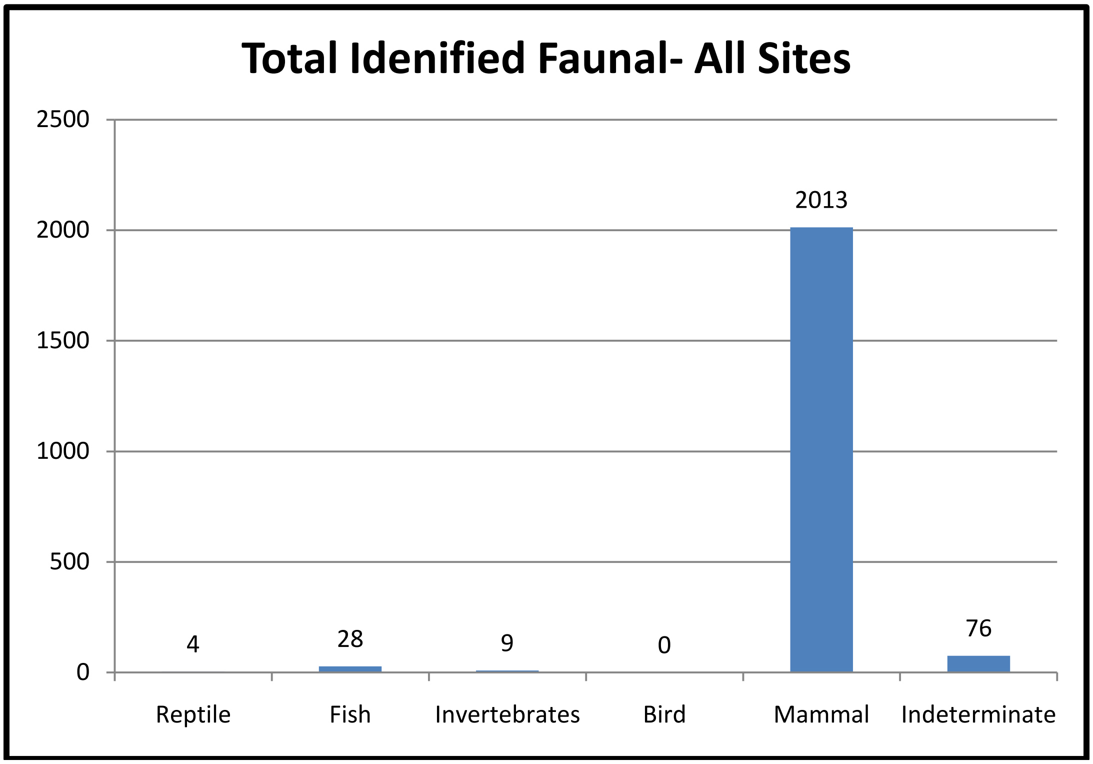


Figure 9.32: Chart of total identified Fauna from all sites on the HREC that received faunal analysis.

A considerable amount of the recovered faunal material had been modified by either burning or cut/impact marks (Figure 9.2). Of the 10 excavated sites (including CA-MEN-2221 – the PCN site), modified bone was present in all six of the sites where bone was recovered, and all exhibited some burned bone with four of the sites also represented with cut or impact marks. It is important to take into consideration that burned bone may also result from a forest fire, and that bone identified as having been modified by a spiral fracture, may not always indicate food use, but rather a fresh or recent fracture from trampling by later human and/or natural events. It is necessary to evaluate the complete context of the site to make a determination.

Figure 9.2 Indicates that mammals were the most abundant species found during the excavations. This is not surprising, as a camp site would most likely contain bones of eaten species. The lack of identification of any bird bone is surprising, as I am sure the pre-historic diet did include fowl. The Russian River is just to the east, where there would have been abundant salmon, yet, none were identified. This could be explained by a couple of observations. If they were traveling (as on the trail connecting them from lithic sources to their villages) they would probably rely on local, available subsistence. And there is the sag pond. Sag ponds, as discussed earlier, result from the caching of water between techtonics plates, and are not fed by local rivers or large creeks, thus, not an abundance of fresh fish.

Lithics

As evidenced in all the charts (except the faunal), lithic material is a critical component of the artifact assemblage recovered on the HREC, as most site discussion has focused on the lithic items, and sources of the raw material. Table 9.12 provides insight into the use (distribution) of raw lithic material shown by both site and the percentage of that material to the total represented items. Due to the large quantity of debitage present, this is shown separately in Table 9.13. Comparing the two tables proves interesting – MEN-852, MEN-2206, and MEN-3357 average by percentage a very similar amount of chert to obsidian, artifact to debitage, while at MEN-2216, only 13% of the debitage is chert, while chert artifacts represent 44% of the total. The artifact count is small (9 total), and the amount of debitage is significant (4671 total) and while 87% of the debitage (4045). This site has been classified as a camp site and may indicate a stop on the way back from Clear Lake, where they were processing their obsidian into finished products. MEN-2223 also provides a similar statistic – 81% of the debitage was obsidian (5207), yet only 47% of the artifacts were obsidian (60 total artifacts), and is also classified as a camp site. MEN-3351 has a somewhat similar distribution – 91% to 63% ratio of obsidian debitage to artifact. The purpose of a stop at MEN-3355 indicates that the primary reason for them being there was the available chert with chert representing 88% of the debitage (134 total) and 100% of the artifacts (4), at this lithic site. With the ratio of debitage 81% being obsidian, and with the large amount of total debitage (7548), and 67% of the artifacts being obsidian (8), this camp site indicates there was a large amount of obsidian reduction taking place, again, probably on the return from Clear Lake. With HREC-12 being the site of a chert quarry, that is the only raw lithic material represented in the assemblage. Reviewing MEN-1602 ratios, There was some preference shown for chert in both the debitage and the artifacts – 60% of the debitage (938 total) was chert as compared to 79% of the artifacts (33 total). By comparing the ratio of debitage to artifact, it is possible to gain understanding of some of the activities on the landscape.

Site Number	Chert		Obsidian		Quartz		Basalt		Total	
	#	%	#	%	#	%	#	%	#	%
MEN--852	80	25%	244	75%	0	0%	1	0%	325	100%
MEN-2206	4	40%	6	60%	0	0%	0	0%	10	100%
MEN-2216	4	44%	5	56%	0	0%	0	0%	9	100%
MEN-2221	2	67%	1	33%	0	0%	0	0%	3	100%
MEN-2223	28	47%	28	47%	1	2%	3	4%	60	100%
MEN-3351	22	29%	47	63%	0	0%	6	8%	75	100%
MEN-3355	4	100%	0	0%	0	0%	0	0%	4	100%
MEN-3357	1	11%	8	89%	0	0%	0	0%	9	100%
MEN-3462	15	33%	31	67%	0	0%	0	0%	46	100%
HREC-12	4	100%	0	0%	0	0%	0	0%	4	100%
MEN-1602	26	79%	7	21%	0	0%	0	0%	33	100%
Total	190		377		1		10		578	

Table 9.12: Table showing number and percentage of artifacts from all sites sourced to raw material.

Site Number	Chert		Obsidian		Quartz		Basalt		Total	
	#	%	#	%	#	%	#	%	#	%
MEN-852	7,016	17%	34,937	83%	103	0%	37	0%	42,093	100%
MEN-2206	210	36%	366	63%	4	.5%	4	.5%	584	100%
MEN-2216	607	13%	4,045	87%	13	0%	6	0%	4,671	100%
MEN-2221	2	67%	1	33%	0	0%	0	0%	3	100%
MEN-2223	1,182	18%	5,207	81%	29	1%	19	0%	6,437	100%
MEN-3351	776	8%	8,504	91%	36	1%	6	0%	9,322	100%
MEN-3355	118	88%	7	5%	9	7%	0	0%	134	100%
MEN-3357	81	11%	663	88%	9	1%	1	0%	754	100%
MEN-3462	1,319	17%	6,121	81%	106	2%	2	0%	7,548	100%
HREC-12	3,404	100%	0	0%	0	0%	0	0%	3,404	100%
MEN-1602	563	60%	372	40%	0	0%	3	0%	938	100%
Total	11,315		57,151		309		75		75,888	

Table 9.13: Table showing number and percentage of debitage pieces from all sites sourced to raw material.

Obsidian Hydration

A total of 185 artifacts from the U. C. Davis field school specimens was submitted for testing by obsidian hydration by the Origer Laboratory. The tested artifacts include those submitted during my research and the 30 that had been submitted by WiseHawthorne in 2002. Four to six hydration readings were recorded from each specimen, and then averaged. The results, comparing sites with temporal readings are reported in Figure 9.33, representing 166 readings. Not all submitted artifacts could be successfully tested with obsidian hydration, due to weathering and other factors. The rim measurements have been calibrated to reflect the climate in the geographic area. A chart of the mean rim measurements for all test sites is found in Appendix B, in addition to all the Obsidian Hydration reports.

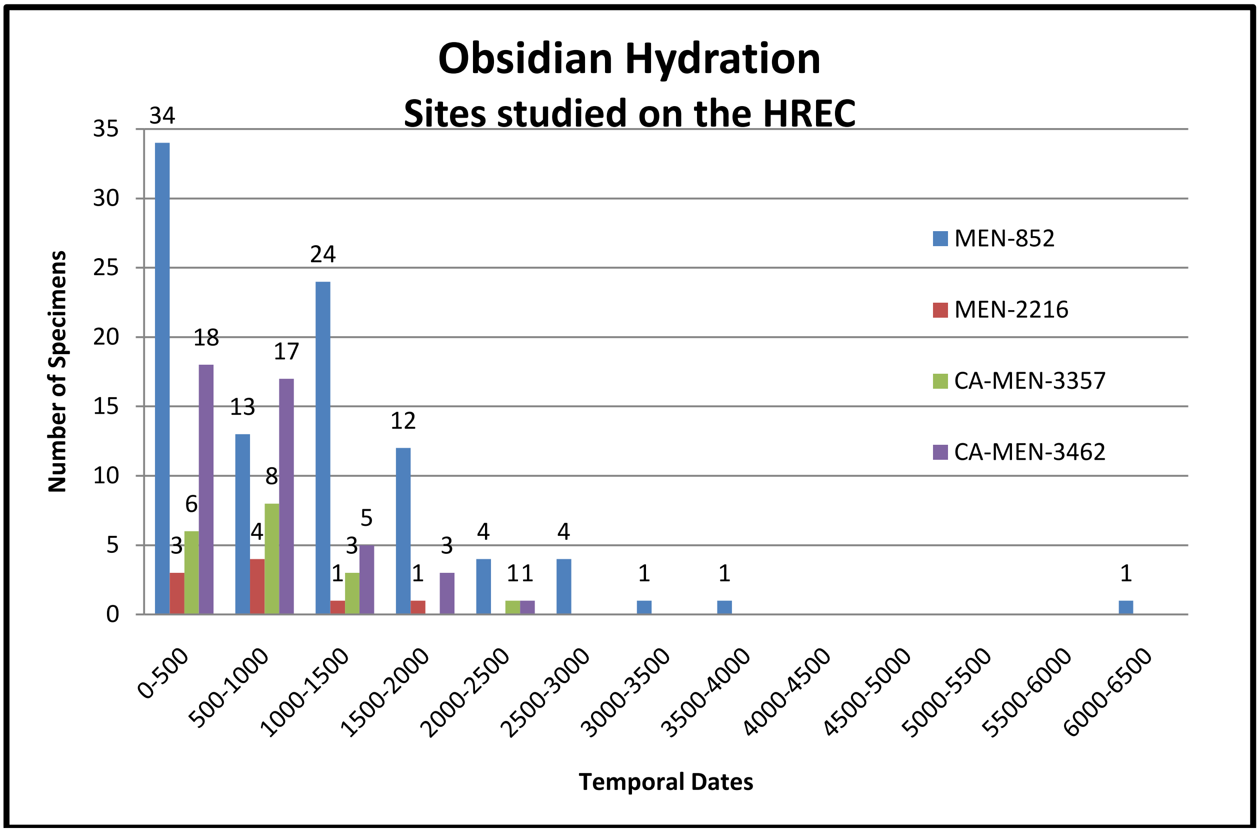


Figure 9.33: Temporal periods for all sites on the HREC based on obsidian hydration shown in 500 year increments.

Based on the results of the obsidian hydration testing, Native American activities on the HREC span at least from ~90 B.P. to ~6000 B.P. The one date of 11,200 B.P. at CA-MEN-852 has been discarded, based on two factors: 1) the weathering of the rind was too severe for a reliable result; and 2) the fact that it was sourced to Mount Konocti and then hydration dated to a time period that pre-dates any published references to the use of the Mount Konocti quarry. The results also indicate that most activities on the HREC have taken place in the past 3000 years, with increased activity in the last 1500 years, and with maximum use in the last 500 years.

I have not included the results of the obsidian hydration testing of artifacts from CA-MEN-1602 (a site that lies outside the modern boundaries of the HREC) as the results presented here reflect those that were recovered by the U. C. Davis field schools. A discussion of the results of hydration and sourcing studies are covered on page 158 and Table 9.14. As a point of information, the limited results from hydration testing indicates this lithic scatter site was visited repeatedly in the past 6000+ years.

Chemical Sourcing XRF

Chemical, or XRF (X Ray Defraction) sourcing was completed by Richard Hughes and by Steve Shackley's class at U. C. Berkeley on artifacts from three sites on the HREC. A total of 129 specimens were sourced, from three sites. In reviewing and analyzing the results from the U. C. Berkeley students it was discovered that there were discrepancies between the data sheets and the written report for the XRF sourcing. The numbers included in my results are taken from the data, and not the student report. The results are as found in Table 9.14, with the complete reports in Appendix D.

As noted in the report in Appendix B, U. C. Berkeley was unable to source six of the specimens. Richard Hughes, being a specialist on California obsidian sources was asked to identify the questionable specimens. He was unable to positively identity one of the six specimens sources, but assigned it to the most likely based on some of the minerals present, and has been included in the tabulation of sources. The assignment of obsidian to a particular source is based on the amount of certain elements present in the specimen. The identifying element for the Borax Lake and Mount Konocti sources is strontium (Sr). His data is included in the tables and figures Table 9.14.

Visual Sourcing

Artifacts submitted to the Origer Laboratory for hydration studies are also visually sourced, based on the clarity and/or noted inclusions in the obsidian. All samples from the same source have similar appearance. Summarized results are found in Table 9.14; full reports can be found in Appendix B as part of the general Obsidian Hydration report.

The results of the two sourcing methods are reported and compared, by site, in Table 9.14. The table indicates a percentage error that includes samples that were submitted but not sourced with one of the methods for various reasons. If just comparing the results of the two methods of sourced items, the percentage of error is less than 4 %, or represents four incorrect sourcing by the U. C. Berkeley class and three discrepancies with the Origer results. With visual sourcing being a subjective method, the XRF readings are considered more accurate. Included in the table below are only specimens that were analyzed by XRF and Visual Sourcing (this excludes the material as it was only subjected to visual sourcing). The UCB Class Data compares visual sourcing of the same artifacts by Origer laboratory visual sourcing to the XRF sourcing by U. C. Berkeley students, and the Hughes' Data compares the Origer laboratory visual sourcing to the testing by Hughes. Acknowledging that XRF testing is an objective method and scientific method, the results are very close, especially when eliminating the rate of error for those specimens that were unable to be sourced.

Site Number	Visual Sourcing				XRF Chemical Sourcing				% Error
	MK	BL	NV	A	MK	BL	NV	A	
	UCB Class Data								
MEN-852	32	7	1	1	34	8	0	1	9.8%
MEN-3357	10				11				9.1%
MEN-3462	21	6			23	7			10%
	Hughes' Data								
MEN-852	34	4			36	3			7.7%
MEN-3462	7				7				0%

Table 9.14: Comparison of Visual and XRF Sourcing at indicated sites of artifacts recovered from sites on the HREC and tested by the Hughes laboratory and Prof. Steve Shackley's petrology class at U. C. Berkeley.

Evidence gained from the XRF sourcing indicates that the majority of the lithic material from the U. C. Davis collection as reported in (Figure 9.34) by site, was obtained from Mount Konocti. Earlier in this chapter I suggested that certain sites may represent lithic scatters by

Native peoples who were returning from procuring their lithic material from the Clear Lake obsidian sources. This is evidenced by the dense obsidian debitage at those sites. I believe that the data indicates that the lithic archaeological evidence on the HREC could support the hypothesis that these sites were waystops or stopovers for pre-historic peoples as they traveled the trails to procure lithic material from Mount Konocti and Borax Lake. A more complete study of the temporal periods of the sourced material could determine if procurement of the obsidian can be separated into periods of use of the two quarries, especially, in relation to available knowledge from other tested sites.

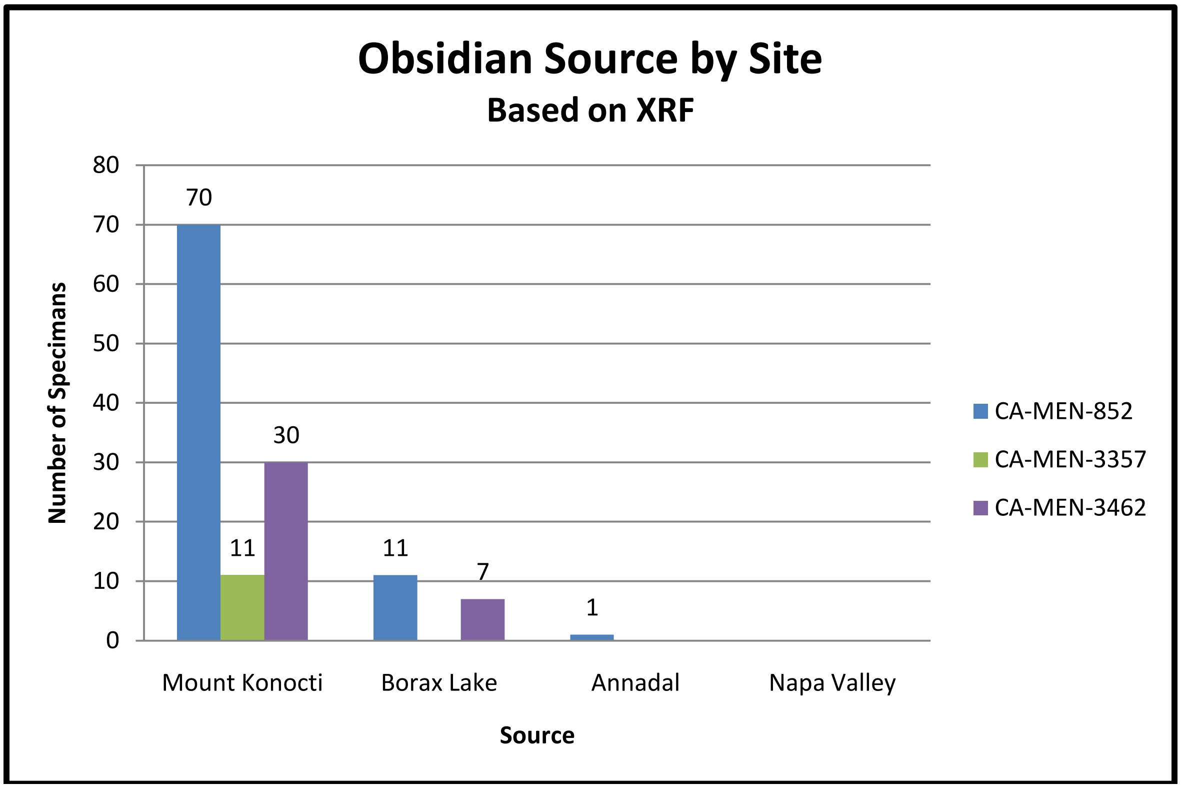


Figure 9.34: Obsidian Source based on XRF testing.

Visual Sourcing of the HREC Collection

Origer also visually sourced 298 specimens in the HREC collection when he made a trip to the HREC, and these are reported in Figure 9.35. As explained earlier, the items in the catalog have been picked up nonsystematically by HREC staff and are not representative of a specific distribution. The catalog does include approximate location of where items were collected, over the last 50+ years. Obsidian artifacts are more “showy”, shine like the glass they are, and thus were collected more often. The reported visual sourcing of this collection indicates a greater percentage of use of the Borax Lake obsidian source than in the excavated samples from the field schools, as represented by both XRF and visual sourcing. This may be indicative of the selection of a better quality obsidian (without inclusions as found in the Mount Konocti obsidian) being used for the larger and bulkier points in the HREC collection.

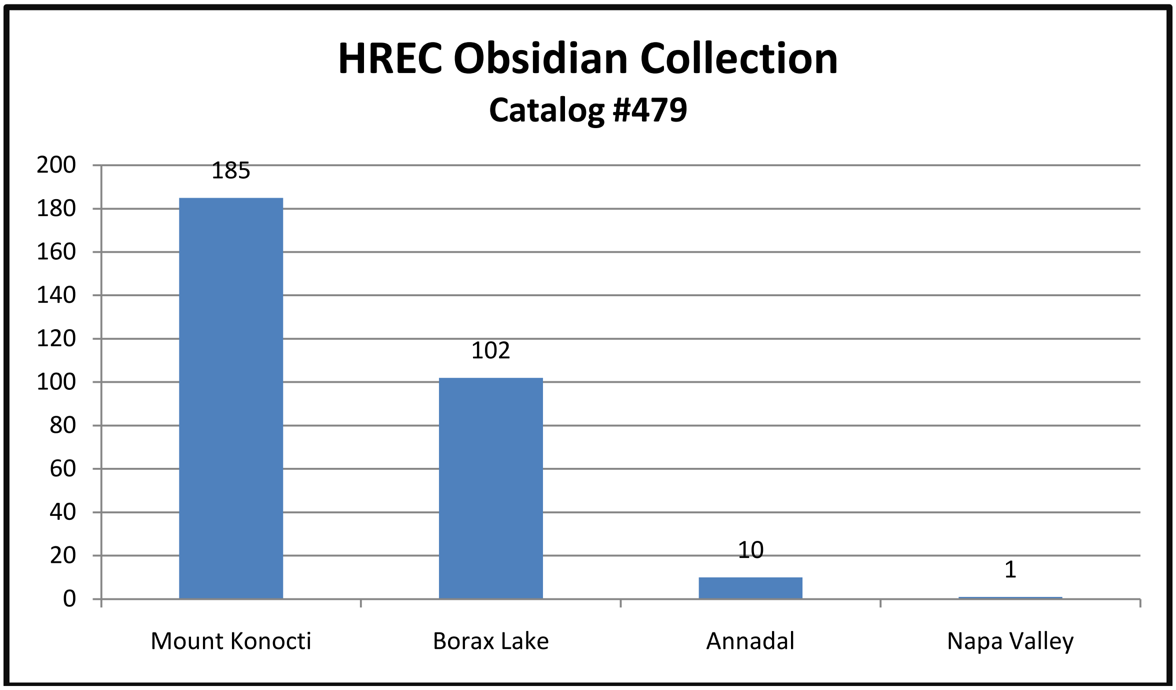


Figure 9.35: Obsidian hydration (visual sourcing) of HREC Collection.

Conclusions

This chapter has presented the findings from the analytical and exploratory methods used in my archaeological investigation. I presented the results site by site, in both table and chart format, and the outcome of the various scientific investigations were reported. The following and final chapter will revisit Chapter 1 and the goals and significance of my study, with some suggested conclusions and what I believe I have found out about the HREC landscape, and how we can perhaps understand the marked PCN boulders in a wider landscape overtime. The significance of my research will be discussed and I will suggest areas for future research that have emerged in the course of my study.

X. Conclusions, Significance of Study, and Future Research

It's not what you find, it's what you find out.
David Hurst Thomas (1989:31)

Introduction

This dissertation has taken the study of rock art (or cultural markings) and bridged it into the archaeological landscape, and added some pre-historic people and their movements and activities. The preceding chapter presented and discussed the results of the field and laboratory studies. To summarize the previous chapters, I have taken the reader through the research process, explaining the multifaceted contextual approach and introduced the research questions. The historical and ethnographic information were also covered. After detailing the theory and methods being applied, the results were presented and discussed. This concluding chapter will synthesize the conclusions, relate the significance of the study, and offer suggestions for further research that have emerged as my study has progressed.

The Scope of the Dissertation

As the above quote from David Hurst Thomas implies the focal point of archaeology is not on the artifacts, the "find", but rather on the information that we infer from the artifacts what we "find out". As this dissertation concludes, it is time to reflect on what we have found out about this pre-historic landscape, now known as the HREC. The marked boulders, known as PCNs, are not isolated objects on the landscape, but rather manifestations of activities that have taken place, and, as such, have become part of the landscape. They have a story to tell. Possibly, they are the only evidence remaining of those who left the marks on the boulders, crossed the region, and followed the trails. No matter when the boulders were marked – whether it was all at the same time or over a period of time, in the distant past, or more recently there were people in the area after the marking. The boulders could have become part of their landscape.

Without the ability, at this time, to confirm the OCR results that indicate the boulders were marked very early, we cannot (as yet) fix the time sequence for PCN activities on the HREC. While it is tempting to imagine that those who came after the boulders had been marked, knew that they were there, and perhaps generated an explanation for their existence, we cannot link specific occupations and activities to those who marked the boulders. Figure 10.1 presents a chronometric view of known (dated) activities, on the HREC, and includes the proposed data from the soil dating experiments (in dashed lines). Archaeological evidence cannot, at this time, confirm an early date for the PCN remains. The three chips of obsidian and chert, recovered near the surface of the split boulder at MEN-2221, do not provide chronometric evidence.

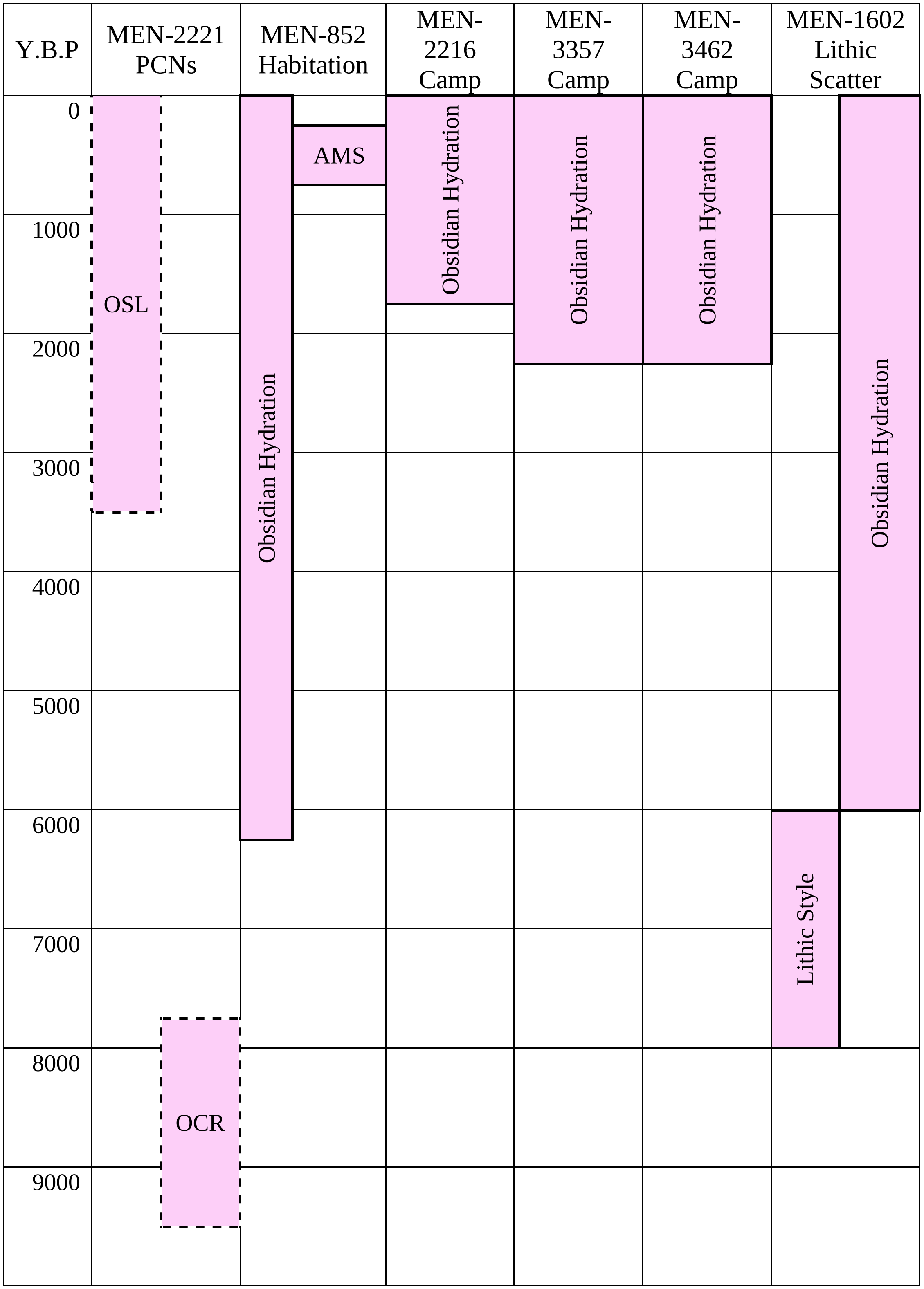


Table 10.1: Chronometric chart indicating activities on the HREC within temporal periods of activities, identified through different testing methods.

Clearly, people over time traveled the trails that connected some of the places on the landscape – the campsites, the chert quarries, and the "trail" to and from the more remote obsidian quarries near Clear Lake. People traveled *through* the HREC landscape, leaving evidence of their presence lithic scatters and burned bones that have let us know of their pausing; to hunt, to rest and sharpen their tools, or camp for the night, or perhaps stay for a season. We, as archaeologists, study this evidence that they left, including the marked boulders, the lithic tools, the debitage, burned bone, and other artifacts to inform our understanding of their pre-historic lives, and the period in which they lived. This was, and is, a living landscape, constantly changing. And, it is this constant change of the landscape that provides the ability to apply new methods of determining when these earlier peoples passed this way – such as the study of soils that may contain evidence of when people were there. Through archaeological processes, we are able to "find out" about their lives. These conclusions, and the story they tell, will be organized below by revisiting the research questions as presented in Chapter I, p. 1.

What activities can be identified as taking place on the landscape of the HREC?

Evidence from the archaeological context and field work indicates that activities on the HREC over time have ranged from habitation sites (possibly yearround), camp sites (both one time and returning), lithic scatters (with no indication of overnight stays), to places where they quarried the local chert sources, and, to the boulders themselves, with their cultural markings. The table below (Table 10.1) designates the site function of the archaeological sites on the HREC, based on the results of this study.

Trinomial	Other Designations	Site Function
CA-MEN-852	Rockpile	Habitation
CA-MEN-2204	Parasite	Midden*
CA-MEN-2205	Chuck's Chert Quarry	Quarry*
CA-MEN-2206	Fern Spring	Camp
CA-MEN-2210	Sealed Spring	Lithic*
CA-MEN-2211	Woodpecker Heaven	Lithic*
CA-MEN-2212	Hagen Lake Outlet	Lithic*
CA-MEN-2213	Huntley Peak Petroglyphs	Petroglyph (PCNs)
CA-MEN-2214/H	Vassar Corner	Lithic*
CA-MEN-2215	Talus Chert Quarry	Quarry
CA-MEN-2216	Madrone Grove	Camp
CA-MEN-2221	Hidden Hill Petroglyph	Petroglyph (PCNs)
CA-MEN-2222	Airstrip	Lithic*
CA-MEN-2223	Buck Springs	Camp
CA-MEN-2235	Watershed Down Petroglyph	Petroglyph (PCNs)
CA-MEN-2300	Glittering Rock Petroglyph	Petroglyph (cupules)
CA-MEN-3351	Riley Ridge Scatter	Lithic
CA-MEN-3352	Chaparral Hunting Camp	Lithic*
CA-MEN-3354	Rattlesnake Chert Quarry	Quarry
CA-MEN-3355	Vineyard Site	Habitation
CA-MEN-3356	Rabbit Pens	Lithic*
CA-MEN-3357	Parson's Creek Narrows (HREC8)	Camp
CA-MEN-3461	Madrone Chert Quarry	Quarry
CA-MEN-3462	Middle Lake	Camp
HREC-10	(none)	Lithic
HREC-11	(none)	Lithic
HREC-12	Bunny Head Knoll	Quarry
HREC-13	(none)	Lithic
HREC-14	Chucks Rock	Petroglyph (PCNs)
HREC-15	Bob's Rock	Petroglyph (PCNs)

Table 10.2: Archaeological Sites on the HREC.
(*) Sites so marked have not been excavated – designation may change with further study.

The table above (10.1) lists the 31 identified archaeological sites on the HREC landscape, with 20 sites having been the subject of study in this dissertation. After reevaluating their classifications, based on archaeological evidence from the excavations, we can now identify two probable habitation sites, five campsites, one midden site, five chert quarries, 12 lithic scatters, and six petroglyph sites, including five PCN sites and one boulder marked with cupules. Of those sites not included in the study, seven are lithic scatters, one is a chert quarry, and one is a midden. With the absence of information on why particular sites were chosen by U. C. Davis field schools for archaeological investigation it is not possible to determine why some sites were excluded (excluded sites are marked in the table with an *).

Based on the above data, we can say that the HREC landscape was a traveled and utilized area. The 31 identified sites do represent the use of the landscape, over a period of time, and the location of the sites on the map (Figure 10.2) gives us additional information where spatially activities were taking place, spatially. Many of the activities, of all site classification type, took place in the southwestern portion of the HREC, at a lower elevation than much of the HREC landscape, with many activities located adjacent to Parson's Creek and the drainages that feed into the creek as it flows toward the Russian River. As covered in an earlier chapter (Chapter VIII) the HREC landscape has received a fair amount of survey, so the known distribution of archaeological sites is probably accurate. The location of the chert quarries is obviously determined by the geological location of the chert, which, by referring to the HREC map on page 179 shows them clustered in the western central portion of the HREC, with the exception of HREC12, which is located in the most southwestern corner. This quarry, as discussed above, yields a poorer quality chert. The quarries are at a higher elevation than where many of the pre-historic activities (both habitation and camp sites) are located. Interestingly, the PCN marked boulders are located at nearly the lowest elevation of the HREC, with other site classifications located to the north and to the east of the boulders. Schist boulders are located at other areas of the HREC, yet the ones chosen for marking with PCN elements are all clustered along a northeast line. Does this location for the PCN marked boulders give us some insight into what was going on?

Perhaps those who made the marks were coming from the lower elevations (the Russian River area or McDowell Valley) and had knowledge of the particular boulders as they traveled the landscape to acquire lithic material (chert) or other resources or social encounters. The ethnographic literature supports the suggestion that the hypothesized rituals took place "in the hills" (Powers 1976:64). Were they aware of the chert quarries at the higher elevations? Concerning the water sources available on the HREC, the map has accentuated the waterways with blue line indicators, although, as mentioned earlier, the PCN boulders are adjacent to seasonal creek beds; these creek beds are not evident on this particular map. I suggest that this location for marking boulders may be because the often dry small creek beds were easy to follow to reach the higher elevations. These creek beds may have served as connective systems to link the various activity areas on the landscape. While it is generally thought that pre-historic trails followed the ridgelines, evidence of trails on the HREC landscape indicate that the creek beds were also followed, at lower elevations, at least in historic times when oral accounts by the early settlers reported that the Indians traveled by their homes in historic times. Gerbic's initial research (personal communication 2011) on the trails that were traversed through the HREC also indicates trails at lower elevations. As evidenced by their locations on the map (Table 10.2), the lithic scatters appear at the higher elevations. I suggest that these lithic scatters indicates that the sites may have been stopping spots on the HREC landscape connecting pre-historic peoples between the Clear Lake area and their home areas (that may not have been not have been located in the immediate area), but there are not sufficient archaeological data to support this.

So, while there is evidence of fire and food processing and consumption activities at four sites (designated as camp sites), plus evidence of longrepeated use at the main habitation site (CA-MEN-852), we do not know if people were living full time on the HREC landscape during some periods. There is little or no evidence that the sites were permanent villages, through either archaeological evidence or ethnographic or ethnohistoric accounts. We do know that people did, perhaps over millennia, at least visit the area and left archaeological evidence of their presence. With present knowledge we cannot unequivocally link those who left their various imprints to those who created the markings on the boulders. We cannot rule out the possibility that the boulders were marked during a more recent time by those who left the recovered artifacts that were identified in the excavations. It will require additional rigorous testing and research to understand the temporal relationships of the activities that are represented on the landscape.

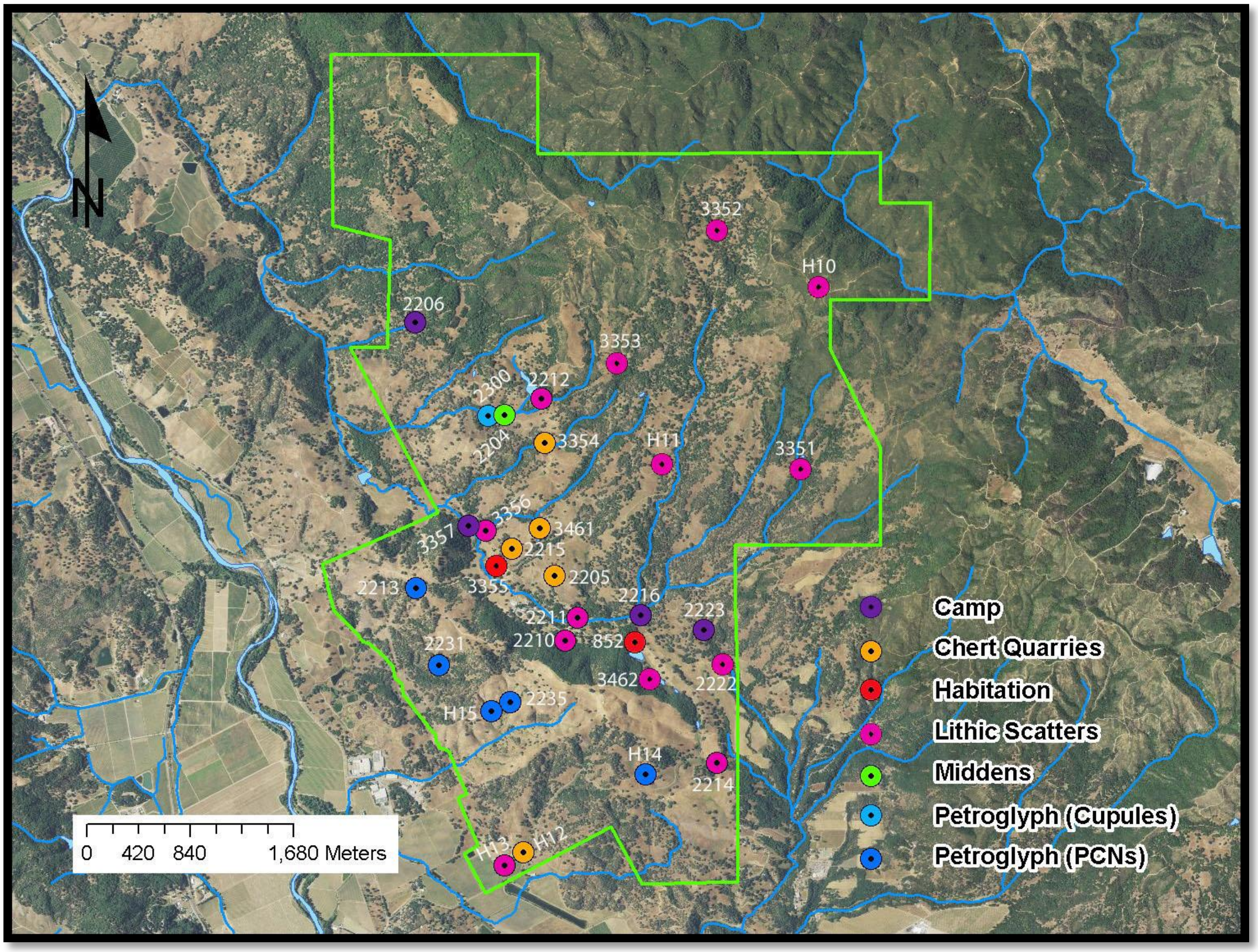


Figure 10.1: Map of the HREC with site numbers and classified into different functions, following the research by the U. C. field schools. Google map with modification by Shane Feirer

What role did the people play in a symbolic landscape?

The marked PCN boulders clearly indicate a human presence on the landscape. Why did they pick these particular boulders? As was discussed in the previous chapters, there is an archaeological site south of the HREC (CA-MEN-1602) that has been dated through obsidian hydration and stylistic identification of lithics to have been the site of pre-historic activity at least 7000 years ago (Figure 9.22). And, this temporal period was evidenced without reaching a sterile level during the excavation, which suggests the possibility that there may be deposits that are even earlier. The projectile point classification (fluted points) of recovered lithic material may extend this date further back; given that certain projectile point styles (both from chert and obsidian) appear to have chronological significance. It was suggested by the excavators (Damon and Fredrickson 1979) that this was not a habitation site, but rather a tool manufacturing area. With little archaeological research in the North Coastal Ranges, it is difficult to determine where groups of people were residing prior to prohistoric times.

People were traveling around the landscape and probably saw different natural features as having special significance (Bradley 2000). Whether or not the PCN marked boulders were some of these significant features, they did, at some period, become part of the living landscape, and those who traveled from different locations, to hunt or gather or for other activities at the higher elevations, or to visit the chert quarries or for other unknowable reasons, may have been aware of them. This was not static landscape; people came and went as evidenced by the temporal periods suggested by the obsidian hydration results.

I have come to the tentative hypothesis that the selection of what boulders to mark with PCNs was more a matter of the occurrence of the boulders and their natural placement than is the case of some "rock art" that identifies boundaries, or is placed in a "powerful" location. No cultural or group boundaries are ethnographically identified in the study area that would require a boundary marker. In addition, there is no evidence through the study of the PCN tradition that these marked boulders ever served as boundary markers. While some of the boulders, even on the study landscape, offer a significant viewshed, this is not always the case with PCN marked boulders within the Coastal Ranges. I believe that the only requirement for the PCN boulders was for them to be away from the village (evidenced by no known PCN sites located within a village site), in an area where a young couple could journey together to perform the needed rituals, assuming that the ethnographic "function" of the boulder marking as a ritual practice related to fertility increase can be extended back in time, but this is, of course, a total conjecture.

The suggestion that the presumed ritual of boulder marking took place somewhere "away" is derived from 20th century ethnographic reports that when a couple were dealing with fertility that the husband and wife made a "long journey" into the mountains (Powers 1976:64). Were the PCN sites considered "in the mountains" to the pre-historic people who were active in McDowell Valley or elsewhere? I suggest that activities evidenced at MEN-1602 may coincide with my hypothesized temporal period of the PCN marking, (5000-8000 B.P.). While research has yet to identify a habitation site where the people of that period resided they did spend extended time in the area, as evidenced by the span of use of the MEN-1602 site, as well as the Vineyard site on the HREC (MEN-3355) – thought to be a very old site (Sjordal, et al. 1999e), but un verified. While most of the PCN marked boulders on the HREC exhibit a limited number of PCN markings, the numerous PCN elements (100150) made on the large boulder at MEN-2213 (locus 1) (see Figure 4.2), may indicate a larger population or use over an extended period of time. This is difficult, if not, impossible to determine.

To what temporal period can activities be assigned?

Obsidian hydration testing included artifacts from only four of the sites. No temporal data are available for the other sites. Evidence from obsidian hydration testing indicates that the site with the deepest time depth was CA-MEN-852, the main archaeological site on the HREC, and long considered by archaeologists to have been a habitation site. The hydration dates indicate that the site can be documented to ~6000 B.P., with sporadic use until 2500 B.P. The dates show an increase of activity between, ~1000-1500 B.P., with the most intense use in the last 500 years, into historic times. HREC-9 (CA-MEN-3462) indicates usage as early as ~3000 B.P., with HREC8 (CA-MEN-3357) dated to ~2000 B.P. Both sites saw increased use in the last 1500 years. The earliest documented use of CA-MEN-2216 is ~1700 B.P., with dates as recent as ~100 B.P. The Carbon 14 AMS dating results place people at CA-MEN-852 between ~275-700 B.P. The above reported obsidian hydration and AMS dates place people on the HREC landscape at various times over the last ~6000 years. The results indicate that different sites were occupied at different times.

Assignment of the rock art to a temporal period, based on associated soil dating, is still inconclusive, and verification of the OCR dates must be done through other accepted methods (see Chapter VIII for a description of the soil dating methods). The OCR dates by Frink place the covering of the paleosol by the boulder as having taken place sometime around 9423 B.P., His method dates the split in the boulder, based on the first deposition of soil between the two pieces, as having taken place after 7825 B.P. but likely before 7532 B.P. This would place the marking of the boulder that occurred before the split in it to between 9423 and 7825 B.P., but this is only suggestive as the method is so preliminary and experimental. Comparing this suggested early date with the OSL dates, the oldest date extracted from the lowest sample (#6), was 4405 B.C. (6405 B.P. based on the 1950 baseline date). The above applied dates are given as chronometric dates to conform to the actual reports received from the laboratories. Add to this the 6421 year error possibility for the OSL dates and the two dating suggestions from OCR and from OSL may be in the same range. The very extensive high error factor for the OSL dates certainly questions the validity and utility of the OSL results. There was close agreement with the upper level (Ahorizon) OSL samples and the results from the OCR method. The slight divergence in B and Chorizon readings may be due to what is measured in each procedure. The OCR method looks at organic material trapped in the soil that has been deposited from upslope, while the OSL method is based on the exposure of light, with the "clock" being "reset" as the surface soil level (horizon) continues to build. The rate of error in the readings of this particular analysis causes considerable concern for the validity of this specific OSL dating. It is hoped that the future planned repeat of the OSL dating method, with another laboratory will help clear up the questions, but it is generally agreed that OSL dating is complex and very much still in a development stage in almost all laboratories. PCN researchers have long suggested that we might imagine some antiquity to the PCN tradition, based on the combination of the historical linguistic inferences, and on what appears to be a coherent geographic distribution of sites throughout the coastal ranges that might be taken as an indication of a common culture or cultural traits over a considerable area of the Coastal Ranges. This suggestion of an early date, may also be suggested with the observance that the PCN markings are always the lowest elements on the boulder (this includes the cupules).However, it is not yet possible to provide any quality empirical evidence to support an early date; in fact, it would be interesting to probe into just why so many seem to want an early date, which might tell us more about some of our own cultural presuppositions and assumptions.

Can the pre-historic peoples whose activities are represented on the HREC be temporally identified as the same people who left the markings on the boulder?

This is an impossible question to answer. We do not, at this time, have the needed scientific proof to place an earlier group on the landscape that would have been responsible for the PCN markings. Perhaps the PCN marks are the remnants of more recent peoples, those that are represented with the excavated artifacts from the U. C. Davis field schools. However, as mentioned above, there is also the possibility that the field school excavations did not reach a sterile level, and earlier groups of people could yet be represented in the artifacts "buried" on the HREC. But even so, this would not link those people with the PCN marking practices.

We do know, evidenced by research at the Clear Lake area (5.5 km away) that people inhabited the Coastal Range and inland at least 10,000 years ago. There is recent research by Jon Erlandson and colleagues (Erlandson, et al. 2011), that confirms coastal settlement in southern California (at least on the off shore Channel Islands) at 13,000 B. P. Paisley Caves in inland Oregon have yielded radiocarbon dates on human coprolites that range between 12,750 and 14,290 B. P. (Gilbert, et al. 2008). These two sites provide evidence that people were on the western landscape of North America at what is considered to be an early date. It will be left to later archaeologists and scientists, with more precise methods of dating to determine just how early this HREC area was occupied.

Additional Conclusions

What other data does the archaeological assemblage yield about the activities that took place on the pre-historic landscape that provide material evidence of the pre-historic peoples? One source of data involves the use of the nearby obsidian quarries (Mount Konocti and Borax Lake). Was there a preference for using either of these two sources, which was the most widely used, and did specific sites on the HREC attest use from any specific source(s) ? Based on the XRF analyses described in Chapter IX, the overall preference-or, at least use was for obsidian from Mount Konocti at CA-MEN-852, the choice of the XRF sourced artifacts was 70 from Mt Konocti to 30 from Borax Lake and only one made on obsidian from Annadel) (see Figure 9.35). The analysis of lithic source materials shows that no sites demonstrated a preference for the obsidian from Borax Lake; that source was represented by less than 10% of the artifacts at any of the tested sites on the HREC (MEN-852, MEN-3357, and MEN-3462). The MEN-3462 site had a slightly higher frequency of Borax Lake obsidian than the other sites. The physical characteristics of the Borax Lake obsidian are a clear "unblemished" black glass, with no inclusions, while the Mount Konocti obsidian has distinctive flecks of white throughout the material. Was the clearer (Borax Lake) obsidian considered a higher quality that the mottled Mount Konocti glass? Were the projectile points strictly utilitarian? Was it because Mount Konocti was a little closer in social and geographic distance? These and other questions are left for future research.

The nature of the artifact assemblages also generates other questions. It seems as if there are very few of what we consider to be "ritual materials". Is this another indication of only periodic use of CA-MEN-852, without activities being carried out there related to ritual practices? Just a couple of pieces of charmstones (or fragments) and only two shell beads have been found. There are the reported "ritual" obsidian blades, but they have not been located again for confirmation or analysis as yet. And there is the lack of evidence of bird bones in the faunal assemblage at CA-MEN-852 yet the habitation was on the edge of a sag pond.

The recovery of only 5 hammerstones, and a lack of other artifactual material (three pieces of debitage) at the PCN boulder site of CA-MEN-2221 may indicate that the past people came to special place (CA-MEN-2221) just to perform what I am inferring was ritual. There was no indication of camping or other activities in the immediate area.

There is also the serious and always difficult question of the relevance of ethnographic material about fertility ritual. How long might a ritual tradition last? This hypothesized ritual may well have changed in form and function through time. However, the boulders on which the PCNs are placed are of the same material that is related in ethnographic accounts as being used for that purpose. To some, including readers of this dissertation, this might lead to a consideration of a more recent date for the PCNs. But what we have yet to study would be the weathering patterns, the superpositions of PCNs and other possible lines of inference to "date" the PCN markings. The circle itself, as a motif, may be taken to represent a continuation of life – world renewal or human. But then again, it could have multiple and shifting referents. There is no way to know if the PCNs can be understood in the same way as the ethnographic fertility rituals.

Determining the location of the pre-historic trails – what I call the connective tissue between places and people on the HREC landscape is still very much a work in process. Mary Gerbic (2011) has been conducting Master's thesis research to identify potential trails through the HREC. She has identified some trail segments that led past several of the camp sites and lithic scatters, and even some of the PCN sites, and a potential trail that lead to and from the main habitation site (CA-MEN-852) (2011). But how to place these in the temporal timescale remains a challenge. Gerbic's research is still in process.

Significance of Study

I believe the significance of this study is found in several dimensions: First, I have "zoomed out" from the focus of much rock art research, namely, the pecked and culturally marked boulders, and tried to see what we might learn about the wider landscapes within which these PCN boulders "sit". In this endeavor, I have been able to rescue some already collected archaeological data from previous research and analyze it in the hopes that I could link the PCN boulders to other dimensions of daily life of those who marked the boulder. But, as is evident – and a problem not restricted to PCNs - there are still serious limitations because we cannot place the bouldermarking in any specific or even general time frame. Nonetheless, our vision of the HREC boulders has been expanded because we have a more detailed sense of the archaeological landscape of the HREC, taken together given the know sites.

Secondly, I have attempted to apply some innovative methods to gain as much information about the PCN tradition and its context as is available by current and even experimental technologies. As a rock art researcher and as an archaeologist one of the most difficult tasks is to link rock art "i.e. cultural markings" with the archaeological context of a site, both spatial and temporal. The application of analytical tools and techniques (some still in the experimental stage) have been an integral component of the research presented here. To highlight a few of these techniques and methods I note the 3-D scanning of the boulder at CA-MEN-2221. Not only do the scans provide accurate measurements, but the process also allows viewing the modifications to boulders that are not discernable to the naked eye because of interference by moss and primarily lichen. This 3-D scanning is increasingly in use for the recording or documentation of rock art. The split boulder, with the exfoliated element, and buildup of soil between the segments led me to consider the application of soil dating techniques, which led me to the OCL method as an innovative soil dating method. And subsequently, I learned of the Gordon Method of soil dating, still being developed and not reported in this thesis. By experimenting with these two processes and validating the results against the more developed but still very laboratory dependent OSL method, a less expensive method of soil dating may sometime become available.

In fact, one goal has been to communicate to my rock art researcher colleagues about analytical archaeological tools that may expand their toolkit. The use of XRF to identify the mineral content of the boulder material may also add new insight into understanding why pre-historic peoples used specific boulders for these presumed ritual events. One other facet of my research also needs mentioning. For the archaeological context of my study I used an existing collection of artifacts. There was no need for extensive excavation. Archaeologists need to remember that excavation is a nonrenewable process. Leaving as much as possible for future generations to work with is important. It is my goal that this study will provide a workable model and methodology for additional contextual research that will enhance the level of knowledge that is presently available to rock art research.

Suggestions for Further Research

As I began my graduate studies at U. C. Berkeley, a colleague asked what I planned as my research area for my advanced work. After all – as he stated – “you have already *done* PCNs”! After spending these last few years “doing PCNs”, I know that they are far from being “done”. Each step taken only extends the horizon. Much more remains to be “done”. In the last few years additional PCN sites have been identified, both on the HREC and throughout the Coastal Ranges. While my dissertation study has focused on a few sites in Mendocino County, the marked boulders represent a much broader tradition and need to be addressed in that context. My future studies on the PCN tradition will delve into the tradition itself, focusing on a group of PCN marked boulders in the Central Coast area.

Additional obsidian hydration dating of materials from other excavated sites is needed to place them in the temporal framework of activities on the HREC, even if there are still debates about the validity of some uses of obsidian hydration for dating. Further studies of the artifacts themselves by a lithic specialist may provide evidence of the type of activity in which the pre-historic people were engaged. Were they actually in the area to hunt and /or to gather? Or, were the camps just a waystop on their travels on the trails, or both?

I would also like to suggest that perhaps the field of rock art research, and specifically the study of the PCN tradition, may be able to coordinate more with historical linguistic studies to better understand the movement of groups through the landscape.

The dissertation committee with whom I worked on this project feel that future work should be done to address the age of the PCNs and, furthermore, that we should consider an alternative interpretation than that which I hypothesize that the PCNs are early in the sequence of human occupation of the coastal ranges. It is possible they suggest that some of the PCNs may be contemporaneous with other more recent sites on HREC, or even later than some of the known sites discussed in this dissertation. I agree that more research is needed to establish the temporal period of the PCN markings and eagerly look forward to future research by me and others to address these issues.

A Closing Note

To complete this dissertation I would like to return to a paragraph that I presented in my introduction about the PCN tradition (p.1).

> (T)he marked boulders are more than cultural phenomena to be placed in a temporal/spatial context, they are a critical part of the archaeological record, and need to be fully integrated into archaeological studies. Not just relics or epiphenomena of the pre-historic/historic past; the marked boulders are representations of meaningful social and cultural practices (rituals). Even today, they are material manifestations that evoke history, memory and meanings. They are phenomena with life histories and biographies and in particular, can perhaps be better understood as vital to a dynamic landscape of symbols and meanings as "players" or "participants" in the multiple ways in which relationships among people, places, spirits, histories, groups and practice may have been brought into being, reinforced, changed, forgotten or rejected.

This dissertation has taken the above quote, as I had stated in the opening chapter, and placed the marked boulders (PCNs) into a contextual landscape, and left a model for others to apply to future research. While this dissertation has been unable to conclusively establish the temporal period for the manufacture of the PCNs, it has opened up the potential of applying innovative and little used technological tools in rock art research, and, in keeping with my landscape approach, placed pre-historic peoples on the land and enlightened our knowledge of the range and temporal periods of their activities on the HREC landscape.

References Cited

Adams, C.

1980 *CA-MEN-1800 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Aginsky, B. W.

1939 Population Control in the Shanel (Pomo) Tribe. *American Sociological Review* 4(2):209-216.

Alison, J.

1994 Possessing Your Landscape (Abstract). *Proceedings of the World Archaeological Congress 3*. Sir Lanka.

Anderson, G.

1997 Fingers and Finelines. In *Our Gendered Past: Archaeological Studies of Gender in Southern Africa*, edited by L. Wadley. Witwatersrand University Press, Johannesburg.

Anonymous

2010 Fred B. Kniffen. vol. 2010. Pelican Publishing Company, Gretna, Lousiana. Anovitz, L. M., J. M. Elam, L. R. Riciputi and D. R. Cole

1999 The Failure of Obsidian Hydration Dating: Sources, Implications, and New Directions. *Journal of Archaeological Science* 26(7):735-752.

Anschuetz, K. F., T. J. Ferguson, H. Francis, K. B. Kelley and C. L. Scheick

2002 *"That Place People Talk About"*. On file at National Park Service, Petroglyph National Monument, Albuquerque.

Anschuetz, K. F. and C. L. Scheick

2002 Introducing Cultural and Ethnographic Landscapes. In *"That Place People Talk About"*, edited by K. F. Anschuetz, T. J. Ferguson, H. Francis, K. B. Kelley and C. L. Scheick. Report on file with the National Park Service, Petroglyph National Monument, Albuquerque.

Arnold, J. E.

1992 Complex HunterGathererFishers of Pre-historic California: Chief, Specialists, and Maritime Adaptations of the Channel Islands. *American Antiquity* 54:60-84.

1993 Labor and the Rise of Complex HunterGatherers. *Journal of Anthropological Archaeology* 12:75-119.

Arnold, J. E. and M. R. Walsh

2010 *California's Ancient Past: From the Pacific to the Range of Light*. The Society for American Archaeology, Washington D. C.

Arnold, J. E., M. R. Walsh and S. E. Holliman
2004 The Archaeology of California. *Journal of Archaeological Research* 12(1):172.

Asher, R.
1961 Analogy in Archaeological Interpretation. *Southwestern Journal of Anthropology* 17:317-325.

Ashmore, W. and A. B. Knapp (editors)
1999 *Archaeologies of Landscape: Contemporary Perspectives*. Blackwell Publishers, Malden MA.

Ashmore, W., D. T. Lippert and B. J. Mills (editors)
2010 *Voices in American Archaeology*. SAA Press, Washington D. C.

Bahn, P.
1986 No Sex, Please, We're Aurignacians. *Rock Art Research* 3(2).

1988 Comments on The Signs of All Times: Entoptic Phenomena in Upper Paleolithic Art. *Current Anthropology* 29(2):217-218.

1998 *Pre-historic Art*. Cambridge Illustrateed History. Cambridge University, Cambridge, United Kingdom.

Baldwin, M. A.
1971a *CA-SLO-619 Archaeological Site Report*. On file at the Central Coast Information Center, University of California, Santa Barbara.

1971b *CA-SLO-620 Archaeological Site Report*. On file at the Central Coast Information Center, University of California, Santa Barbara.

Balme, J. and W. Beck (editors)
1995 *Gendered Archaeology*. ANH Publications, Canberra, Australia.

Banks, P.
1974a *CA-SON-568 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1974b *CA-SON-579 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Barnett, T., A. Chalmers, M. DiazAndreu, P. Longhurst, G. Ellis, K. E. Sharpe and I. Trinks
2005 3 D Laser Scanning for Recording and Monitoring Rock Art Erosion. *INORA* 41:25-29.

1906 A Composite Myth of the Pomo Indians. *Journal of American FolkLore* 19(72):3751.

1908a The EthnoGeography of the Pomo and Neighboring Indians. *University of California Publications in American Archaeology and Ethnology* 6(1):3-32.

1908b Pomo Indian Basketry. In *University of California Publication in American Archaeology and Ethnology*, pp. 134-308. vol. 7, Berkeley.

1917 Ceremonies of the Pomo Indians, pp. 397441. vol. 12. University of California Publications in American Archaeology and Ethnology, Berkeley.

1933 Pomo Myths. In *Bulletin of the Public Museum of the City of Milwaukee*. vol. 15. Public Museum of the City of Milwaukee, Milwaukee.

1952 *Material Aspects of the Pomo Culture*. Bulletin of the Public Museum of the City of Milwaukee 20. 2 vols. Public Museum of the City of Milwaukee, Milwaukee.

Barrett, S. A. and E. W. Gifford
1933 Miwok Material Culture. In *Public Museum City of Milwalkee Bulletin*. vol. 2.

Barrett, S. R.
1996 *Anthropology: A Student's Guide to Theory and Method*. University of Toronto Press, Toronto.

Basgall, M. E.
1987 Resource Intensification Among Hunter-Gatherers: Acorn Economics in Pre-historic California. *Economic Anthropology* 9:21-52.

2004 Resource Intensification Among Hunter-Gatherers. In *Pre-historic California: Archaeology and the Myth of Paradise*, edited by L. M. Raab and T. L. Jones, pp. 86-98. The University of Utah Press, Salt Lake City.

Baumhoff, M.
1978 Environmental Background. In *California*, edited by R. F. Heizer, pp. 16-24. Handbook of North American Indians. vol. 8, W. C. Sturtevant. Smithsonian Institute, Washington.

Baumhoff, M., R. F. Heizer and A. B. Elsasser
1958 Lagomarsino Petroglyph Site, Storey County, Nevada. In *University of California Archaeological Survey Report No. 43*, Berkeley.

Bawden, G. (editor)
2003 *Readings in American Archaeological Theory: Selections from American Antiquity 1992-2002*. Society for American Archaeology, Washington D.C.

Bean, L. J.

1975 Power and Its Application in Native California. *The Journal of California Anthropology* 2(1):25-33.

Bednarik, R. G.
1993 Meaning of 'Vulva Symbols' Established. *AURA Newsletter* 10(1):1-4.

2006 Names and Hyphenation of Names. *Rock Art Research* 23(2):257-258.

Bell, C.
1992 *Ritual Theory, Ritual Practice*. Oxford University Press, New York.

1997 *Ritual Perspectives and Dimensions*. Oxford University Press, New York.

2007 Response: Defining the Need for a Definition. In *The Archaeology of Ritual*, edited by E. Kyriakids, pp. 277-288. Cotsen Institute of Archaeology, University of California, Los Angeles.

Bender, B. (editor)
1993 *Landscape: Politics and Perspectives*. Berg Publishers, Providence, RI.

1998 *Stonehenge: Making Space*. Berg, Oxford.

Bender, B. and M. Winer (editors)
2001 *Contested Landscapes: Movement, Exile and Place*. Berg, Oxford.

Berg, F., M. Gary and D. Mclear-Gary
1988a *CA-MEN-2210 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1988b *CA-MEN-2211 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1988c *CA-MEN-2212 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Binford, L. R.
1962 Archaeology as Anthropology. *American Antiquity* 28:217-225.

1967 Smudge Pits and Hide Smoking: The Use of Analogy in Archaeological Reasoning. *American Antiquity* 32(1):1-12.

1977 *For Theory Building in Archaeology*. Academic Press, New York.

Blake, M. C., Jr.
1985 Distribution and Origin of Blueschist Rocks in the San Francisco Bay Region, California. In *Bay Area Rock Art News*. vol. 3.

Bostwick, T.
2002 *Landscape of the Spirits: Hohokan Rock Art at South Mountain Park*. The University of Arizona Press, Tucson.

Boynton, S. R.
1978 *The Painter Lady: Grace Carpenter Hudson*. Sun House Guild Corporation, Ukiah.

Bradley, R. (editor)
2000 *An Archaeology of Natural Places*. Rutledge, New York.

Breuil, H. A.
1952 *Four Hundred Centruies of Cave Art*. Translated by M. E. Boyle. Centre d'Etudes et de Documentation Prehistoriques, Montignac, Dordogne.

Broughton, J. M.
1999 Resource Depression and Intensification During the Late Holocene, San Francisco Bay: Evidence from the Emeryville Shellmound Vertebrate Fauna. In *University of California Anthropological Records No. 32* Berkeley.

2004 Declines in Mammalian Efficiency During the Late Holocene. In *Pre-historic California: Archaeology and the Myth of Paradise*, edited by L. M. Raab and T. L. Jones, pp. 34-52. The University of Utah Press, Salt Lake City.

Bruff, J. G.
1873 Indian Engravings on Rocks Along Green River Valley in the Sierra Range of Mountains. In *Smithsonian Institution Annual Report*, pp. 409-412. vol. 1872.

Carreras, R.
2000 *HREC-10 Archaeological Site Report*. Site Report on File with Gillette and at UC Davis.

Casteel, R. W. and C. K. Beaver
1978 Inferred Holocene Temperature Change in the North Coast Ranges of California. *Northwest Science* 52(4):337-342.

Chartkoff, J. L. and K. K. Chartkoff
1984 *The Archaeology of California*. Stanford University Press, Stanford.

Chattan, C.
1999 *CA-MEN-2303 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Chippendale, C. and G. Nash (editors)
2004 *Pictures in Place: The Figured Landscapes of RockArt.* Cambridge University Press, Cambridge.

Chippendale, C. and P. S. C. Tacon (editors)

1998a *The Archaeology of RockArt*. Cambridge University Press, Cambridge.

1998b An Archaeology of RockArt Through Informed Methods and Formal Methods. In *The Archaeology of Rock Art*, edited by C. Chippendale and P. S. C. Tacon, pp. 1-10. Cambridge University Press, Cambridge.

2006 What's in a Word, What's in a Hyphen? *Rock Art Research* 23(2):255257.

Clark, J. D.

1959 *The Prehistory of Southern Africa*. Penguin Books, Hamondsworth.

Clarkson, P. B.

1998 Archaeological Imaginings: Contextualization of Images. In *Reader in Archaeological Theory: PostProcessual and Cognitive Approaches*, edited by D. S. Whitley, pp. 119-129. Rutledge, London.

Clewlow Jr. , C. W.

1978 Pre-historic Rock Art. In *California*, edited by R. F. Heizer, pp. 619-625. Handbook of North American Indians. vol. 8. Smithsonian Institution, Washington D.C.

Coles, J.

1979 *Experimental Archaeology*. Academic Press, London.

Conkey, M. W.

1997 Beyond Art and Between the Caves: Thinking About Context in the Interpretive Process. In *Beyond Art: Pleistocene Image and Symbol*, edited by M. W. Conkey, O. Soffar, D. Stratmann and N. G. Jablonski, pp. 343-367, N. G. Jablonski. California Academy of Sciences, San Francisco.

2007 Questioning Theory: Is There a Gender of Theory in Archaeology? *Journal of Archaeological Method and Theory* (14):285-310.

Conkey, M. W., O. Soffer, D. Stratmann and N. G. Jablonski

1997 Beyond Art: Pleistocene Image and Symbol. *Proceedings of the Paul L. and Phyllis Wattis Foundation Endowment Symposium*. San Francisco.

Conkey, M. W. and J. D. Spector

1984 Archaeology and the Study of Gender. In *Advances in Archaeological Theory and Method*, edited by M. Schiffer, pp. 138. vol. 7. Academic Press, New York.

Cook, S. F.

1957 The Aboriginal Population of Alameda and Contra Costa Counties, California. *University of California in Anthropological Records* 16:239-292.

Cosgrove, D.

1993 Landscapes and Myths, Gods and Humans. In *Landscape: Politics and Perspectives*, edited by B. Bender, pp. 281-305. Berg, Oxford.

Culler, J.

1992 Literary Theory. In *Introduction to Scholarship in Modern Languages and Literatures*, edited by J. Garibaldi, pp. 201-235. The Modern Language Association, New York.

1994 Introduction: What's the Point? In *The Point of Theory: Practices of Cultural Analysis*, edited by M. Bal and I. Boer, pp. 13-17. Amsterdam University Press, Amsterdam.

Curtis, E. S.

1924 *The North American Indian* 14. Privately Printed.

Damon, L. F. and D. Fredrickson

1979 *An Archaeological Investigation at CA-MEN-1602, Situated on the Middleridge Ranch, Near Hopland, Mendocino County, California*. Report #10717 on file at the Anthropological Studies Center, Cultural Resources Facility, Sonoma State University.

Darvill, T.

2008 Oxford Concise Dictionary of Archaeology. 2 ed. Oxford University Press, Oxford.

David, B. and J. Thomas (editors)

2008 *Handbook of Landscape Archaeology*. Left Coast Press, Walnut Creek.

David, B. and M. Wilson (editors)

2002 *Inscribed Landscapes: Making and Marking Place*. University of Hawai'i Press, Honolulu.

Davis, C. A.

1981 Newberry Cave: An Elko Magicoreligious Site in San Bernardino County. M. A. Thesis, University of California, Riverside.

Davis, E. L

1874 PaleoIndian Land Use Patterns at China Lake, California. In *Pacific Coast Archaeological Society Quarterly*. vol. 10, Costa Mesa.

1961a The Mono Craters Petroglyphs, California. *American Antiquity* 27(2):236-239.

1968 Early Man in the Mojave Desert. In *Eastern New Mexico Contributions in Anthropology*. vol. 15, Portales.

Davis, J. T.

1961b Trade Routes and Economic Exchange Among the Indians of California. *Reports of the University of California Archaeological Survey* 54:1-73.

Dean, C.
2006 The Trouble with (the Term) Art. *Art Journal* 65(2):25-32.

DeGeorgey, A. and D. Mongeau
2005 *The No'boral-Co'kadjal Trail: An Aboriginal Footpath Between the Clear Lake Basin and the Ukiah Valley*. Prepared for the Bureau of Land Management, Ukiah Field Office.

Deitz, S. M. H.
1973 *CA-SCL-63 Archaeological Site Report on file at the Northwest Information Center, California State University, Sonoma.*

Devey
1974 *CA-SON-585 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

DiazGranados, C.
1993 The Petroglyphs and Pictographs of Missouri: A Distributational, Stylistic, Contextural, Functional, and Temporal Analysis of the State's Rock Graphics. Ph.D., Department of Anthropology, Washington University, St Louis.

Dimitrov, A. and G. Johnson
1968 *CA-SON-682 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Dixon, R. B. and A. L. Kroeber
1913 New Linguistic Families in California. *American Anthropologist* 15(4):647-655.

1919 Linguistic Families of California. *University of California Publications in American Archaeology and Ethnology* 16(3):47-118.

Dorn, R.
1996 A Change of Perception. *La Pintura* 23(2):10-11.

1998 Age Determination of the Coso Rock Art In *Coso Rock Art: A New Perspective,* edited by E. Younkin. Maturango Museum, Ridgecrest.

Downs, R. M. and D. Stea
1977 *Maps in Minds*. Harper & Row, New York.

Drennan, R. D.
1983 Ritual and Ceremonial Development at the Hunter-Gatherer Level. In *The Cloud People*, edited by K. V. Flannery and E. J. Marcus, pp. 30-32. Academic Press, New York.

Dubrasich, M.

2007 Book Review - Forgotten Fires by Omer C. Stewart In *Western Institute for Study of the Environment Colloquium*. http://westinstenv.org/histwl/2007/12/forgottenfires/.

Earle, T.
2009 Routes Through the Landscape: A Comparative Approach. In *Landscapes of Movement: Trails, Paths, and Roads in Anthropological Perspective*, edited by J. E. Snead, C. L. Erickson and J. A. Darling, pp. 253-269. University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia.

Ebert, J. I.
1996 *Rock Art Recording, Management, and Analysis: An Integrated System Incorporating 3-Dimensional Digitizing, Geographical Information Systems, and Other Digital Mapping and Imaging Technologies Final Report for National Science Foundation SBIR Phase 1 Grant Award No. 9560425*.

EknessHoyle, T.
1989 *CA-MEN-1800 Supplement to Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Ellis, L. (editor)
2000 *Archaeological Method and Theory: An Encyclopedia*. Garland Publishing, Inc., New York.

Elmendorf, W. W.
1984 Yukian Sharings. Paper presented at the Hokan-Penutian Workshop, University of California, Berkeley.

Elsasser, A. B.
1986 *Review of the Prehistory of the Santa Clara Valley Region, California*. Coyote Press Archives of California Prehistory 7. Coyote Press, Salinas.

Elsasser, A. B. and P. T. Rhode
1996 *Further Notes on California Charmstones*. Coyote Press Archives of California Prehistory No. 38. Coyote Press, Salinas.

Erlandson, J., T. C. Rick, T. J. Braje, M. Caperson, B. Culleton, B. Fulfrost, T. Garcia, D. A. Guthrie, N. Jew, D. J. Kennett, M. L. Moss, L. Reeder, S. Craig, J. Watts and L. Willis
2011 Paleoindian Seafaring, Maritime Technologies, and Coastal Foraging on California's Channel Islands. *Science* 331(4):1181-1185.

Erlandson, J. M. and R. H. Colten
1991 *Hunter-Gatherers of Early Holocene Coastal California* vol. 1. UCLA Institute of Archaeology, Los Angeles.

Erlandson, J. M. and M. A. Glassow

1997 *Archaeology of the California Coast During the Middle Holocene.* vol. 2. UCLA Institute of Archaeology, Los Angeles.

Erlandson, J. M. and T. L. Jones
2002 *Catalysts to Complexity: Late Holocene Societies of the California Coast.* vol. 3. UCLA Institute of Archaeology, Los Angeles.

Ernst, W. G.
1984 California Blueschist, Subduction, and the Significance of Tectonostratigraphic Terranes. *Geology* 12:436-440.

1988 Tectonic History of Subduction Zones Inferred from Retrograde Blueschist P-T Paths. *Geology* 16:1081-1084.

Evans, P.
2008 The Use of Ethnography in Landscape Archaeology. In *Handbook of Landscape Archaeology*, edited by B. David and J. Thomas, pp. 237-244. Left Coast Press, Inc., Walnut Creek, California.

Fagan, B.
2003 *Before California*. Rowman & Littlefield Publishers, Inc., Lanham, MD.

Feathers, J. K.
2003 Use of Luminescense Dating in Archaeology. *Measurement Science and Technology* 14:1493-1509.

Fenenga, F.
1935 *CALAK0034 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Fentress, J. B.
1992 Pre-historic Rock Art of Alamenda and Contra Costa County. M. A., Department of Anthropology, California State University, Hayward.

1999 *Excavations at a Native American Rock Art Site: Archaeological Research at CA-ALA-571*. Department of Anthropology, San Francisco State University.

Fleshman, G. L.
1975 Pit and Groove Rocks and Cupules in San Luis Obispo County. *Papers on the Chumash* Ocasional Paper Number 9:90-115.

Fletcher, M. R., R. Mich and D. Saville
2003 New Technology: GIS and GPS in Rock Art Survey at Petroglyph National Monument. In *Papers in Honor of Helen and Jay Crotty*, edited by R. N. Wiseman, T. C.

O'Laughlin and C. T. Snow, pp. 82-88. vol. 29. Archaeological Society of New Mexico, Albuquerque.

Foster, D.
1983 A Note on CA-MEN-1912: The Spyrock Road Site, Mendocino County, California. *Proceedings of the Rock Art Papers* 1:51-56. San Diego.

1984 *CA-MEN-433 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1986 *CA-MEN-2020 Archaeological Site Report* On file at the Northwest Information Center, California State University, Sonoma.

1990 Pendant From Domenigine Ranch. *Coalarg* 1(1).

Foster, D., J. Betts, B. Johnson and L. Deford
1990 *CA-FRE-2485 Archaeological Site Report*. On file at the Southern San Joaquin Valley Information Center, California State University, Bakersfield, and the California Department of Forestry and Fire Protection, Sacramento.

Foster, D., J. Foster, D. Drennen and E. Rohl
1993 *CA-TR-I1 Archaeological Site Report.* On file at the Northeast Information Center, California State University, Chico, and the California Department of Forestry.

Foster, D., M. Gary and D. McLear
1984 *CA-MEN-1941 Archaeological Site Report on file at the Northwest Information Center, California State University, Sonoma.*

1985 *CA-MEN-1941 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Foster, D. and F. Imhoff
1982 *CA-MEN-1912 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Foster, D. G. and J. Betts
1994 Swallow Rock (CA-FRE-2485): An Outstanding Petroglyph Site in the Southern Diablo Range, Fresno County, California. *Proceedings of the Rock Art Papers* 11:27-40. San Diego.

Foster, D. G. and J. W. Foster
1994 Slakaiya Rock (CA-TRI-1) : A Rediscovered Petroglyph Site From the Eel River, Trinity County, California. Unpublished Manuscript, Ventura, CA.

Foster, G. M.

1960 Edward Winslow Gifford. *American Anthropologist* 62(2):327-329.

Fredrickson, D. A.
1973 Early Cultures of the North Coast Ranges, California. Unpublished Ph.D. Dissertation, Anthropology, University of California, Davis.

Fredrickson, D. A. and T. M. Origer
2002 Obsidian Hydration in the Borax Lake Basin, Lake County, California. In *Essays in California Archaeology: A Memorial to Franklin Fenenga*, edited by W. J. Wallace and F. A. Riddell, pp. 148-165. vol. 60. University of California Archaeological Research Facility, Berkeley.

Fredrickson, V. M. and R. Schwaderer
1982 *Warm Springs Cultural Resoures Study (Special Petroglyph Report)*. U.S. Army Corp of Engineers.

Frink, D. S.
1994 The Oxidizable Carbon Ratio (OCR): A Proposed Solution to Some of the Problems Encountered with Radiocarbon Data. *North Americn Archaeologist* 20:67-79.

in press *Explorations into a Dynamic ProcessOriented Soil Science*. Elsevier, London.

Gary, M.
1991 The Keystone Petroglyph (CA-MEN-2200). Unpublished Manuscript.

Gary, M. and D. Mclear-Gary
1988 Petroglyph Boulders of Mendocino County, California. Unpublished Manuscript.

Gary, M., D. Mclear-Gary, F. Berg and C. Vaughn
1988a *CA-MEN-2215 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Gary, M., D. Mclear-Gary and D. Drennan
1994 *CA-HUM-983 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Gary, M., D. Mclear-Gary and C. Vaughn
1988b *CA-MEN-2216 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

1988c *CA-MEN-2221 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

1988d *CA-MEN-2222 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

1988e *CA-MEN-2223 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Gary, M., D. Mclear-Gary, C. Vaughn and R. Keiffer
1988f *CA-MEN-2204 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

1988g *CA-MEN-2205 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

1988h *CA-MEN-2206 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

1988i *CA-MEN-2214/H Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1990 *CA-MEN-2300 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Gary, M., D. Mclear-Gary, C. Vaughn, R. Keiffer and F. Berg
1988j *CA-MEN-2213 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Gary, M., D. Mclear-Gary, C. Vaughn, R. Keiffer, R. T. Timm and F. Berg
1988k *CA-MEN-2217 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Gary, M., D. Mclear-Gary, C. Vaughn and T. Wanzer
1989 *CA-MEN-2235 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Gary, M. and D. McLear
1986 Rock Art in Masut Pomo Territory. Unpublished Manuscript.

Gary, M., D. McLear and F. Berg
1986 *CA-MEN-2068 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Gary, M., D. McLear and D. Foster
1985a *CA-MEN-2028 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1985b *CA-MEN-2029 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1985c *CA-MEN-2030 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1985d *CA-MEN-2034 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Gary, M., D. Mclear and D. Foster
1985e *CA-MEN-2035 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Gary, M., D. McLear, E. B. Parkman and D. Foster
1988l *CA-MEN-2200 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Gerbic, M.
2009 PCN Petroglyphs at the Hopland Research and Extension Center, Hopland, Mendocino County, California: A Pilot Study for a GIS-Based Predictive Model. Unpublished Manuscript, Sonoma State University.

2011 A Trail Through Time, M. A. Thesis Draft, California State University, Sonoma.

Gibbs, G.
1853a *George Gibbs Journal of Redrick McKee's Expedition Through Northwestern California in 1851*. University of California 1972 reprint. Originally published in: Historical and Statistical Information, Respecting the History, Condition and Prospects of the Indian Tribes of the United States / collected and prepared under the direction of the Bureau of Indian Affairs by Henry R. Schoolcraft. v. 3, 1853. With introduction and end notes by Robert F. Heizer .

1853b Vocabularies of Indian Languages in Northwest California. In *Historical and Statistical Information Respecting the History, Condition and Prospects of the Indian Tribes of the United States*, edited by H. R. Schoolcraft, pp. 428-445. vol. 3. Lippincot, Philadelphia. (Reprinted: University of California Archaeological Research Facility, Berkeley, 1972).

Giedion, S.
1957 *The Eternal Present: The Beginnings of Art* 1. 2 vols. Bollinger Foundation, New York.

Gifford, E. W.
1923 *Pomo Lands on Clear Lake*. University of California Publications in American Archaeology and Ethnology 20, Berkeley.

1926 *Clear Lake Pomo Society*. University of California Publications in American Archaeology and Ethnology 18, Berkeley.

1928 Notes on Central Pomo and Northern Yana Society. *American Anthropologist* 30(4):675684.

1967 *Ethnographic Notes on the Southwestern Pomo*. University of California Anthropological Records 25, Berkeley.

Gifford, E. W. and A. L. Kroeber
1937 Cultural Element Distributions: IVPomo. *University of California Publications in American Archaeology and Ethnology*:117-253.

Gilbert, M. T., D. L. Jenkins, A. Gotherstrom, N. Naveran, J. J. Sanchez, M. Hofreiter, P. F. Thomsen, J. Binladen, T. F. G. Higham, R. M. Yohe II, R. Parr, L. S. Cummings and E. Willerslev
2008 DNA from Pre-Clovis Human Coprolites in Oregon, North America. *Science* 320:786-789.

Gillette, D. L.
1995 PCNs and Their Geographical Distribution in California. Paper presented at the Society for California Archaeology Meeting, Eureka.

1996a PCNs or Pecked Curvilinear Nuleated Elements. Unpublished Manuscript, Santa Cruz Archaeological Society.

1996b Rock Art and Artifacts. Paper presented at the Society for California Archaeology, Bakersfield, CA.

1998a PCNs of the Coast Ranges of California: Religious Expression or the Result of Quarrying? M.A. Thesis, Anthropology, California State University Hayward, Hayward.

1998b *PCNs of the Coast Ranges of California: Religious Expression or the Result of Quarrying?* SAA.

2003 The Distribution and Antiquity of the California Pecked Curvilinear Nucleated (PCN) Rock Art Tradition. Paper presented at the WAC-5, Washington D.C.

Gillette, D. L. and J. Barton
2006 Applying 3 D Laser Scanning to Rock Art Research, Paper presented at Rock Art 2006, San Diego Museum of Man.

Gillings, M. and D. Whearley

2005 Geographic Information Systems. In *Handbook of Archaeological Methods*. vol. 1. 2 vols. AltaMira Press, Lantham.

Gilreath, A. J.

2007 Rock Art in the Golden State: Pictographs and Petroglyphs, Portable and Panoramic. In *California Prehistory*, edited by T. L. Jones and K. A. Klar, pp. 273-290. AltaMira Press, Lanham, MD.

Glich, J.

2000 *HREC-13 Archaeological Site Report*. Site Report on File With Gillette and at U. C. Davis.

Goggin, J.

1949 Culture Traditions in Florida Prehistory. In *The Florida Indian and His Neighbors*, edited by J. Griffin. Rollins College, Winter Park, Florida.

Golla, V.

2004 Linguistic Prehistory. In *California Prehistory: Colonization, Culture, and Complexity* edited by T. L. Jones and K. A. Klar, pp. 63-82. AltaMira Press, Lantham.

Gordon, B.

2008 Dating Pictographs And Petroglyphs With AMS Carbon-Dated Charcoal, Bone and Plant Specks Associated With Fallen Pigment Dust, Droplets Or Rock Fragments: A Non-Destructive Field Technique Using High Resolution Photofiltering of 20x50 cm Rectangular Soil Peels Below The Rock Art. Paper presented at the World Archaeology Congress, Dublin, Ireland.

2010 Dating Pictographs and Petroglyphs: A New Nondestructive Method Using Highresolution Pigment and Pecked Particle Photography. Paper presented at the Canadian Archaeological Association, Calgary, Canada.

Gowans, K. D.

1958 *Soil Survey of the Hopland Field Station*. California Agricultural Experiment Station.

Graff, A. J. and B. Lee

1929 *CA-SON-268 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Grant, C.

1965 *The Rock Paintings of the Chumash*. University of California Press, Berkeley.

1967 *Rock Art of the American Indian*. Thomas Y. Crowell, New York.

1971 Rock Art in California. In *The California Indians/ A Source Book*, edited by R. F. Heizer, pp. 231-243. University of California, Berkeley.

Grant, C., J. W. Baird and J. K. Pringle
1968 *Rock Drawings of the Coso Range*. Fifth Printing 1978 ed. Maturango Museum, China Lake, California.

Groves, J. H.
1927 *CA-MEM-433 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Hall, N. and K. Sale
1994 What Art Thou? The AIATIS Rock Art Database and GIS Project 1993. In *Methods in the Mountains*, edited by I. Johnson, pp. 53-72. vol. 2. University of Sydney, Sydney, Australia.

Harden, D. R.
2004 *California Geology*. 2nd ed. Pearson Education, Inc., Upper Saddle River, New Jersey.

Harrington, J. P.
n.d. Harrington Fieldnotes, 87,754. Martin Luther King Library, San Jose.

Harrington, M. R.
1925 Ancient Salt Mines Near St. Thomas, Nevada. *Heye Foundation Indian Notes and Monographs* II(3).

1938 Folsom Man in California. In *The Masterkey*. vol. 13, Los Angeles.

1945 Farwell to Borax Lake. In *The Masterkey*. vol. 19, Los Angeles.

1948 An Ancient Site at Borax Lake, California. *Southwest Papers* 16:11-26.

Hartley, R. J. and A. M. W. Vawser
1997 Wayfinding in the Desert: Evaluation of the Role of Rock Art Through GIS. In *Rock Art As Visual Ecology.*, pp. 55-76. vol. IRAC Proceedings , Volume 1.

Haslam, R.
1986 Pecked Curvilinear Nucleated Petroglyphs as a Soft Rock Quarrying Technique. *Proceedings of the Paper Presented at 20th Annual Meeting of the Society for California Archaeology*. Santa Rosa.

Hedges, K.
1970 An Analysis of Diegueño Petroglyphs. M.A. Thesis, San Diego State University.

1983a The Cloverdale Petroglyphs. *Rock Art Papers* 1:56-64.

1983b A Re-examination of the Pomo Baby Rocks. *American Indian Rock Art* IX:10-21.

2001 Transversing the Great Gray Middle Ground: An Examination of Shamanistic Interpretation of Rock Art. In *American Indian Rock Art*, edited by S. M. Freers and A. Woody, pp. 123-136. vol. 27. American Rock Art Research Association, Phoenix.

Heicksen
n.d. *CA-MEN-1912 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Heizer, R. F.
1953 Sacred Rain-Rocks of Northern California. In *Archaeological Survey Reports*. vol. 20. University of California, Berkeley.

1966 *Ethnographic Notes on California Indian Tribes: C. Hart Merriam*. University of California Archaeological Survey No. 68, Part I. University of California, Berkeley.

1976 Editors Introduction. In *Tribes of California*, edited by S. Powers. University of California Press, Berkeley.

1978a *California*. 8. Smithsonain Institution, Washington.

1978b History of Research. In *California*, edited by R. F. Heizer, pp. 6-15. vol. 8. Smithsonian, Washington D.C.

1978c Introduction. In *California*, edited by R. F. Heizer, pp. 1-5. vol. No. 8. Smithsonian Institution, Washington D.C.

Heizer, R. F. and M. A. Baumhoff
1962 *Pre-historic Rock Art of Nevada and Eastern California*. University of California Press, Berkeley.

Heizer, R. F. and C. W. Clewlow Jr.
1973 *Pre-historic Rock Art of California*. Ballena Press, Romona, California.

Heizer, R. F. and A. B. Elasser
1980 *The Natural World of the California Indians*. Univesity of California Press, Berkeley.

Heizer, R. F. and A. L. Kroeber
1979 *Ishi the Last Yahi*. University of California Press, Berkeley.

Heizer, R. F. and K. M. Nissen

1973 *The Human Sources of California Ethnography*. Archaeological Research Facility, Department of Anthropology, Berkeley.

Hellmer, E.
2000 *HREC-12 Archaeological Site Report*. Site Report on File With Gillette and at UC Davis.

Heyd, T. and J. Clegg (editors)
2005 *Aesthetics and Rock Art*. Ashgate, Hampshire, England.

Hilderbrandt, W. R. and T. L. Jones
2004 Evolution of Marine Mammal Hunting. In *Pre-historic California: Archaeology and the Myth of Paradise*, edited by L. M. Raab and T. L. Jones, pp. 53-72. The University of Utah Press, Salt Lake City.

Hodder, I. (editor)
2001 *Archaeological Theory Today*. Polity Press, Cambridge.

Holm, L.
2003 *Geographic Information Systems in Archaeology*. Field Statement, Department of Anthropology, University of California, Berkeley.

Holmes, W. H.
1919 Handbook of Aboriginal American Antiquities Pt. 1, Introductory: The Lithic Industries. In *Bureau of American Ethnology Bulletin 60*. Smithsonian Institution, Washington D.C.

Hood, J. D., J. L. Kelly and D. McGeein
1997 *CA-ALA-571 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

HotzSteenhoven, V.
1986 Petroglyphs of The San Fancisco Bay Region And Related Areas. *Rock Art Papers* 3:175-189.

Hotz, V. and C. W. Clewlow Jr.
1974 A Northern California Petroglyph Site. *The Masterkey* 48(4):148-152.

Hotz, V., T. Miller, S. Rice and R. Haslem.
1974 *CA-MRN-442 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Howard, V.
1998 Steatite Vessel Production on Santa Catalina Island. *Proceedings of the Society for American Archaeology*. Seattle.

Howard , V.
n.d. *Steatite Production on Santa Catalina Island: Issues of Specialization*. Unversity of California, Los Angeles.

HREC
2010 Hopland Research and Extension Center: Climate. http://groups.ucanr.org/hopland/Natural_Resources/Climate.htm,

Hudson, J.
1889-1936 Unpublished Ethnographic Notes on the Pomo in the Archives of the Grace Hudson Museum, Ukiah, California

Hull, K. L.
2001 Reasserting the Utility of Obsidian Hydration Dating: A TemperatureDependent Empirical Approach to Practical Temporal Resolution with Archaeological Obsidians. *Journal of Archaeological Science* 28(10):1025-1040.

Huntley, D. J., D. I. Godfrey-Smith and M. L. W. Thewalt
1985 Optical Dating of Sediments. *Nature* 313(10):105-107.

Ingold, T.
1993 The Temporality of the Landscape. *World Archaeology* 25(2):154-174.

Johnson, M.
1999 *Archaeological Theory: An Introduction*. Blackwell Publishers, Inc., Maulden, Massachusetts.

Jones, E. T.
2006 *CA-MEN-1075 Archaeological Site Report Update.* On file at the Northwest Information Center, California State University, Sonoma.

Jones, T. L. and K. A. Klar (editors)
2004 *California Prehistory: Colonization, Culture, and Complexity*. AltaMira Press, Lantham, Maryland.

Jordan, L.
1995 Petroglyphs of the Southern North Coast Ranges: A Study of Style and Meaning. M.A. Thesis, Cultural Resources Management, California State University, Sonoma.

Joyce, R.
2001 Archaeology of Ritual and Symbolism In *International Encyclopedia of the Social and Behavioral Sciences,* edited by N. J. Smelser and P. B. Baltes, pp. 13371-13375. University of Pennsylvania Press, Philadelphia.

Kaufman, T.
1988 A Research Program For Reconstructing Proto-Hokan: First Groupings. In *Papers from the 1988 Hokan-Penutian Languages Workshop*. vol. 1. University of Oregon Papers in Linguistics: Publication of the Center for Ameindian Linguistics, University of Oregon.

Keiffer, B., C. Vaughn, D. Mclear-Gary and M. Gary
1990 *CA-MEN-2300 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Kennett, D. J. and J. P. Kennett
2004 Competitive Responses to Climatic Instability in Coastal Southern California. In *Pre-historic California: Archaeology and the Myth of Paradise*, edited by L. M. Raab and T. L. Jones. University of Utah Press, Salt Lake City.

Keter, T. S.
2009 All Those Things that You're Liable to Read in the Ethnographic Literature-They Ain't Necessarily So. Paper presented at the The Society for California Archaeology, Modesto, California.

Keyser, J. D.
1992 *Indian Rock Art of the Columbia Plateau*. University of Washington Press, Seattle.

Killick, D. J., A. J. T. Jull and G. S. Burr
1999 Point Counter-Point. *Society for American Archaeology Bulletin* 17(5).

King, T. F.

1970 *The Dead at Tiburon: Mortury Practices and Social Organization on San Francisco Bay*. Study #S242 on file at the Northwest Information Center, California State University, Sonoma.

Kirch, P. V. and T. L. Hunt (editors)
1997 *Historical Ecology in the Pacific Islands*. Yale University Press, New Haven.

Kniffen, F. B.
1939 Pomo Geography. In *University of California Publications in American Archaeology and Ethnology*, pp. 353-400. vol. 36, Berkeley.

Knunkel, P. H.
1974 The Pomo Kin Group and the Political Unit in Aboriginal California. *The Journal of California Anthropology* 1(1):1-18.

Kroeber, A. L.

1907 Indian Myths of South Central California. *University of California Publications in American Archaeology and Ethnology* 4(4).

1916 California Place Names of Indian Origin. *University of California Publications in American Archaeology and Ethnology* 12(2):31-69.

1925 *Handbook of Indians of the California*. Bureau of American Ethnology.

1932 The Patwin and Their Neighbors. *University of California Publications in and Ethnology* 29(4):253-422.

1935 Preface to The Structure of California Indian Culture. *University of California Publications in American Archaeology and Ethnology* 37(1):1-11.

1936 Prospects in California Prehistory. *American Antiquity* 2(2):108-116.

Kunkel, P. H.
1974 The Pomo Kin Group and the Political Unit in Aboriginal Clifornia. *The Journal of California Anthropology* 1(1):1-18.

Kyriakidis, E.
2007a Archaeologies of Ritual. In *The Archaeology of Ritual*, edited by E. Kyriakidis, pp. 289-308. Cotsen Institute of Archaeology, Univesity of California, Los Angeles.

2007b *The Archaeology of Ritual*. Cotsen Institute of Archaeology, University of California, Los Angeles.

Lanbert, J. B. and C. Chippendale
2005 Archaeological Chemistry. In *Handbook of Archaeological Methods*, edited by H. D. G. Maschner and C. Chippendale, pp. 478-500. vol. 1. AltaMira Press, Lanham, Maryland.

Langdon, M.
1974 *Comparative HokanCoahuiltecan Studies: A Survey and Appraisal*. Junua Linguarum, Series Critics 4. Mouton, The Hague.

Larsen, K.
2006 Brief Introduction to the Kashaya and Southern Pomo and Preservation Issues at CA-SON-2403 on Private Property. M.A., Anthropology, California State University, East Bay, Hayward.

Larsen, K. and B. Much
2005 *CA-MEN-2403 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Laszewski, J.
2008 Samuel A. Barrett. In *EMuseum@Minnesota State University*. vol. 2010. Minnesota State Museum, Mankato.

Layton, R.
1988 Comments on Signs of All Times: Entoptic Phenomena in Upper Paleolithic Art. *Current Anthropology* 29(2):226-227.

Layton, R. and P. J. Ucko
1999 Introduction: Gazing on the Landscape and Encountering the Environment. In *The Archaeology and Anthropology of Landscape*, pp. 1-20. One World Archaeology, London.

Lee, G.
1981 The Rock Art of Soxtonocmu, an Inland Chumash Village. *Journal of California and Great Basin Archaeology* 3(1):116-126.

Lee, R. B. and I. DeVore (editors)
1968 *Man the Hunter: The First Intensive Survey of Single, Crucial Stage of Human DevelopmentMan's Once Universal Hunting Way of Life*. Aldine Publishing, Chicago.

LenssenErz, T.
2004 The Landscape Setting of Rockpainting Sites in the Brandandberg (Namibia): Infrastructure, *Gestaltung*, Use and Meaning. In *The Figured Landscapes of RockArt*, pp. 131-150. Cambridge University Press, Cambridge.

2008 Space and Discourse as Constituents of Past Identities The Case of Namibian Rock Art. In *Archaeologies of Art: Time, Place, and Identity*, edited by I. D. Sanz, D. Fiore and S. K. M. May, pp. 29-50. Left Coast Press Inc., Walnut Creek, California.

Leventhal, A., L. Field, H. Alvarez and R. Cambra
1994 The Ohlone: Back From Extinction. In *The Ohlone: Past and Present*, edited by L. J. Bean. Ballena Press, Menlo Park.

LeviStrauss, C.
1969 *The Raw and the Cooked*. Translated by J. Weightman and D. Weightman. Harper & Row, Publishers, Inc., New York.

Levy, R.
1978 Costanoan. In *California*, edited by R. F. Heizer, pp. 485-495. Handbook of North American Indians. vol. 8, W. C. Sturtevant. Smithsonian, Washington, D.C.

LewisWilliams, D. and T. Dowson
1988 The Signs of All Times: Entoptic Phenomena in Upper Paleolithic Art. *Current Anthropology* 29(2):201-245.

LewisWilliams, J. D.
1995 Seeing and Construing:The Making and 'Meaning' of a Southern African Rock Art Motif. *Cambridge Archaeological Journal* 5(1):3-23.

Lewis, E. R.
1980 *Day of Shining Red*. Cambridge University Press, Cambridge.

Lightfoot, K. and O. Parrish
2009 *California Indians and Their Environment*. California Natural History Guides. University of California Press, Berkeley.

Lightfoot, K. G.
2005 *Indians, Missionaries, and Merchants: The Legacy of Colonial Encounters on the California Frontiers*. University of California Press, Berkeley.

Lillard, J. B., R. F. Heizer and F. Fenenga
1939 *An Introduction to the Archaeology of Central California* Bulletin 2. Department of Anthropology, Sacramento Junior College.

Lilley, I. (editor)
2007 *Native Title and the Transformation of Archaeology in the Postcolonial World*. Left Coast Press, Walnut Creek, California.

Lipo, C. and S. Sakai
2011 *Luninescence Results - Sediment to Date the Markings on Split Rock*. Report on File with Gillette.

Loeb, E. M.
1926 Pomo Folkways. *University of California Publications in American Archaeology and Ethnology* 1:147-409.

1931 The Religious Organizations of North Central California and Tierra Del Fuego. *American Anthropologist* 33(4):517-556.

Lyman, R. L.
1987 Archaeofaunas and Subsistence Systems. In *Advances in Archaeological Method and Theory*, edited by M. Schiffer, pp. 331-393. vol. 5. Academic Press, New York.

Mallery, G.
1893 Picture Writing of the American Indians. Smithsonian Institution, Bureau of American Ethnology Annual Report for 1888-89: 25-807 Washington D.C.

Margolin, M.

1978 *The Ohlone Way: Indian Life in the San Francisco-Monterey Bay Area*. Heyday Books, Berkeley.

Mark, R.
1990 Letter to Chuck Vaughn, Menlo Park

Mark, R. and E. Billo
1999 A Stitch in Time: Digital Panaramas and Mosaics. In *American Indian Rock Art*. vol. 25. American Rock Art Research Association, Tucson.

Mauldin, H.
1951 *The Mauldin Chronicles*. Lakeport Historic Courthouse Museum.

1952 *CA-LAK-0034 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

McGowan, C.
1978 Female Fertility Themes in Rock Art. *Journal of New World Archaeology* 2(4):15-27.

1982 *Cermonial Fertility Sites in Southern California*. 14. San Diego Museum of Man, San Diego.

McLendon, S. and R. L. Oswalt (editors)
1978 *Pomo: Introduction*. 8. Smithsonian Institution, Washington D.C.

McPherson, R. S.
1992 *Sacred Land, Sacred View: Navajo Perceptions of the Four Corners Region*. Bringham Young University, Probe, Utah.

Meighan, C. W., Fischer and M. Baumhoff
1951 *CA-MEN-1912 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Meighan, C. W. and C. V. Haynes
1970 The Borax Lake Site Revisited. *Science* 167:1213-1221.

Merriam, C. H.
1955 Studies of California Indians, edited by The Staff of the Department of Anthropology of the University of California. Univesity of Calfironia, Berkeley

1977 *Contributions to Native California Ethnology From the C. Hart Merriam Collection*. 3 vols. University of California Archaeological Research Facility, Berkeley.

Miller, T.

1977 Identification and Recording of Pre-historic Petroglyphs in Marin and Related Bay Area Counties. M.A. Thesis, Anthropology, San Francisco State University, San Francisco.

Miller, T. and R. Haslam
1974a *CA-SOM-844 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1974b *CA-SON-682 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1975a *CA-MEN-874 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1975b *CA-MEN-875 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1975c *CA-SON-846 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Millerstrom, S. N.
2001 Images Carved in Stones and Settlement Patterns Archaeology in Hatiheu Valley, Nuku Hiva, the Marquesas Islands, French Polynesia. Dissertation, Department of Anthropology, University of California, Berkeley.

Millikan, R.
1995 *A Time of Little Choice*. Ballena Press, Menlo Park.

Morales Jr., R.
2005 Considerations on the Art and Aesthetics of Rock Art. In *Aesthetics and Rock Art*, edited by T. Heyd and J. Clegg, pp. 61-74. Ashgate, Hampshire, England.

Moratto, M. J.
1984 *California Archaeology*. Academic Press, Inc., Orlando.

2004 *California Archaeology*. Second ed. Coyote Press, Salinas.

Moratto, M. J., T. F. King and W. B. Woolfenden
1978 Archaeology and California's Climate. *The Journal of California Anthropology* 5(2):147-161.

Morphy, H.
1995 Colonialism, History and the Construction of Place: The Politics and Perspectives of Landscape in Northern Australia. In *Landscape: Politics and Perspectives*, edited by B. Bender, pp. 205-243. Berg, Oxford.

Much, B.
2011 Up on the Pile: A Study of Petroglyphs in North Central Sonoma County, California, Cultural Resources Management, California State University, Sonoma.

Mudge, M., T. Malzbender, C. Schroer and M. l. Lum
2006 New Reflection Transformation Imaging Methods for Rock Art and Multiple-Viewpoint Display. In *The 7th International Symposium on Virtual Reality, Archaeology, and Cultural Heritage*, edited by M. Ioannides, F. Arnold, K. Niccolucci and M. K., Cyprus, Greece.

Mudge, M., N. Matthews, S. Rusinkiewicz, C. TolerFranklin and C. Schroer
in prep. Robust, Scientifically Reliable Rock Art Documentation from Digital Photographs. In *A Companion to Global Rock Art*, edited by J. McDonald and P. Veth. Publishing.

Mulloy, W.
1978 *CA-SON-1160 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Murphy, A. H. and H. F. Heady
1983 Vascular Plants of the Hopland Field Station, Mendocino County, California. *The Wasmann Journal of Biology* 41(12):53-96.

Nash, G.
2000 *Signifying Place and Space: World Perspectives of Rock Art and Landscape*. BAR International Series 902. Archaeopress, Oxford, England.

Nelson, N. C.
1909 Shellmounds of the San Francisco Bay Region. *University of California Publications in American Archaeology and Anthropology* 7(4):310-345.

Newland, M. and B. Much
2008 *A Century After Barrett.* Report #34677 file at the Northwest Information Center, California State University, Sonoma.

Norton, W.
1989 *Explorations in the Understanding of Landscape*. Contributions on Sociology 77. Greenwood Press, New York.

O'Brien, P. J.
1994 Pre-historic Politics: Petroglyphs and the Political Boundaries of Cahokia. *Gateway Heritage* 15(1):30-45.

Olmsted, D. L.

1985 Appendices: Linguistic Evidence Concerning Pomo Migrations In *Ethnography and Prehistory of the North Coast Range, California*, edited by H. McCarthy, W. R. Hildebrandt and M. K. Swenson, pp. 216-221. vol. Center for Archaeological Research at Davis, Publication Number 8. University of California, Davis.

Origer, T. M.
1979 *CA-MEN-1602 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Origer, T. M. and S. Thompson
2002 *CA-SON-2354 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Orlins, R.
1974 *CA-MEN-852 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Oswalt, R. L.
1964 The Internal Relationships of the Pomo Family of Languages. In *Actas y Memorias*. vol. 2. Congreso Internacional de Americanistas, Mexico.

Ouzman, S.
1998 Towards a Mindscape of Landscape: Rock-Art as Expression of World-Understanding. In *The Archaeology of RockArt*, edited by C. Chippendale and P. S. C. Taçon, pp. 30-41. Cambridge University Press, Cambridge.

2003 Radiant Landscapes and Ancient Mindscapes: Archaeology and Architecture in Harmonious Counterpoint. In *Nine Landscapes: Essays on Landscape in South Africa*, pp. 7-34. Department of Architecture, University of Pretoria, Pretoria.

Paglia, C.
1999 Mummy Dearest: Archaeology is Unfairly Maligned by Trendy Academics, Wall Street Journal, September 30, 1999.

Parker, J.
1993 Ethnographic and Pre-historic Settlement Systems in the Clear Lake Basin. In *There Grows a Green Tree: Papers in Honor of David A. Fredrickson*, edited by G. White, P. Mikkelsen, W. R. Hildebrandt and M. E. Basgall, pp. 303-322. vol. 11. Center for Archaeological Research at Davis.

Parkman, E. B.
1991 Three Papers on California Rock Art Papers on California Prehistory. vol. 3. Coyote Press Archives of California Prehistory No. 33., Salinas, California.

1993a Creating Thunder: The Western Rain-Making Process. *Journal of California and Great Basin Archaeology* 15(1):90-110.

1993b The PCNStyle Petroglyph. In *There Grows a Green Tree: Papers in Honor of David A. Fredrickson*, edited by G. White, P. Mikkelsen, W. R. Hildebrandt and M. E. Basgall, pp. 351-371. The Center for Archaeological Research at Davis.

1994 Pomoan Concepts of Power, Spirit, and Place. *Rock Art as Visual Ecology: International Rock Art Congress* 1:21-29.

Parsell, A. P.

2002 *Stories and Scholarship From the Social Science Field Laboratory, Ukiah California, 1939-1948.* Mendocino County Museum Grassroots History Publication Number Nineteen. Mendocino County Museum Willits, California.

Pausanias

1913 *Pausanias's Description of Greece, Translated with a Commentary, by J. G. Frazier.* MacMillan and Co., London.

Payen, L. A.

1966 Pre-historic Rock Art in the Northern Sierra Nevada, California. M. A., California State University, Sacramento.

Peterson, P. and P. Peterson

1989 *CA-LAK-0034 Archaeological Site Report* On file at the Northwest Information Center, California State University, Sonoma.

Peterson, P. A.

1989a *CA-MEN-874 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1989b *CA-MEN-875 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Peterson, P. A. and P. R. Peterson

1987 *CA-LAK-1577 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

Pilling, A. and R. Drake

1950 *CA-SBN-12 Archaeological Site Report* On file at the Northwest Information Center, California State University, Sonoma.

Pilling, A. and T. Meighan

1949 *CA-CCO-152 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Piperno, D. R.
1988 *Phytolith Analysis: An Archaeological And Geological Perspective*. Academic Press, San Diego.

Porcasi, J. F. and T. L. Jones
2004 Trans-Holocene Marine Mammal Exploration on San Clemente Island: A Tragedy of the Commons Revisited. In *Pre-historic Californa: Archaeology and the Myth of Paradise,* edited by L. M. Raab and T. L. Jones, pp. 73-85. The University of Utah Press, Salt Lake City.

Powers, S.
1877 Tribes of California. In *Contributions to North American Ethnology 3*. vol. U. S. Geographical and Geological Survey of the Rockey Mountain Region. Washington D. C.

1891 *Annual Report to the Bureau of American Ethnology*. Smithsonian Institution, Washington D. C.

1976 *Tribes of California*. University of California Press, Berkeley (Originally printed in 1877).

Quinlan, A.
2000 The Ventriloquist's Dummy: A Critical Review of Shamanism and Rock Art in Far Western North America. *Journal of California and Great Basin Anthropology* 22(1):92-108.

Raab, L. M. and T. L. Jones (editors)
2004 *Pre-historic California: Archaeology and the Myth of Paradise*. The University of Utah Press, Salt Lake City.

Rappaport, R.
1979 The Obvious Aspects of Ritual. In *Ecology, Meaning and Religion,* edited by R. Rappaport. North Atlantic Books, Richmond, California.

1999 *Ritual and Religion in the Making of Humanity*. University of Cambridge Press, Cambridge.

Renfrew, C. and P. Bahn
1991 *Archaeology: Theories, Methods, and Practice.* Thames and Hudson, New York.

Rhode, P.
1991 Are Charmstones Hatched From PCNs? In *Bay Area Rock Art News*. vol. IX.

Richards, C. and J. Thomas

1984 Ritual Activity and Structured Deposition in Later Neolithic Wessex. In *Neolithic Studies: A Review of Some Current Research*, edited by R. Bradley and J. Gardiner, pp. 189-218. BAR British Series 133, Oxford.

Rogers, A. K.
2008 Obsidian hydration dating: accuracy and resolution limitations imposed by intrinsic water variability. *Journal of Archaeological Science* 35(7):2009-2016.

2010 Accuracy of obsidian hydration dating based on obsidianradiocarbon association and optical microscopy. *Journal of Archaeological Science* 37(12):3239-3246.

Ross, A., S. Pickering, J. G. Snodgress, H. D. Delcore and R. Sherman
2011 *Idigenous Peoples and the Collabrative Stewardship of Nature*. Left Coast Press, Walnut Creek, California.

Ross, M.
2001 Emerging Trends in Rock-Art Research: Hunter-Gatherer Culture, Land and Landscape. *Antiquity* 75(289):543-548.

Rowntree, L. B.
1996 The Cultrual Concept in American Human Geography. In *Concepts in Human Geography*, edited by C. Earle, K. Mathewson and M. S. Kenzer, pp. 127-159. Rowman & Littlefield Publishers, Inc., Lanham, Maryland.

Rushing, B. J.
2004 A Contextual Analysis of PCN Petroglyphs in Marin and Southern Sonoma Counties. M.A., Anthropology, California State University, San Francisco.

Russell, S. A.
1997-98 Playing Ball With the Gods. *Amercian Archaeology* 1(4):18-23.

Sample, L. L.
1950 Trade and Trails in Aboriginal California. *Reports of the University of California Archaeological Survey* 8:1-30.

Sanz, I. D., D. Fiore and S. K. M. May (editors)
2008 *Archaeologies of Art: Time, Place, and Identity*. Left Coast Press Inc., Walnut Creek, California.

Sarris, G.
1994 *Mabel McKay: Weaving the Dream*. University of California Press, Berkeley.

Schaafsma, P.
1985 Form, Content, and Function: Theory and Method in North American Rock Art Studies. *Advances in Archaeological Method and Theory* 8:237-277.

Schwaderer, R.

1980a *CA-MEN-585 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1980b *CA-SON-1319 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1980c *CA-SON-1320 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1981a *CA-SON-1383 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1981b *CA-SON-568 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Sells, L.

2005 "Moving Mountains" to Provide Access to Rock Art: MultiMedia Interpretation of the Hedgpeth Hills Petroglyph Site. In *Making Marks: Graduate Studies in Rock Art Research at the New Millennium* edited by J. K. K. Huang and E. V. Culley, pp. 21-219. vol. 1. American Rock Art Research Association, Tuscon.

Sharer, R. J. and W. Ashmore

2003 *Archaeology: Discovering our Past*. McGraw-Hill, Boston.

Shepard, R. S.

1996 Luiseno Rock Art and Sacred Landscapes in Late Pre-historic Southern California. M. A. thesis, Department of Anthropology, University of California, Los Angeles.

Shipley, W. F. (editor)

1978 *Native Languages of California*. 8. Smithsonian Institution, Washington.

Sickler, R. R.

2003 A Paleoseismic Study of the Maacama Fault, Near Ukiah, Mendocino County, California. M. A. Thesis, Environmental Systems: Geology, Humboldt State University, Arcata.

Silliman, S. W.

2005 Obsidian Studies and the Archaeology of 19th-Centruy California. *Journal of Field Archaeology* 30(1):75-94.

Simpson, A., P. Clogg, M. DiazAndreu and B. Larkman

2004 Towards Three-Dimensional NonInvasive Recording of Incised Rock Art. *Antiquity* 78:692-698.

Sjordal, P., A. Guerrero and A. Noel
1999a *CA-MEN-852 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1999b *CA-MEN-3352 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1999c *CA-MEN-3353 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1999d *CA-MEN-3354 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1999e *CA-MEN-3355 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1999f *CA-MEN-3356 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1999g *CA-MEN-3357 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1999h *CA-MEN-3461 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1999i *CA-MEN-3462 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1999j *CA-MEN-3551 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

2000 *Hopland Research and Extension Center University of California at Davis: Preliminary Archaeological Investigations*. University of California, Davis.

Skinner, C. E. and J. J. Thatcher
2007a Borax Lake. In *Northwest Research Obsidian Studies Laboratory Source Catalog*. http://www.sourcecatalog.com/ca_borax_lake.html

2007b Mt. Konocti. In *Northwest Research Obsidian Studies Laboratory Source Catalog*. http://www.sourcecatalog.com/ca/ca_mt_konocti.html

Sloan, D.
2006 *Geology of the San Francisco Bay Region*. University of California Press, Berkeley.

Snead, J. E., C. L. Erickson and J. A. Darling (editors)
2009 *Landscapes of Movement: Trails, Paths, and Roads in Anthropological Perspective*. University of Pennsylvania Museum of Archaeology and Anthropology Philadelphia.

Snyder, R.
2000 *HRE-11 Archaeological Site Report*. Site Report on File With Gillette and UC Davis.

Sonin, B.
1995 California Rock Art: An Annotated Site Inventory and Bibliography, edited by M. L. Marymor,

Squire, B.
1949 *CA-CCO-152 Archaeological Site Report* On file at the Northwest Information Center, California State University, Sonoma.

Steward, J. H.
1929a *CA-MEN-434 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1929b Petroglyphs of California and Adjoining States. In *University of California Publications in American Archaeology and Anthropology*. vol. 24, Berkeley.

Stewart, O. C.
1943 *Notes on Pomo Ethnogeography*. University of California Press. Submitted to University of California Publications in American Archaeology and Ethnology Volume 40.

2002a *Forgotten Fires – Native Americans and the Transient Wilderness*. University of Colorado Press, Boulder.

Stewart, R. M.
2002b *Archaeology: Basic Field Methods*. Kendall/Hunt Publishing Company, Dubuque, Iowa.

Strang, V.
2008 Uncommon Ground: Landscape as Social Geography. In *Handbook of Landscape Archaeology*, edited by B. David and J. Thomas, pp. 51-59. Left Coast Press, Inc., Walnut Caeek, California.

Sutton, M. Q.
1987 Papers on the Archaeology of the Mojave Desert. In *Archives of California Prehistory*. vol. 10. Coyote Press, Salinas.

Sutton, M. Q. and B. S. Arkush
1996 *Archaeology Laboratory Methods: An Introduction*. 4th ed. Kendall/Hunt Publishing Company, Dubuque, Iowa.

Swift, S. and B. Roop
1977 *CA-SCL-281 Archaeological Site Report*. On file at the Northwestern Information Center, California State University, Sonoma.

Taçon, P. S. C. and S. Ouzman
2004 Worlds Within Stone: The Inner and Outer Rock-Art Landscapes of Northern Australia and Southern Africa. In *The Figured Landscapers of Rock-Art: Looking at Pictures in Place,* pp. 39-68. Cambridge University Press, Cambridge.

Tatum, R. M.
1946 Distribution and Bibliography of Petroglyphs of the United States. *American Antiquity* 12:122-125.

Taylor, W. W.
1961-1962 Archaeology and Language in Western North America. In *American Antiquity*, edited by R. H. Thompson, pp. 71-81. vol. 27. University of Utah Press.

Theodoratus, D. and F. LaPena
1994 Wintu Sacred Geography of Northern California. In *Sacred Sites, Sacred Places*, edited by D. L. Carmichael, J. Hubert, B. Reeves and A. Schanche, pp. 20-31. One World Archaeology, London.

Thomas, D. H.
1989 *Archaeology*. 2nd ed. Holt, Rinehart and Winston, Inc., Ft. Worth, Texas.

Timm, R. T. and C. Vaughn (editors)
2003 *Research at Hopland: 1951-2001: An Annotated Bibliography*. Hopland Research & Extension Center, Hopland.

Trigger, B. G.
1989 *A History of Archaeological Thought*. 1999 ed. Cambridge University Press, Cambridge.

Trinks, I., M. Diaz-Andreu, R. Hobbs and K. E. Sharpe
2005 Digital Rock Art Recording: Visualising Petroglyphs Using 3 D Laser Scanner Data. *Rock Art Research* 22(2):131-139.

Turner, V. W.
1969 *The Ritual Process: Structure and Anti-Structure*. Aldine, Chicago.

1973 Symbols in African Ritual. *Science* 179(4074):1100-1105.

Ucko, P. J. and R. Layton (editors)
1999 *The Archaeology and Anthropology of Landscape: Shaping Your Landscape*. Routledge, London.

Upp, R. R.
1989 Holocene Activity and Tectonic Setting of the Maacama Fault Zone, Mendocino, California. *Engineering Geology* 27:375-412.

Wallace, W. J.
1971 Indian Use of California's Rocks and Minerials. *Journal of the West* X(1):35-52.

Weaver, T.
2002 The Dynamics of Applied Anthropology in the Twentieth Century: The Malinowski Award Papers, edited by T. Weaver. Society for Applied Anthropology.

Wellman, K. F.
1979 *A Survey of North American Indian Rock Art*. 1 vols. Akademische Druck-u. Verlagsantalt, Graz, Austria.

Whipple, M. A., T. Ewbank and W. M. Turner
1856 Reports of Explorations for a Railroad Route Near the Thirty-Fifth Parallel of North Latitude, from the Mississippi River to the Pacific Ocean, 1853-1854. *Railroad Reports* 3.

Whistler, K. W.
1988 Pomo Prehistory: A Case for Archaeological Linguistics.- *Journal of the Steward Anthropological Society* 15(1983-1984):64-98.

White, G. G., D. Fredrickson, L. D. Hager, J. Meyer, J. Rosenthal, M. Waters, G. J. West and E. Wohlgemuth
2002 *Cultural Diversity and Culture Change in Pre-historic Clear Lake Basin: Final Report of the Anderson Flat Project* Publication Number 13. Center for Archaeological Research, Davis.

Whitley, D. S.
1994 Ethnography and Rock Art in the Far West: Some Archaeological Implications. In *New Light on Old Art/ Recent Advances in Hunter-Gatherer Rock art Research*, edited by D. S. Whitley and L. L. Loendorf. 1st ed. vol. 36. UCLA Institute of Archaeology, Los Angeles.

1998a Finding Rain in the Dessert. In *The Archaeology of Rock Art*, edited by C. Chippendale and P. S. C. Tacon, pp. 11-20. Cambridge University Press, Cambridge.

1998b *Reader in Archaeologicl Theory*. Rutledge, London.

2000 *The Art of the Shaman*. University of Utah Press, Salt Lake City.

Whitley, D. S. and R. Dorn
1987 Rock Art Chronology in Eastern California. *World Archaeology* 19(2):150-164.

1993 New Perspectives on the Clovis vs. Pre-Clovis Controversy. *American Antiquity* (4):626-647.

Whitson, M.
1977a *CA-SOM-1026 Archaeological Site Report.* On file at the Northwest Information Center, California State University, Sonoma.

1977b *CA-SOM-1041 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Whitson, M. and R. Haslam
1977 *CA-SON-1075 Archaeological Site Report*. On file at the Northwest Information `Center, California State University, Sonoma.

Whitson, M. and T. Miller
1976a *CA-SON-928 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

1976b *CA-SON-929 Archaeological Site Report*. On file at the Northwest Information Center, California State University, Sonoma.

Whittlesey, S. M.
1997 Archaeological Landscapes: A Methodological and Theoretical Discussion. In *Vanishing River*, edited by S. M. Whittlesey, R. Ciolek-Torrello and J. H. Altschul. SRI, Tuscon, Arizona.

Wilcox, D. R.
1996 Organizational Parameters of Southwest/Mesoamerican Connectivity. Paper presented at the Southwest Symposium, Arizona State University, Tempe.

Willey, G. and P. Phillips
1958 *Method and Theory in American Archaeology*. The University of Chicago Press, Chicago.

Wilson, N.
1982 Misc. Field Notes of Dr. John Hudson. California Department of Parks and Recreation, Sacramento.

Wright, D. J., M. F. Goodchild and J. D. Proctor
1997 GIS: Tool or Science? *Annals of the Association of American Geographers* 87:2.

Appendix A

PCN Sites by County

Alameda

CA-ALA-0571 – Carnegie Off-Road State Park
New Un-recorded Site

Contra Costa

Kensington (not recorded) – Private Property
CA-CCO-0553H (125) – Alvarado Park, Wildcat Canyon
CA-CCO-152 – Canyon Trail Park

Fresno

CA-FRE-2485 – Swallow Rock

Humboldt

CA-HUM-0983 – Squaw Rock
CA-HUM-0000 – Whitlow site

Kern

CA-KER-2187 – Tecuya Creek
CA-KER-3265/H – Salt Creek Site

Lake

CA-LAK-0034 – Bachelor Valley Baby Rock
CA-LAK-1577 – On Reservation

Los Angeles

CA-LAN-1631 – Ritter Ranch PCNs need to be appended to this report

Mendocino

CA-MEN-0433 –Steward's Pt. 3 Bell Springs
CA-MEN-0793 – Feliz Creek – PCNs verified by Parkman
CA-MEN-0874 – Knights Valley (large boulder) #2
CA-MEN-0875 – Knight's Valley – Barrett's Pomo Baby Rock #1
CA-MEN-1800 – Cloverdale Boulder – per Sven's photo
CA-MEN-1912 – Spyrock
CA-MEN-1941 – (same as MEN-434) Steward's Pt. 3
CA-MEN-1944 – Greenfield Y
CA-MEN-2020 – Porter Valley
CA-MEN-2028 – Willits – Genesis #9
CA-MEN-2029 – Willits – Genesis #10
CA-MEN-2030 – Willits – Genesis #11
CA-MEN-2034 – Redwood Valley
CA-MEN-2035 – Willits – Infinity #1
CA-MEN-2213 – HREC – Huntley Peak Petroglyphs
CA-MEN-2200 – Keystone
CA-MEN-2221 – HREC – Hidden Hill Petroglyphs
CA-MEN-2235 – HREC – Watershed Down
CA-MEN-0000 – HREC 14 (unrecorded Chuck's Rock)
CA-MEN-0000 – HREC 15 (unrecorded Bob's Rock)

CA-MEN-0000 – Barrett's site not recorded, with PCNs. (Much)

Marin

CA-MRN-0057 – Nelson #57
CA-MRN-0414 – no name
CA-MRN-0416 – Deer Island Area #3
CA-MRN-0417 – Deer Island Area #4
CA-MRN-0418 – Deer Island Area #5
CA-MRN-0419 – Deer Island Area #6
CA-MRN-0420 – San Andreas Apts.
CA-MRN-0421 – Novato #18
CA-MRN-0422 – Novato #19
CA-MRN-0424 – no name
CA-MRN-0425 – Tiburon #3 Field #3
CA-MRN-0426 – Tiburon #4 Field #4
CA-MRN-0427 – Tiburon #5 Field #5
CA-MRN-0428 – Tiburon #6 Field #6
CA-MRN-0429 – Tiburon #7 Field #7
CA-MRN-0430 – Tiburon #8 Field #8
CA-MRN-0431 – Tiburon #9, #10, #11, Field #9, #10, #11
CA-MRN-0432 – Tiburon #12
CA-MRN-0433 – Tiburon #13 Field #13
CA-MRN-0434 – Tiburon #14, #15 Field #14, #15
CA-MRN-0435 – Tiburon #16 Field #16
CA-MRN-0436 – Tiburon #17 Field #17
CA-MRN-0437 – Tiburon #18 Field #18
CA-MRN-0438 – Tiburon #19 Field #19
CA-MRN-0439 – Tiburon #20A
CA-MRN-0440 – Tiburon #21 Field #21
CA-MRN-0442 – Ring Mountain (type site)
CA-MRN-442A – Ring Mountain (small boulder nearby)
CA-MRN-0452 – no name
CA-MRN-0465 – Whitt's Rock
CA-MRN-0481 – ARS 78-72-Rock 1
CA-MRN-0636 – on Ring Mountain
CA-MRN-0624 – is this the same as 0423A?
CA-MRN-0640 – near Taylor Road

Santa Barbara

CA-SBA-0167 – Soxtonocmu

San Benito

CA-SBN-0012 – San Benito Reservoir Site

Santa Clara County

CA-SCL-0048 – Ogier Ranch
CA-SCL-0063 – Silver Creek – update report o include PCNs
CA-SCL-0279 -(Sandstone) Santa Teresa
CA-SCL-0281 -(Sandstone) Santa Teresa

CA-SCL-0407 -(Sandstone –Stanford)
CA-SCL-0503? -(Coe-Bura Bura Peak)
CA-SCL-0000 - (Lee's Rock-Coe) Not Officially Recorded
CA-SCL-0873 – Calaveras Reservoir
CA-SCL-0000 – PCN Report by Teddy Goodrich – still private property

San Luis Obispo

CA-SLO-0225 – Green Valley Ranch site
CA-SLO-0324 – Warren Ranch Site
CA-SLO-0601 - Fleshman Site #4 - Cayucos Creek
CA-SLO-0619 – Hearst Ranch
CA-SLO-0620 – Hearst Ranch
CA-SLO-0657? – identified from photos
CA-SLO-1440 – Harmony Site
CA-SLO-0000 - (unrecorded – National Forest)

Sonoma

CA-SON-0568 – Warm Springs -
CA-SON-0579 – Warm Springs - Henry Moore Site
CA-SON-0585 – Yorty creek Site
CA-SON-0682 – Porter Creek – Sweetwater Creek
CA-SON-0844 – Petaluma #1
CA-SON-0846 – Petaluma #3
CA-SON-0928 – Grazelli Site – Mike's Rock
CA-SON-0929 – Grazelli Site – Jan's Rock
CA-SON-1026 – Nana's Rock
CA-SON-1041 – Lee's Rock
CA-SON-1075 – Kellie's Rock
CA-SON-1160 – Tolay Creek Site #7
CA-SON-1319 – Warm Springs
CA-SON-1320 – Warm Spring – Field Camp Rock
CA-SON-1383 – Warm Springs – Banded Rock
CA-SON-1942 – Steward's Pt. #8 – Cazadero (same as SON 268 & 434)
CA-SON-2303 – Chattan Recording
CA-SON-2354 – Novato Site
CA-SON-2403 – Phil's Rock – Rockpile Ranch
CA-SON-0000 (Cole Divide PCN –Brian)
CA-SON-0000 TCR-06 per Tim Jones Tolay Lake - not recorded

Trinity

CA-TRI-0001 – Slakaiya Rock Steward's Pt. 2, Little Moose Peak Petroglyph

Oregon

OREGON 1 (Port Orford) (35CU142)
OREGON 1 (Umpqua National Forest)

Baja California

Harman PCN (Cueva Pintada)?

Appendix B

Obsidian Hydration

Origer's Obsidian Laboratory

D. Gillette

Site#	Lab#	Catalog#	Description	Unit	Depth	Remarks	Measurements	Mean	Source
CA-MEN-852									
	1	118	Biface Fragment	4	40106			DH	K
	2.1	597A	Debitage	4	20-30	Band 1; None	2.4 2.4 2.4 2.5 2.5 2.5	2.5	BL
	2.2	597A	Debitage	4	20-30	Band 2; None	5.8 5.9 6.0 6.0 6.0 6.0	6	BL
	2.3	597A	Debitage	4	20-30	Band 3; None	8.5 8.7 8.7 8.8 8.9 8.9	8.8	BL
	3.1	597B	Debitage	4	20-30	Band 1; None	2.5 2.6 2.6 2.7 2.7 2.7	2.6	K
	3.2	597B	Debitage	4	20-30	Band 2; Weathered	9.2 9.2 9.4 9.4 9.5 9.6	9.4	K
	4	601A	Debitage	4	30-40	None	1.5 1.5 1.6 1.6 1.6 1.7	1.6	K
	5	601B	Debitage	4	30-40	None	2.4 2.4 2.4 2.4 2.5 2.5	2.4	K
	6	664A	Debitage	4	40-50	None	1.0 1.1 1.1 1.1 1.1 1.1	1.1	K
	7	664B	Debitage	4	40-50	None	2.6 2.6 2.6 2.6 2.6 2.6	2.6	K
	8	668	Biface Fragment	4	40-50	None	1.2 1.3 1.3 1.3 1.3 1.3	1.3	K
	9	671A	Debitage	4	50-60	None	4.4 4.5 4.5 4.6 4.6 4.7	4.6	K
	10	671B	Debitage	4	50-60	None	1.4 1.4 1.6 1.6 1.6 1.6	1.5	K
	11	681A	Debitage	4	60-70	None	3.1 3.2 3.2 3.3 3.3 3.3	3.2	K
	12	681B	Debitage	4	60-70	None	2.6 2.6 2.7 2.7 2.8 2.8	2.7	K
	13	690A	Debitage	4	70-80	Weathered	3.6 3.6 3.6 3.7 3.7 3.9	3.7	K
	14	690B	Debitage	4	70-80	None	1.3 1.3 1.3 1.3 1.3 1.3	1.3	K
	15	694	PP Proximal	4	70-80	None	2.3 2.4 2.4 2.4 2.5 2.5	2.4	K
	16	699A	Debitage	4	80-90	None	1.1 1.1 1.1 1.2 1.2 1.2	1.2	K
	17	699B	Debitage	4	80-90	None	3.0 3.1 3.2 3.2 3.3 3.3	3.2	K
	18	704	Biface Distal	4	80-90	None		DH	BL
	19	719	Biface Fragment	4	80-90	None	3.4 3.4 3.4 3.5 3.6 3.6	3.5	K
	20	720	Biface Fragment	4	90-100	None	3.4 3.4 3.4 3.4 3.4 3.5	3.4	K
	21	723A	Debitage	4	90-100	None	3.2 3.2 3.2 3.2 3.3 3.3	3.2	K
	22	723B	Debitage	4	90-100	None	3.2 3.2 3.2 3.2 3.2 3.3	3.2	K
	23	732A	Debitage	4	100-110	None	2.6 2.6 2.6 2.7 2.7 2.7	2.7	K
	24	732B	Debitage	4	100-110	None	3.0 3.2 3.2 3.3 3.3 3.3	3.2	K
	25	737A	Debitage	4	110-120	None	1.3 1.3 1.3 1.3 1.4 1.4	1.3	K
	26	737B	Debitage	4	110-120	Weathered	3.5 3.5 3.5 3.6 3.6 3.7	3.6	BL
	27	741	Biface Distal	4	110-120	None	5.2 5.3 5.4 5.4 5.5 5.7	5.4	BL

	28	745A	Debitage	4	120-130	Weathered	2.4 2.4 2.5 2.5 2.5 2.5	2.5	K
	29	745B	Debitage	4	120-130	None	2.8 2.8 2.8 2.9 2.9 3.1	2.9	K
	30	748A	Debitage	4	130-140	None	3.7 3.7 3.8 3.8 3.9 4.0	3.8	K
	31	748B	Debitage	4	130-140	None	3.2 3.3 3.3 3.3 3.3 3.3	3.3	K
	32	758A	Debitage	4	140-150	None	2.4 2.4 2.4 2.4 2.4 2.4	2.4	K
	33	758B	Debitage	4	140-150	None	3.3 3.3 3.3 3.4 3.4 3.6	3.4	K
	34	2014	Biface Medial	4	20-30	None	1.0 1.1 1.1 1.1 1.1 1.2	1.1	K
	35	2016	Flaked Tool	4	20-30	None	1.3 1.3 1.4 1.4 1.4 1.4	1.4	BL
	36	2017	Biface Fragment	4	50-60	None	1.7 1.7 1.8 1.9 1.9 1.9	1.8	K
	37	2018	Biface Fragment	4	50-60	None	1.3 1.3 1.3 1.3 1.3 1.4	1.3	K
	38	2023	Biface Fragment	4	60-70	None	1.0 1.0 1.0 1.0 1.1 1.2	1.1	?
	39	2025	Biface Fragment	4	60-70	None	3.2 3.3 3.3 3.4 3.4 3.5	3.4	K
	40	2042	Biface Fragment	4	70-80	None	3.4 3.4 3.4 3.4 3.5 3.7	3.5	K
	41	2046	Roughout	4	80-90	None	4.8 4.8 4.9 4.9 5.0 5.2	4.9	K
HREC-9									
	42	1127	Debitage	4	130-140	None	2.7 2.7 2.8 2.8 2.8 2.9	2.8	K
	43	1146A	Debitage	4	110-120	None	2.6 2.6 2.7 2.7 2.7 2.7	2.7	K
	44	1146B	Debitage	4	110-120	None	2.6 2.6 2.6 2.6 2.6 2.7	2.6	K
	45	1154A	Debitage	4	130-140	None	1.7 1.7 1.7 1.7 1.7 1.7	1.7	K
	46	1154B	Debitage	4	130-140	None	2.8 2.8 2.9 2.9 2.9 2.9	2.9	K
	47	1909A	Debitage	4	110-120	None	3.4 3.5 3.6 3.6 3.6 3.7	3.6	K
	48	1909B	Debitage	4	110-120	None		NVB	K
	49	2238	Debitage	4	120-130	None	2.4 2.4 2.5 2.5 2.5 2.6	2.5	K

D. Gillette

Site#	Lab#	Catalog#	Description	Unit	Depth	Remarks	Measurements	Mean	Text40
CA-MEN-852									
	1	504-73	Biface Frag	2	39741	None	2.3 2.3 2.4 2.4 2.4 2.6	2.4	K
	2	504-117	Roughout Frag	4	39741	None	2.3 2.3 2.3 2.3 2.3 2.3	2.3	BL
	3	504-202	Projectile Point Frag	3	39741	Weathered		NVB	BL

4	504-210A	Debitage	3	39741	Weathered		DH	K
5	504-210B	Debitage	3	39741	None	1.2 1.2 1.3 1.3 1.3 1.3	1.3	K
6	504-210C	Debitage	3	39741	None	1.0 1.1 1.1 1.1 1.1 1.2	1.1	K
7	504-210D	Debitage	3	39741	None	2.0 2.0 2.0 2.1 2.1 2.1	2.1	BL
8.1	504-210E	Debitage	3	39741	None		NVB	K
8.2	504-210E	Debitage	3	39741	None	1.7 1.7 1.8 1.8 1.8 1.8	1.8	K
9	504-231	Biface	1	50-60	None	1.4 1.4 1.4 1.4 1.4 1.4	1.4	K
10	504-248	Biface Frag	2	50-60	None	1.1 1.1 1.1 1.1 1.2 1.2	1.1	K
11	504-367	Used Flake	1	100-110	Band 1; Weathered		NVB	K
12	504-483A	Debitage	2	120-130	Band 2; Crack	1.7 1.7 1.8 1.9 1.9 1.9	1.8	K
13	504-483B	Debitage	2	120-130	None	1.9 2.0 2.0 2.0 2.0 2.0	2	K
14	504-483C	Debitage	2	120-130	None	5.3 5.3 5.4 5.4 5.5 5.5	5.4	BL
15	504-496A	Debitage	2	130-140	None	1.9 2.0 2.0 2.0 2.1 2.3	2.1	BL
16	504-496B	Debitage	2	130-140	None	3.0 3.1 3.2 3.2 3.2 3.2	3.2	K
17	504-679	Biface Frag	4	50-60	None	2.8 2.9 2.9 2.9 3.0 3.2	3	K
18	504-742	Biface	4	110-120	Weathered	1.6 1.6 1.8 1.8 1.8 1.9	1.8	K
19	504-752	Biface Frag	4	130-140	None	1.2 1.2 1.2 1.2 1.3 1.3	1.2	K
20	504-761A	Debitage	4	150-153	None	4.0 4.1 4.1 4.1 4.2 4.4	4.2	BL
21	504-761B	Debitage	4	150-153	Weathered		NVB	K
22	504-761C	Debitage	4	150-153	Weathered		DH	A?
23.1	504-761D	Debitage	4	150-153	Band 1; Weathered		DH	BL
23.2	504-761D	Debitage	4	150-153	Band 2; Crack	4.5 4.5 4.5 4.6 4.6 4.7	4.6	BL
24.1	504-761E	Debitage	4	150-153	Band 1; Weathered		DH	K
24.2	504-761E	Debitage	4	150-153	Band 2; Crack	3.9 3.9 3.9 4.0 4.0 4.2	4	K
25	504-801	Biface	5	39741	None	3.2 3.3 3.3 3.3 3.4 3.4	3.3	K
26	504-808	Projectile Point Frag	6	39741	None	1.6 1.6 1.6 1.6 1.7 1.7	1.6	BL
27	504-852A	Debitage	7	20-30	None	2.8 2.8 2.9 2.9 3.0 3.1	2.9	K
28.1	504-852B	Debitage	7	20-30	Band 1; Weathered		NVB	K
28.2	504-852B	Debitage	7	20-30	Band 2; Crack	3.3 3.3 3.3 3.3 3.4 3.4	3.3	K
29	504-852C	Debitage	7	20-30	None		NVB	K
30	504-852D	Debitage	7	20-30	None	3.1 3.2 3.2 3.3 3.3 3.3	3.2	K
31	504-852E	Debitage	7	20-30	None	3.2 3.2 3.2 3.3 3.3 3.4	3.3	K
32	504-858	Biface Frag	5	50-60	None	3.0 3.1 3.1 3.2 3.2 3.3	3.2	K
33	504-873A	Debitage	5	60-70	None	1.8 1.8 1.9 1.9 1.9 2.0	1.9	K
34	504-873B	Debitage	5	60-70	None	2.6 2.6 2.6 2.6 2.7 2.8	2.7	K
35	504-873C	Debitage	5	60-70	None	3.5 3.6 3.6 3.7 3.8 3.8	3.7	K
36	504-873-D	Debitage	5	60-70	None	3.4 3.4 3.4 3.4 3.5 3.6	3.5	K

	37	504-873E	Debitage	5	60-70	None	3.2 3.3 3.3 3.3 3.4 3.4	3.3	K
	38	504-889A	Debitage	6	60-70	None	3.3 3.3 3.4 3.4 3.4 3.4	3.4	K
	39	504-889B	Debitage	6	60-70	None	1.0 1.0 1.1 1.1 1.1 1.1	1.1	K
	40	504-889C	Debitage	6	60-70	None	3.6 3.6 3.6 3.6 3.6 3.7	3.6	K
	41	504-889D	Debitage	6	60-70	None	3.6 3.6 3.7 3.8 3.8 3.9	3.7	K
	42	504-889E	Debitage	6	60-70	None	5.8 6.0 6.0 6.0 6.1 6.2	6	BL
	43	504-890	Biface Frag	6	60-70	Weathered	1.0 1.0 1.1 1.1 1.1 1.2	1.1	NV
	44	504-961	Biface Frag	6	100-110	None	4.0 4.0 4.2 4.2 4.2 4.3	4.2	K
	45	504-1958	Biface Frag	1	39741	None	2.6 2.6 2.7 2.8 2.8 2.8	2.7	K
	46	504-2049	Biface Frag	4	90-100	None	4.9 5.0 5.0 5.0 5.1 5.2	5	BL
	47	504-2132	Flake Tool Frag	5	60-70	None	1.7 1.7 1.8 1.8 1.8 1.8	1.8	NV
	48	504-2172	Roughout	7	100-110	None	3.1 3.2 3.3 3.3 3.3 3.4	3.3	K
HREC-8									
	49	504-1766A	Debitage	1	39741	Weathered	1.7 1.9 1.9 2.0 2.0 2.1	1.9	K
	50	504-1766B	Debitage	1	39741	None	3.0 3.0 3.0 3.2 3.2 3.3	3.1	K
	51	504-1766C	Debitage	1	39741	None	2.4 2.4 2.4 2.4 2.4 2.4	2.4	K
	52	504-1766D	Debitage	1	39741	None	2.4 2.4 2.4 2.4 2.4 2.5	2.4	K
	53	504-1766E	Debitage	1	39741	None	1.4 1.4 1.6 1.6 1.6 1.6	1.5	BL
	54	504-1773	Biface Frag	1	40-50	None	1.7 1.8 1.8 1.8 1.8 1.8	1.8	K
	55	504-1776A	Debitage	1	50-60	None	1.6 1.6 1.6 1.6 1.7 1.7	1.6	K
	56	504-1776B	Debitage	1	50-60	None	2.4 2.5 2.6 2.6 2.6 2.6	2.6	K
	57	504-1776C	Debitage	1	50-60	None	3.9 4.0 4.0 4.1 4.1 4.1	4	K
	58	504-1776D	Debitage	1	50-60	None	2.8 2.8 2.9 2.9 2.9 3.1	2.9	K
	59	504-1776E	Debitage	1	50-60	None	2.0 2.1 2.1 2.1 2.1 2.3	2.1	K
	60	504-1795	Biface Frag	1	100-110	None	1.7 1.7 1.8 1.8 1.9 1.9	1.8	K
	61	504-1805A	Debitage	1	110-120	None	2.7 2.7 2.7 2.7 2.9 2.9	2.8	K
	62	504-1805B	Debitage	1	110-120	None	1.3 1.3 1.3 1.4 1.4 1.4	1.4	K
	63	504-1805C	Debitage	1	110-120	None	2.5 2.5 2.6 2.6 2.6 2.6	2.6	K
	64	504-1805D	Debitage	1	110-120	None	1.9 2.0 2.0 2.0 2.1 2.1	2	K
	65	504-1805E	Debitage	1	110-120	None	3.1 3.1 3.2 3.2 3.3 3.3	3.2	K
	66	504-2194	Used Flake Frag	1	60-70	None	2.6 2.6 2.7 2.7 2.7 2.9	2.7	K
HREC-9									
	67	504-249A	Debitage	2	39741	None	1.3 1.3 1.3 1.3 1.3 1.5	1.3	BL
	68	504-249B	Debitage	2	39741	None	1.7 1.7 1.8 1.8 1.8 1.9	1.8	K
	69	504-249C	Debitage	2	39741	None		NVB	K
	70	504-249D	Debitage	2	39741	None	0.8 0.8 1.0 1.0 1.0 1.0	0.9	K
	71	504-249E	Debitage	2	39741	None	1.0 1.0 1.0 1.0 1.1 1.1	1	K
	72	504-252	Projectile Point	2	39741	None	1.0 1.0 1.1 1.1 1.1 1.2	1.1	K

		Frag						
73	504-256	Projectile Point Frag	1	60-70	None	1.4 1.4 1.4 1.6 1.6 1.6	1.5	K
74	504-261A	Debitage	1	60-70	None	3.7 3.8 3.8 3.8 3.9 4.0	3.8	BL
75	504-261B	Debitage	1	60-70	None	2.0 2.0 2.1 2.1 2.1 2.3	2.1	K
76	504-261C	Debitage	1	60-70	None	1.6 1.6 1.6 1.6 1.7 1.7	1.6	K
77	504-261D	Debitage	1	60-70	None		DH	K
78	504-261E	Debitage	1	60-70	None	1.6 1.6 1.6 1.7 1.7 1.7	1.7	K
79	504-325	Biface Frag	1	90-100	None	2.1 2.3 2.3 2.4 2.4 2.4	2.3	K
80	504-332	Biface Frag	2	60-70	None		DH	BL
81	504-1052	Used Flake Frag	1	0-20	None	0.8 1.0 1.0 1.0 1.0 1.1	1	K
82	504-1053	Projectile Point	1	0-20	Weathered		DH	K
83	504-1055	Biface Frag	1	0-20	None	2.5 2.5 2.5 2.5 2.6 2.7	2.6	K
84	504-1095	Biface	1	50-60	None	2.4 2.4 2.4 2.4 2.4 2.4	2.4	K
85.1	504-1137A	Debitage	2	90-100	Band 1; None	1.1 1.1 1.1 1.1 1.1 1.1	1.1	BL
85.2	504-1137A	Debitage	2	90-100	Band 2; None	4.9 4.9 5.0 5.1 5.1 5.2	5	BL
86	504-1137B	Debitage	2	90-100	None	3.8 3.8 4.0 4.0 4.1 4.2	4	BL
87	504-1137C	Debitage	2	90-100	None	2.4 2.5 2.6 2.6 2.6 2.6	2.6	K
88	504-1137D	Debitage	2	90-100	None	1.7 1.8 1.8 1.8 1.9 1.9	1.8	K
89	504-1137E	Debitage	2	90-100	None	1.6 1.6 1.6 1.7 1.8 1.9	1.7	K
90	504-1142	Biface Frag	2	90-100	None	2.0 2.0 2.0 2.0 2.0 2.1	2	K
91	504-1148	Projectile Point Frag	2	100-110	None	3.0 3.0 3.1 3.1 3.1 3.3	3.1	BL
92	504-1186A	Debitage	2	170-180	None	1.9 1.9 2.0 2.0 2.0 2.1	2	K
93	504-1186B	Debitage	2	170-180	None	3.1 3.1 3.1 3.2 3.2 3.2	3.2	K
94	504-1186C	Debitage	2	170-180	None	2.5 2.6 2.6 2.6 2.7 2.8	2.6	K
95	504-1186D	Debitage	2	170-180	Weathered	3.6 3.7 3.7 3.8 3.9 3.9	3.8	K
96	504-1186E	Debitage	2	170-180	None	2.0 2.1 2.1 2.1 2.3 2.3	2.2	K
97	504-1189	Roughout	1	60-70	None	1.4 1.6 1.6 1.6 1.6 1.6	1.6	K
98	504-1193	Used Flake	1	0-20	Weathered		DH	K
99	504-1197	Roughout	1	50-60	None		NVB	K
100	504-1198	Biface Frag	2	140-150	None	1.9 1.9 2.0 2.0 2.0 2.1	2	K

Submitted by Wise-Hawthorne

Lab.	Submitter	Site.	Job.	Catalog.	Description	Depth	Remarks	Measurements	Mean	Source
1	T. Wise-Harthorn - UC Davis	CA-MEN-852	2002-H2152	852-242A-1	Debitage	20-30	none	1.3 1.3 1.4 1.4 1.5 1.5	1.4	K(v)
2	T. Wise-Harthorn - UC Davis	CA-MEN-852	2002-H2152	852-242A-2	Debitage	20-30	none	2.4 2.4 2.4 2.4 2.4 2.5	2.4	K(v)
3	T. Wise-Harthorn - UC Davis	CA-MEN-	2002-H2152	852-242A-3	Debitage	20-30	none	1.0 1.0 1.0 1.1 1.1 1.1	1.1	K(v)

		852								
4	T. Wise-Harthorn - UC Davis	CA-MEN-852	2002-H2152	852-242A-4	Debitage	20-30	none	0.9 0.9 0.9 1.0 1.0 1.0	1.0	K(v)
5	T. Wise-Harthorn - UC Davis	CA-MEN-852	2002-H2152	852-242A-5	Debitage	20-30	none	3.4 3.4 3.4 3.5 3.6 3.8	3.5	K(v)
6	T. Wise-Harthorn - UC Davis	CA-MEN-852	2002-H2152	852-295-6	Debitage	130-140	none	3.1 3.1 3.2 3.2 3.2 3.2	3.2	K(v)
7	T. Wise-Harthorn - UC Davis	CA-MEN-852	2002-H2152	852-295-7	Debitage	130-140	none	3.8 3.8 3.8 3.9 3.9 3.9	3.9	K(v)
8	T. Wise-Harthorn - UC Davis	CA-MEN-852	2002-H2152	852-295-8	Debitage	130-140	none	1.7 1.8 1.8 1.8 1.8 1.8	1.8	K(v)
9	T. Wise-Harthorn - UC Davis	CA-MEN-852	2002-H2152	852-295-9	Debitage	130-140	none	5.6 5.6 5.6 5.6 5.7 5.7	5.6	BL(v)
10	T. Wise-Harthorn - UC Davis	CA-MEN-852	2002-H2152	852-295-10	Debitage	130-140	none	2.5 2.5 2.6 2.6 2.6 2.6	2.6	K(v)
11	T. Wise-Harthorn - UC Davis	CA-MEN-2216	2002-H2152	2216-4-11	Debitage	20-30	none	0.9 0.9 0.9 0.9 0.9 0.9	0.9	K(v)
12	T. Wise-Harthorn - UC Davis	CA-MEN-2216	2002-H2152	2216-4-12	Debitage	20-30	none	1.0 1.0 1.0 1.1 1.1 1.1	1.1	K(v)
13	T. Wise-Harthorn - UC Davis	CA-MEN-2216	2002-H2152	2216-4-13	Debitage	20-30	none	2.2 2.2 2.2 2.2 2.3 2.3	2.2	K(v)
14	T. Wise-Harthorn - UC Davis	CA-MEN-2216	2002-H2152	2216-4-14	Debitage	20-30	none		DH	K(v)
15	T. Wise-Harthorn - UC Davis	CA-MEN-2216	2002-H2152	2216-4-15	Debitage	20-30	none	2.4 2.5 2.5 2.5 2.5 2.6	2.5	K(v)
16	T. Wise-Harthorn - UC Davis	CA-MEN-2216	2002-H2152	2216-10-16	Debitage	50-60	none	2.9 2.9 2.9 2.9 3.0 3.1	3.0	K(v)
17	T. Wise-Harthorn - UC Davis	CA-MEN-2216	2002-H2152	2216-10-17	Debitage	50-60	none	4.6 4.6 4.6 4.7 4.7 4.7	4.7	BL(v)
18	T. Wise-Harthorn - UC Davis	CA-MEN-2216	2002-H2152	2216-10-18	Debitage	50-60	none	2.5 2.5 2.5 2.5 2.5 2.5	2.5	K(v)
19	T. Wise-Harthorn - UC Davis	CA-MEN-2216	2002-H2152	2216-10-19	Debitage	50-60	none	1.3 1.3 1.4 1.4 1.4 1.5	1.4	K(v)
20	T. Wise-Harthorn - UC Davis	CA-MEN-2216	2002-H2152	2216-10-20	Debitage	50-60	none	2.5 2.5 2.5 2.5 2.5 2.6	2.5	K(v)
21	T. Wise-Harthorn - UC Davis	HREC-9	2002-H2152	HREC-9-16-21	Debitage	20-30	none	2.4 2.4 2.4 2.5 2.5 2.6	2.5	K(v)
22	T. Wise-Harthorn - UC Davis	HREC-9	2002-H2152	HREC-9-16-22	Debitage	20-30	none	1.1 1.1 1.1 1.1 1.1 1.1	1.1	K(v)
23	T. Wise-Harthorn - UC Davis	HREC-9	2002-H2152	HREC-9-16-23	Debitage	20-30	none	2.7 2.7 2.8 2.9 2.9 2.9	2.8	K(v)
24	T. Wise-Harthorn - UC Davis	HREC-9	2002-H2152	HREC-9-16-24	Debitage	20-30	none	3.0 3.0 3.0 3.0 3.0 3.1	3.0	K(v)
25	T. Wise-Harthorn - UC Davis	HREC-9	2002-H2152	HREC-9-16-25	Debitage	20-30	none	2.0 2.0 2.0 2.0 2.0 2.0	2.0	K(v)
26	T. Wise-Harthorn - UC Davis	HREC-9	2002-H2152	HREC-9-111-26	Debitage	160-170	none	1.8 1.8 1.8 1.8 1.8 1.9	1.8	K(v)
27	T. Wise-Harthorn - UC Davis	HREC-9	2002-H2152	HREC-9-111-27	Debitage	160-170	none	3.2 3.2 3.2 3.2 3.3 3.3	3.2	K(v)
28	T. Wise-Harthorn	HREC-9	2002-	HREC-9-	Debitage	160-	none	2.6 2.6 2.6 2.7	2.7	K(v)

	- UC Davis		H2152	111-28		170		2.7 2.7		
29	T. Wise-Harthorn - UC Davis	HREC-9	2002-H2152	HREC-9-111-29	Debitage	160-170	none	2.6 2.7 2.7 2.7 2.8 2.9	2.7	K(v)
30	T. Wise-Harthorn - UC Davis	HREC-9	2002-H2152	HREC-9-111-30	Debitage	160-170	none	3.1 3.1 3.2 3.2 3.3 3.4	3.2	K(v)

Appendix C

Obsidian Hydration Rim Measurements

D. Gillette

Site#	Catalog#	Description	Depth	Mean Rim Measurement	Source
CA-MEN-852					
	504-73	Biface Frag	10-20	2.4	K
	504-117	Roughout Frag	10-20	2.3	BL
	504-210B	Debitage	10-20	1.27	K
	504-210C	Debitage	10-20	1.1	K
	504-210D	Debitage	10-20	2.05	BL
	504-210E	Debitage	10-20	1.76	K
	504-231	Biface	50-60	1.4	K
	504-248	Biface Frag	50-60	1.13	K
	504-483A	Debitage	120-130	1.82	K
	504-483B	Debitage	120-130	1.98	K
	504-483C	Debitage	120-130	5.4	BL
	504-496A	Debitage	130-140	2.05	BL
	504-496B	Debitage	130-140	3.15	K
	504-679	Biface Frag	50-60	2.95	K
	504-742	Biface	110-120	1.75	K
	504-752	Biface Frag	130-140	1.25	K
	504-761A	Debitage	150-153	4.15	BL
	504-761D	Debitage	150-153	4.57	BL
	504-761E	Debitage	150-153	3.98	K
	504-801	Biface	10-20	3.32	K
	504-808	Projectile Point Frag	10-20	1.65	BL
	504-852A	Debitage	20-30	2.92	K
	504-852B	Debitage	20-30	3.33	K
	504-852D	Debitage	20-30	3.23	K
	504-852E	Debitage	20-30	3.26	K
	504-858	Biface Frag	50-60	3.15	K
	504-873A	Debitage	60-70	1.88	K
	504-873B	Debitage	60-70	2.65	K
	504-873C	Debitage	60-70	3.67	K
	504-873-D	Debitage	60-70	3.45	K
	504-873E	Debitage	60-70	3.32	K
	504-889A	Debitage	60-70	3.36	K
	504-889B	Debitage	60-70	1.07	K
	504-889C	Debitage	60-70	3.62	K
	504-889D	Debitage	60-70	3.73	K
	504-889E	Debitage	60-70	6.02	BL
	504-890	Biface Frag	60-70	1.1	NV
	504-961	Biface Frag	100-110	4.15	K
	504-1958	Biface Frag	10-20	2.72	K
	504-2049	Biface Frag	90-100	5.05	BL
	504-2132	Flake Tool Frag	60-70	1.77	NV
	242A-1	Debitage	20-30	1.4	K
	242A-2	Debitage	20-30	2.42	K
	242A-3	Debitage	20-30	1.05	K
	242A-4	Debitage	20-30	0.95	K
	242A-5	Debitage	20-30	3.52	K
	295-6	Debitage	130-140	3.17	K

	295-7	Debitage	130-140	3.85	K
	295-8	Debitage	130-140	1.78	K
	295-9	Debitage	130-140	5.63	BL
	295-10	Debitage	130-140	2.57	K
	504-2172	Roughout	100-110	3.27	K
CA-MEN-3357					
	504-1766A	Debitage	10-20	1.93	K
	504-1766B	Debitage	10-20	3.12	K
	504-1766C	Debitage	10-20	2.4	K
	504-1766D	Debitage	10-20	2.42	K
	504-1766E	Debitage	10-20	1.53	BL
	504-1773	Biface Frag	40-50	1.78	K
	504-1776A	Debitage	50-60	1.63	K
	504-1776B	Debitage	50-60	2.55	K
	504-1776C	Debitage	50-60	4.03	K
	504-1776D	Debitage	50-60	2.9	K
	504-1776E	Debitage	50-60	2.12	K
	504-1795	Biface Frag	100-110	1.8	K
	504-1805A	Debitage	110-120	2.77	K
	504-1805B	Debitage	110-120	1.35	K
	504-1805C	Debitage	110-120	2.57	K
	504-1805D	Debitage	110-120	2.02	K
	504-1805E	Debitage	110-120	3.2	K
	504-2194	Used Flake Frag	60-70	2.7	K
CA-MEN-3462					
	504-249A	Debitage	10-20	1.32	BL
	504-249B	Debitage	10-20	1,77	K
	504-249D	Debitage	10-20	0.93	K
	504-249E	Debitage	10-20	1.03	K
	504-252	Projectile Point Frag	10-20	1.08	K
	504-256	Projectile Point Frag	60-70	1.5	K
	504-261A	Debitage	60-70	3.88	BL
	504-261B	Debitage	60-70	2.1	K
	504-261C	Debitage	60-70	1.63	K
	504-261E	Debitage	60-70	1.65	K
	504-325	Biface Frag	90-100	2.32	K
	504-1052	Used Flake Frag	0-20	0.98	K
	504-1055	Biface Frag	0-20	2.55	K
	504-1095	Biface	50-60	2.4	K
	504-1137A	Debitage	90-100	1.1	BL
	504-1137A	Debitage	90-100	5.03	BL
	504-1137B	Debitage	90-100	3.98	BL
	504-1137C	Debitage	90-100	2.57	K
	504-1137D	Debitage	90-100	1.82	K
	504-1137E	Debitage	90-100	1.7	K
	504-1142	Biface Frag	90-100	2.02	K
	504-1148	Projectile Point Frag	100-110	3.1	BL
	504-1186A	Debitage	170-180	1.98	K
	504-1186B	Debitage	170-180	3.15	K
	504-1186C	Debitage	170-180	2.63	K
	504-1186D	Debitage	170-180	3.77	K
	504-1186E	Debitage	170-180	2.15	K
	504-1189	Roughout	60-70	1.57	K
	504-1198	Biface Frag	140-150	1.98	K

504-597a	Debitage	20-30	2.45	BL
504-597a	Debitage	20-30	5.95	BL
504-597a	Debitage	20-30	8.75	K
504-597b	Debitage	20-30	2.63	K
504-597b	Debitage	20-30	9.38	K
504-601a	Debitage	30-40	1.58	K
504-601b	Debitage	30-40	2.43	K
504-664a	Debitage	40-50	1.08	K
504-664b	Debitage	40-50	2.6	K
504-668	Biface Frag	40-50	1.28	K
504-671a	Debitage	50-60	4.55	K
504-671b	Debitage	50-60	1.53	K
504-681a	Debitage	60-70	3.23	K
504-681b	Debitage	60-70	2.7	K
504-690a	Debitage	70-80	3.68	K
5-4-690b	Debitage	70-80	1.3	K
504-694	Projectile Point Frag	70-80	2.42	K
504-699a	Debitage	80-90	1.15	K
504-699b	Debitage	80-90	3.18	K
504-719	Biface Frag	80-90	3.48	K
504-720	Biface Frag	90-100	3.42	K
504-723a	Debitage	90-100	3.23	K
504-723b	Debitage	90-100	3.22	K
504-732a	Debitage	100-110	2.65	K
504-732b	Debitage	100-110	3.22	K
504-737a	Debitage	110-120	1.33	K
504-737b	Debitage	110-120	3.57	BL
504-741	Biface Frag	110-120	5.42	BL
504-745a	Debitage	120-130	2.47	K
504-745b	Debitage	120-130	2.88	K
504-748a	Debitage	130-140	3.82	K
504-748b	Debitage	130-140	3.28	K
504-758a	Debitage	140-150	2.4	K
504-758b	Debitage	140-150	3.38	K
504-2014	Biface Frag	20-30	1.1	K
504-2016	Flake Tool Frag	20-30	1.37	BL
504-2017	Biface Frag	50-60	1.82	K
504-2018	Biface Frag	50-60	1.32	K
504-2023	Biface Frag	60-70	1.05	?
504-2025	Biface Frag	60-70	3.35	K
504-2042	Biface Frag	70-80	3.47	K
504-2046	Roughout	80-90	4.93	K
504-1127	Debitage	130-140	2.78	K
504-1146a	Debitage	110-120	2.67	K
504-1146b	Debitage	110-120	2.62	K
504-1154a	Debitage	130-140	1.7	K
504-1154b	Debitage	130-140	2.87	K
504-1909a	Debitage	110-120	3.57	K
504-2238	Debitage	120-130	2.48	K
16-21	Debitage	20-30	2.47	K
16-22	Debitage	20-30	1.1	K
16-23	Debitage	20-30	2.82	K
16-24	Debitage	20-30	3.02	K
16-25	Debitage	20-30	2.0	K
111-2	Debitage	160-170	1.82	K
111-2	Debitage	160-170	3.23	K
111-2	Debitage	160-170	2.65	K
111-2	Debitage	160-170	2.73	K
111-3	Debitage	160-170	3.22	K

CA-MEN-2216					
	4-11	Debitage	20-30	0.9	K
	4-12	Debitage	20-30	1.05	K
	4-13	Debitage	20-30	2.23	K
	4-15	Debitage	20-30	2.5	K
	10-16	Biface Frag	50-60	2.95	K
	10-17	Debitage	50-60	4.65	BL
	10-18	Debitage	50-60	2.5	K
	10-19	Debitage	50-60	1.38	K
	10-20	Debitage	50-60	2.52	K

Appendix D

XRF Results from Richard Hughes

Geochemical Research Laboratory Letter Report 2008-27

April 3, 2008

Ms. Donna Gillette
1642 Tiber Court
San Jose, CA 95138

Dear Donna:

This letter reports the results of energy dispersive x-ray fluorescence (edxrf) analysis of 50 obsidian artifacts recovered from two archaeological sites (CA-Men-852, n= 42; HREC-9, n= 8) located within the Hopland Research and Extension Center, Mendocino County, California. Table 1 and Figure 1 provides *quantitative* edxrf data on 46 artifacts, while Table 2 and Figure 2 present *semi-quantitative* data generated for an additional four specimens that were too small (i.e. < 9-10 mm diameter) and/or too thin (i.e. < ca. 1.5 mm thick) for generating reliable quantitative data using non-destructive edxrf. I am pleased to have been able to conduct these analyses for you as the 2007 recipient of the Society for California Archaeology's James A. Bennyhoff Memorial Fund Award.

Analyses of obsidian are performed at my laboratory on a QuanX-EC™ (Thermo Electron Corporation) edxrf spectrometer equipped with a silver (Ag) x-ray tube, a 50 kV x-ray generator, digital pulse processor with automated energy calibration, and a Peltier cooled solid state detector with 145 eV resolution (FWHM) at 5.9 keV. The x-ray tube was operated at differing voltage and current settings to optimize excitation of the elements selected for analysis. In this case analyses were conducted for the elements rubidium (Rb Kα), strontium (Sr Kα), yttrium (Y Kα), zirconium (Zr Kα), niobium (Nb Kα) and barium (Ba Kα), and to generate iron vs. manganese (Fe Kα/Mn Kα) ratios. X-ray tube current was scaled automatically to the physical size of the specimen.

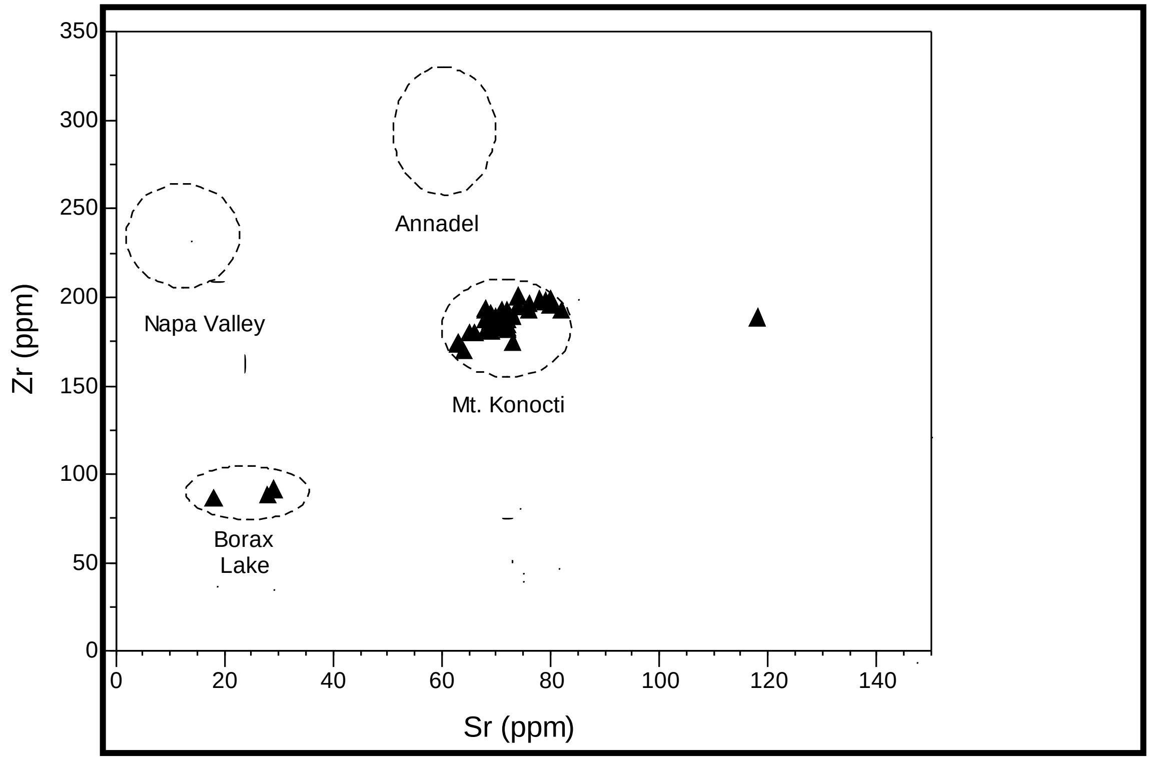
After x-ray spectra are acquired and elemental intensities extracted for each peak region of interest, matrix correction algorithms are applied to specific regions of the x-ray energy spectrum to compensate for inter-element absorption and enhancement effects. Following these corrections, intensities are converted to concentration estimates by employing a least-squares calibration line established for each element from analysis of up to 30 international rock standards certified by the U.S. Geological Survey, the U.S. National Institute of Standards and Technology, the Geological Survey of Japan, the Centre de Recherches Petrographiques et Geochimiques (France), and the South African Bureau of Standards. Further details pertaining to x-ray tube operating conditions and calibration appear in Hughes (1988, 1994).

All trace element values (except Fe/Mn ratios) for the artifacts in Table 1 are expressed in quantitative units (i.e. parts per million [ppm] by weight), and these were compared directly to values for known obsidian sources that appear in Bowman et al. (1973), Hughes (1983, 1985, 1986, 1988, 1989, 1994), Jack (1976), Jackson (1989), and Stross (et al. 1976). Artifacts are assigned to a parent obsidian type if diagnostic trace element concentration values (i.e., ppm values for Rb, Sr, Y, Zr and, when necessary Ba, Ti, Mn and $Fe_2O_3^T$) corresponded at the 2-sigma level. Stated differently, artifact-to-obsidian source (geochemical type, *sensu* Hughes 1998) matches are considered reliable if diagnostic mean measurements for artifacts fell within 2 standard deviations of mean values for source standards. The term "diagnostic" is used here to specify those trace elements that are well measured by x-ray fluorescence, and whose concentrations show low intra-source variability and marked variability across sources (see Hughes 1993). Zn and Ga ppm concentrations are not considered "diagnostic" because they don't usually vary significantly across obsidian sources (see Hughes1984).
The trace element composition measurements presented in Table 1 are reported to the nearest ppm to reflect the resolution capabilities of non-destructive edxrf spectrometry for quantitative analysis. The resolution limits of the present x-ray fluorescence instrument for the determination of Rb is about 4 ppm; for Sr about 3 ppm; Y about 3 ppm; Zr about 4 ppm; and Nb about 2 ppm (see Hughes [1994] for other elements). When counting and fitting error uncertainty estimates (the "±" value in the table) for a sample are greater than calibration-imposed limits of resolution, the larger number is a more conservative reflection of composition variation and measurement error arising from differences in sample size, surface and x-ray reflection geometry.

Forty-six of the specimens you submitted were of adequate physical size to generate quantitative composition estimates (see Table 1 and Figure 1). Forty-three of these artifacts match the trace element profile of Mt. Konocti obsidian (Jack 1976: Table 11.3; Jackson 1989: Table 2) while three others were manufactured from Borax Lake volcanic glass (Jack 1976: Table 11.3; Jackson 1989: Table 2). One biface tip from Men-852 (cat. no. 118) has mid-Z trace element values that plot outside the range of my Mt. Konocti geologic reference samples (see Figure 1), but the values do fall within the range reported by Stross et al. (1976: Table 13.2) for this source, so the artifact is provisionally assigned to this North Coast Range source.

Figure 1

Zr vs. Sr Composition of Artifacts from Men-852 and HREC-9



Dashed lines represent range of variation in obsidian source samples from data in Jack (1976), Jackson (1989) and my in-house-geologic geologic standards. Filled triangles represent plots for artifacts from data in Table 1.

Table 2

Semi-Quantitative Element Data for Artifacts from CA-Men-852 and HREC-9

	Element Intensities			**Intensity Ratios**						Obsidian Source
Cat. no.	Rb	Sr	Zr	Σ Rb,Sr,Zr		Rb%	Sr%	Zr%	Fe/Mn	(Chemical Type)
Men-852, 601b	396	149	591	1136		.349	.131	.520	nm	Mt. Konocti
Men-852, 681b	384	146	590	1120		.343	.130	.527	nm	Mt. Konocti
Men-852, 741	350	29	245	624		.561	.047	.392	68	Borax Lake
HREC-9, 1154b	360	141	552	1053		.342	.134	.524	nm	Mt. Konocti

Elemental intensities (counts/second above background) generated at 30 seconds livetime. nm= not measured.

I generally report trace element measurements in quantitative units (i.e. ppm) and make artifact-to-source attributions on the basis of correspondences in diagnostic trace element concentration values, but four of specimens you sent were too small and thin to generate x-ray counting statistics adequate for proper conversion from background-corrected intensities to quantitative concentration estimates (i.e., ppm). I analyzed these small specimens *semi-quantitatively* to generate intensity (peak count) data for the elements Rb, Sr, and Zr. After background subtraction, the intensities (counts per second) were converted to percentages. The counting data and derived ratios appear in Table 2, and the plotted values appear in Figure 2. Source assignments were made by comparing the plots for artifacts against the Rb/Sr/Zr parameters (and Fe/Mn ratio ranges) of known source types identified archaeologically in the San Francisco Bay area and North Coast Range (cf. Jackson 1974; 1989: Figure 3; Jack 1976: Figure 11.1a. 11.2a). There are problems in the use of ternary diagrams which should be considered when interpreting source assignments made solely on the basis of semi-quantitative (peak count) data (see Hughes 1984: 1-3; 1998: 106-107 for discussion). Rb/Sr/Zr plots for Napa Valley glasses are distinct from other obsidians found archaeologically in the San Francisco Bay area. Casa Diablo plots are distinct from others on this ternary diagram, but they overlap in part with ternary plots for some obsidian from the Medicine Lake Highland in northern California (cf. Jackson 1974: Fig. 13; Jack 1976: Fig. 11.3a). Likewise Bodie Hills plots overlap in part with Buck Mountain and Sugar Hill obsidians of the Warner Mountains in northeastern California, and Annadel plots overlap partially with Obsidian Butte of Imperial County, southern California. None of these overlaps are problematic for artifacts from sites in the Hopland area.

In summary, combining results from both quantitative (n= 46) and semi-quantitative (n= 4) techniques, it was determined that 46 specimens analyzed from these two sites were made from Mt. Konocti obsidian, and that four other artifacts were manufactured from Borax Lake volcanic glass.

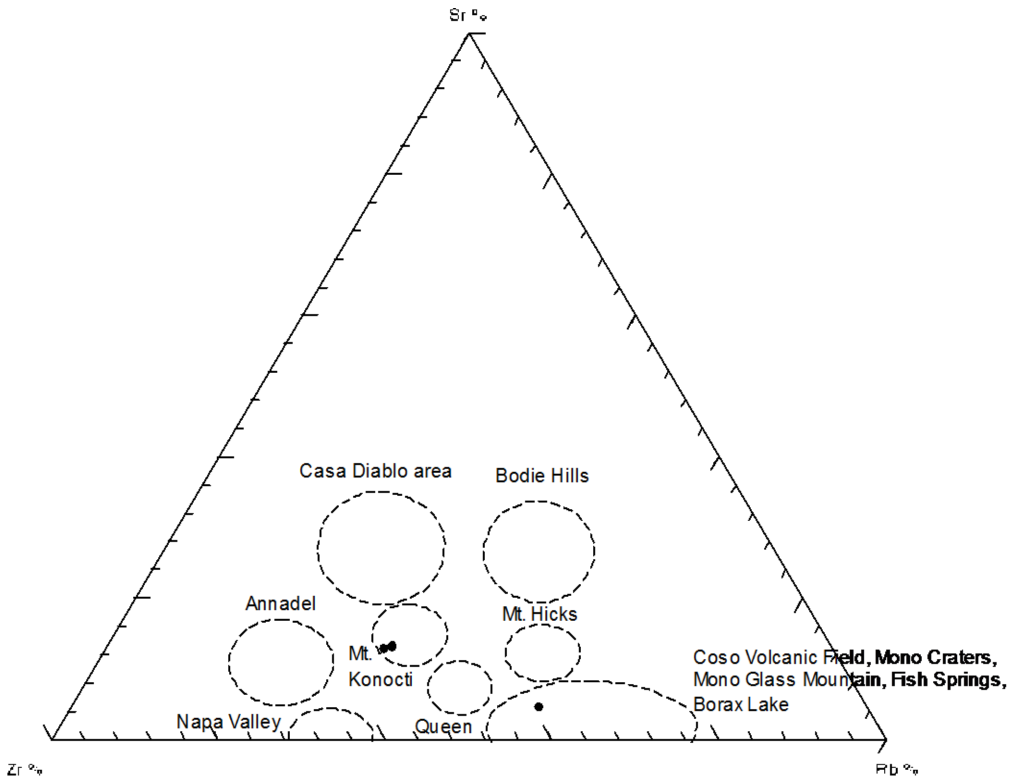
I hope this information will help in your analysis and interpretation of the significance of these specimens. Please contact me at my laboratory (phone: [650] 851-1410; e-mail: rehughes@silcon.com; lab web site: www.geochemicalresearch.com) if I can provide any further assistance or information.

Sincerely,

Richard E. Hughes, Ph.D., RPA
Director, Geochemical Research Laboratory

Figure 2

Ternary Diagram Plots for Specimens from Men-852 and HREC-9



Dashed lines represent range of variation in obsidian source samples, adapted from Jack (1976) and Jackson (1974). Dots represent plots for samples from data in Table 2.

Data Base

Men-852,	nm	nm	173	118	32	189	10	721	nm	nm	nm
nm	Mt. Konocti?										
118		±4	±3	±3	±4	±3	±20				
Men-852,	nm	nm	202	28	39	89	10	0	nm	nm	nm
57	Borax Lake										
597a		±4	±3	±3	±4	±3	±14				
Men-852,	nm	nm	203	71	34	183	10	627	nm	nm	nm
nm	Mt. Konocti										
597b		±4	±3	±3	±4	±3	±15				
Men-852,	nm	nm	204	69	35	180	11	nm	nm	nm	nm
nm	Mt. Konocti										
601a		±4	±3	±3	±4	±3					
Men-852,	nm	nm	196	63	33	174	8	nm	nm	nm	nm
nm	Mt. Konocti										
664a		±4	±3	±3	±4	±3					
Men-852,	nm	nm	194	63	31	175	11	nm	nm	nm	nm
nm	Mt. Konocti										
664b		±4	±3	±3	±4	±3					

Men-852, 668	nm	nm	203 ±4	69 ±3	35 ±3	181 ±4	11 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 671a	nm	nm	213 ±4	72 ±3	37 ±3	182 ±4	9 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 671b	nm	nm	225 ±4	74 ±3	37 ±3	195 ±4	11 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 681a	nm	nm	204 ±4	66 ±3	35 ±3	180 ±4	11 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 690a	nm	nm	221 ±4	71 ±3	35 ±3	186 ±4	11 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 690b	nm	nm	205 ±4	72 ±3	31 ±3	183 ±4	10 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 694	nm	nm	224 ±4	74 ±3	39 ±3	195 ±4	10 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 699a	nm	nm	212 ±4	80 ±3	38 ±3	199 ±4	10 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 699b	nm	nm	205 ±4	70 ±3	37 ±3	184 ±4	12 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 704	nm	nm	221 ±4	73 ±3	37 ±3	190 ±4	12 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 719	nm	nm	194 ±4	64 ±3	36 ±3	170 ±4	13 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 720	nm	nm	220 ±4	68 ±3	36 ±3	193 ±4	11 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 723a	nm	nm	219 ±4	68 ±3	33 ±3	194 ±4	12 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 723	nm	nm	198 ±4	80 ±3	37 ±3	196 ±4	10 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 732a	nm	nm	208 ±4	68 ±3	35 ±3	188 ±4	14 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 732b	nm	nm	201 ±4	70 ±3	36 ±3	184 ±4	9 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 737a	nm	nm	206 ±4	71 ±3	36 ±3	187 ±4	11 ±3	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 737b	nm	nm	215 ±4	18 ±3	43 ±3	87 ±4	10 ±3	nm	nm	nm	nm	55	Borax Lake

Men-852, 745a	nm	nm ±4	199 ±3	69 ±3	37 ±4	191 ±3	11	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 745b	nm	nm ±4	219 ±3	72 ±3	37 ±4	193 ±3	10	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 747	nm	nm ±4	200 ±3	65 ±3	35 ±4	180 ±3	10	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 748a	nm	nm ±4	225 ±3	71 ±3	37 ±4	191 ±3	10	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 748b	nm	nm ±4	191 ±3	63 ±3	39 ±4	174 ±3	10	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 758a	nm	nm ±4	207 ±3	79 ±3	37 ±4	198 ±3	12	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 758b	nm	nm ±4	223 ±3	74 ±3	37 ±4	201 ±3	11	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 2014	nm	nm ±4	223 ±3	71 ±3	36 ±4	191 ±3	10	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 2016	nm	nm ±4	203 ±3	29 ±3	37 ±4	92 ±3	11	nm	nm	nm	nm	60	Borax Lake
Men-852, 2017	nm	nm ±4	196 ±3	82 ±3	36 ±4	193 ±3	12	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 2018	nm	nm ±4	204 ±3	72 ±3	33 ±4	185 ±3	10	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 2023	nm	nm ±4	198 ±3	73 ±3	36 ±4	175 ±3	8	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 2025	nm	nm ±4	207 ±3	72 ±3	32 ±4	188 ±3	11	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 2042	nm	nm ±4	196 ±3	76 ±3	34 ±4	193 ±3	10	nm	nm	nm	nm	nm	Mt. Konocti
Men-852, 2046	nm	nm ±4	214 ±3	71 ±3	37 ±4	192 ±3	10	nm	nm	nm	nm	nm	Mt. Konocti
HREC-9, 1127	nm	nm ±4	208 ±3	78 ±3	37 ±4	199 ±3	11	nm	nm	nm	nm	nm	Mt. Konocti
HREC-9, 1146a	nm	nm ±4	198 ±3	68 ±3	34 ±4	181 ±3	11	nm	nm	nm	nm	nm	Mt. Konocti
HREC-9,	nm	nm	215	71	36	193	11	nm	nm	nm	nm	nm	Mt. Konocti

1146b			±4	±3	±3	±4	±3					
HREC-9,		nm	nm	220	71	37	193	8	nm	nm	nm	nm
	nm	Mt. Konocti										
1154a			±4	±3	±3	±4	±3					
HREC-9,		nm	nm	211	69	38	187	11	nm	nm	nm	nm
	nm	Mt. Konocti										
1909a			±4	±3	±3	±4	±3					
HREC-9,		nm	nm	221	73	37	197	11	nm	nm	nm	nm
	nm	Mt. Konocti										
1909b			±4	±3	±3	±4	±3					
HREC-9,		nm	nm	217	70	36	189	11	nm	nm	nm	nm
	nm	Mt. Konocti										
2238			±4	±3	±3	±4	±3					

- -

U.S. Geological Survey Reference Standard

RGM-1	nm	nm	147	107	26	217	10	790	nm	nm	nm	65
	Glass Mountain, CA											
(measured)				±4	±3	±3	±4	±3	±15			
RGM-1	32	15	149	108	25	219	9	807	1600	279	1.86	
	nr	Glass Mountain, CA										
(recommended)												

References

Bowman, H.R., F. Asaro, and I. Perlman
1973 On the Uniformity of Composition in Obsidians and Evidence for Magmatic Mixing. **Journal of Geology** 81: 312-327.

Hughes, Richard E.
1983 X-ray Fluorescence Characterization of Obsidian. *In* David Hurst Thomas, The Archaeology of Monitor Valley: 2. Gatecliff Shelter. **Anthropological Papers of the American Museum of Natural History** 59 (Part 1): 401-408.

1984 Obsidian Sourcing Studies in the Great Basin: Problems and Prospects. *In* Richard E. Hughes (ed.), Obsidian Studies in the Great Basin. **Contributions of the University of California Archaeological Research Facility** No. 45, pp. 1-19.

1985 Obsidian Source Use at Hidden Cave. *In* David Hurst Thomas (ed.), The Archaeology of Hidden Cave, Nevada. **Anthropological Papers of the American Museum of Natural History** 61 (Part 1): 332-353.

References (continued)

Hughes, Richard E.
1986 Diachronic Variability in Obsidian Procurement Patterns in Northeastern California and Southcentral Oregon. **University of California Publications in Anthropology** 17.

1988 The Coso Volcanic Field Reexamined: Implications for Obsidian Sourcing and Hydration Dating Research. **Geoarchaeology** 3: 253-265.

1989 A New Look at Mono Basin Obsidians. *In* Richard E. Hughes (ed.), Current Directions in California Obsidian Studies. **Contributions of the University of California Archaeological Research Facility** No. 48, pp. 1-12.

1993 Trace Element Geochemistry of Volcanic Glass from the Obsidian Cliffs Flow, Three Sisters Wilderness, Oregon. **Northwest Science** 67: 199-207.

1994 Intrasource Chemical Variability of Artefact-Quality Obsidians from the Casa Diablo Area, California. **Journal of Archaeological Science** 21: 263-271.

1998 On Reliability, Validity, and Scale in Obsidian Sourcing Research. *In* Ann F. Ramenofsky and Anastasia Steffen (eds.), **Unit Issues in Archaeology: Measuring Time, Space, and Material**, pp. 103-114. University of Utah Press, Salt Lake City.

Jack, Robert N.

1976 Pre-historic Obsidian in California I: Geochemical Aspects. *In* R.E. Taylor (ed.), **Advances in Obsidian Glass Studies: Archaeological and Geochemical Perspectives**, pp. 183-217. Noyes Press, Park Ridge, New Jersey.

Jackson, Thomas L.

1974 The Economics of Obsidian in Central California Prehistory: Applications of X-ray Fluorescence Spectrography in Archaeology. M.A. thesis, Department of Anthropology, San Francisco State University.

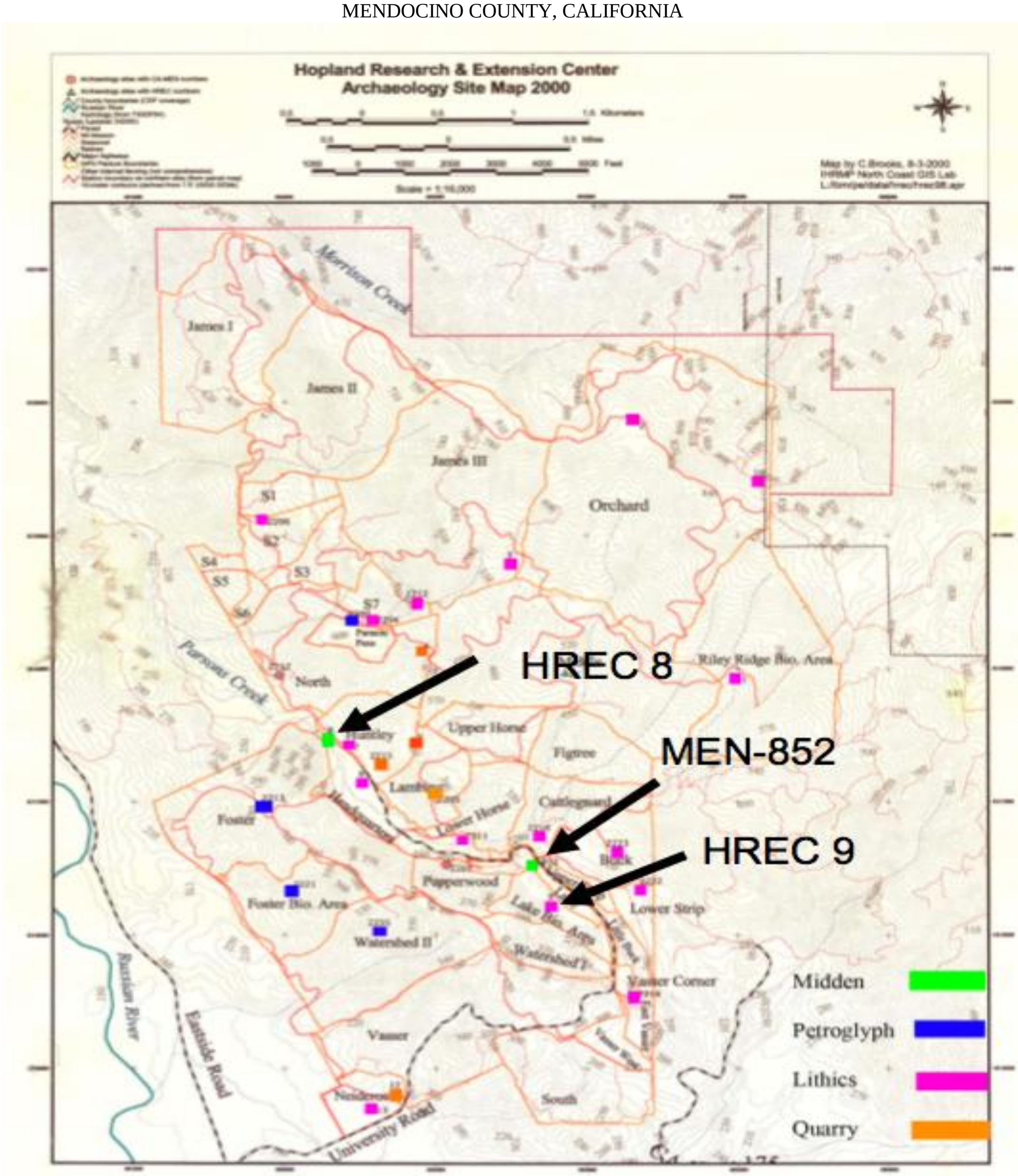
1989 Late Pre-historic Obsidian Production and Exchange in the North Coast Ranges, California. *In* Richard E. Hughes (ed.), Current Directions in California Obsidian Studies. **Contributions of the University of California Archaeological Research Facility** No. 48, pp. 79-94.

Stross, Fred H, Thomas R. Hester, Robert F. Heizer, and Robert N. Jack.

1976 Chemical and Archaeological Studies of Mesoamerican Obsidians. *In* R.E. Taylor (ed.), **Advances in Obsidian Glass Studies: Archaeological and Geochemical Perspectives**, pp. 240-258. Noyes Press, Park Ridge, New Jersey.

XRF Report from U. C. Berkeley

SOURCE PROVENANCE FOR OBSIDIAN ARTIFACTS FROM THE HOPLAND RESEARCH AND EXTENSION CENTER IN MENDOCINO COUNTY, CALIFORNIA



Shannon Swan, Patrick Singer, Andrea Morrow, and Lauren Nareau
Report prepared for Donna Gillette
7 May 2009

INTRODUCTION

This report is prepared for Donna Gillette, an Anthropology PhD candidate at the University of California, Berkeley. The site where the samples originated from is CA-MEN-852 within the Hopland Research and Extension Center (HREC) and were obtained for analysis in cooperation with the University of California, Davis. The Anthropology 135A class, taught by Steven Shackley, analyzed 85 samples in the Archaeological XRF Lab, which is part of the Anthropology department at the University of California, Berkeley. The chemical concentration in parts per million of strontium (Sr), rubidium (Rb), and zirconium (Zr) were analyzed and recorded in order to assign a source provenance for the assemblage. A compilation of graphs, charts and pictures are presented to illustrate the results of the XRF analysis.

METHODS

This assemblage was sampled on a Spectrace/Thermo Quant'x Energy-Dispersive X-ray Spectrometer located in the Archaeological XRF lab, Department of Earth and Planetary Sciences at the University of California, Berkeley. EDXRF is a reference method; therefore standards are necessary for comparative analysis. The instrument compares the spectral intensities of unknown samples to those of known standards. The international standard, RGM-1 is included in each run to insure accuracy. A (Cu) Copper disk is used to perform an initial calibration of the instrument. EDXRF gives great precision, which requires little or no sample preparation and is a non-destructive technique for analysis of obsidian.

The EDXRF recognizes elements between (11; Na) Sodium and (92; U) Uranium located in the periodic table. In most applications, a Rhodium (Rh) target X-ray tube is used. The system of analysis is composed of two parts, the instrument and the personal computer. The latter produces quantitative results that are expressed in bivariate plots; represented in the form of elemental peaks. There are six ways to interpret the elemental peaks presented by EDXRF analysis. They are K&L spectral peaks, Rayleigh scatter peaks also known as Elastic, Compton scatter peaks, Escape peaks, Sum peaks, and Bremstrahlung. The scatter peaks that were taken into consideration for this analysis were the Compton scatter, which provides a direct reflection of the mass of an object and the Bremstrahlung scatter, which is ideal for detecting elements with high atomic numbers such as, (Ba) Barium.

However, there are three types of interferences that may distort the interpretation of statistical analysis; spectral, environmental and matrix. Spectral interference occurs when peaks in the spectra overlap the spectral peaks of the element of interest. Environmental interferences such as air exaggerate weak x-ray emissions produced by light elements. Dirt and argon in the air also act as environmental interferences. Finally, absorption and enhancement act as matrix interferences. Any element can absorb or scatter the fluorescence of an element of interest and enhancement occurs when one element excites another element in the sample. All interferences provide the risk of inaccurate element identification. To avoid interference source filters are used.

Source filters modify primary X-ray beams emitted from the (Rh) Rhodium X-ray tube. The sources are determined based upon the element under analysis. Source filters serve two functions, they reduce the background or scatter and improve fluorescence for a more accurate analysis of samples. In addition, X-ray tube collimators are used to restrict X-ray beam size. In the instrument we used, collimators were circular. Ultimately, collimators reduce intrusive X-rays.

In general, obsidian may result in various compositions; likewise, the way in which obsidian can be identified is also vast. The Energy Dispersive X-ray Fluorescence spectrometer provided a concise and non-destructive interpretation of data.

Sample sizes that were >10mm in diameter and >2 mm in thickness were run and translated directly into Excel Windows software. The data was represented quantitatively in part-per-million (ppm) and displayed in the form of bivariate elemental plots for accurate identification of primary and trace element concentrations. These concentrations were used for further statistical analyses.

SOURCES

The Clear Lake Volcanics are a relatively young formation, and the obsidian flows associated with them were formed during eruptions that occurred between1.01 and .088 million years ago (Jackson, 1989). The Mount Konacti obsidian flow is the larger and older of the two major obsidian sources within the Clear Lake basin, though both sources are mostly confined to the basin itself.

Sample #	**Ti**	**Mn**	**Fe**	**Rb**	**Sr**	**Y**	**Zr**	**Nb**
504-73	1788	268	12583	195	77	31	184	10
504-117	876	195	9644	219	10	43	91	10
504-202	1005	251	10512	237	12	43	99	10
504-210A	1592	257	12027	215	75	41	189	10
504-210B	1582	239	12205	207	77	38	198	8
504-210C	1642	252	12253	212	74	36	198	9
504-210D	973	225	10009	213	8	40	90	8
504-210E	1488	229	11774	211	80	34	190	14
504-367	1628	239	12090	202	77	39	197	11
504-231	1718	269	12955	215	78	38	202	16
504-248	2208	317	16613	186	133	37	211	13
504-483b	1770	269	14050	220	83	37	198	8
504-496a	987	232	11054	229	9	46	98	9
504-496b	1832	304	14106	245	73	38	197	11
504-679	1626	247	12136	209	78	39	193	12
504-742	1625	245	12442	218	71	37	190	13
504-852a	1587	252	11818	210	72	37	182	10
504-852b	1570	250	12601	233	75	36	194	11
504-852c	1355	227	10998	204	65	38	186	8
504-852d	1589	239	12119	215	77	34	193	10
504-852e	1700	250	12576	228	76	39	197	9

504-761c	1557	287	11956	219	65	37	184	5
504-752	2049	313	15157	252	75	40	202	10
504-801	1531	232	12074	205	63	36	184	11
504-873a	1743	284	12581	218	69	33	191	12
504-873b	1624	257	12435	208	76	36	198	7
504-873c	1459	230	11399	208	69	35	189	10
504-808	1090	245	11197	229	18	43	97	13
504-858	1576	236	12505	222	68	37	197	11
504-873-D	1675	249	12305	213	78	34	197	13
504-873e	1590	219	11926	216	69	37	191	9
504-889a	1568	224	11982	216	70	38	190	13
504-889b	1471	231	11646	218	71	40	195	7
504-889c	1652	259	12343	225	68	38	201	12
504-889d	1643	268	12473	209	78	36	194	9
504-889e	973	201	9808	225	10	43	93	11
Sample #	Ti	Mn	Fe	Rb	Sr	Y	Zr	Nb
504-890	1327	305	14797	116	41	48	245	4
504-961	1530	237	11607	213	64	35	186	12
504-1958	1605	224	12259	216	72	39	193	12
504-2049	1296	217	10041	187	8	42	82	9
504-2132	933	205	9907	223	8	46	96	10
504-2172	1500	223	11225	201	63	33	182	9
504-2172	1500	223	11225	201	63	33	182	9
504-1766	2253	299	13655	209	73	30	178	10
504-1773	1519	235	11806	219	70	37	188	9
504-1776b	1584	204	10412	173	56	30	161	12
504-1776c	1980	230	9911	149	46	26	139	4
504-1776D	1851	249	12897	234	71	38	194	11
504-1776E	1515	213	11823	227	72	40	187	9
504-1795	1523	227	11592	223	70	37	203	11
504-1805B	1957	244	12657	231	67	38	185	8
504-1805C	1801	233	12121	219	69	35	184	9
504-1805E	1756	244	12989	229	83	34	202	7
504-2194	1496	223	11466	209	71	36	187	13
504-249A	1259	219	10363	235	9	43	92	16
504-249B	1919	245	12348	210	69	36	174	8
504-249C	1479	207	11141	201	66	35	182	10
504-249D	1660	238	11842	205	75	37	194	11
504-249E	1791	251	12341	223	69	36	189	10

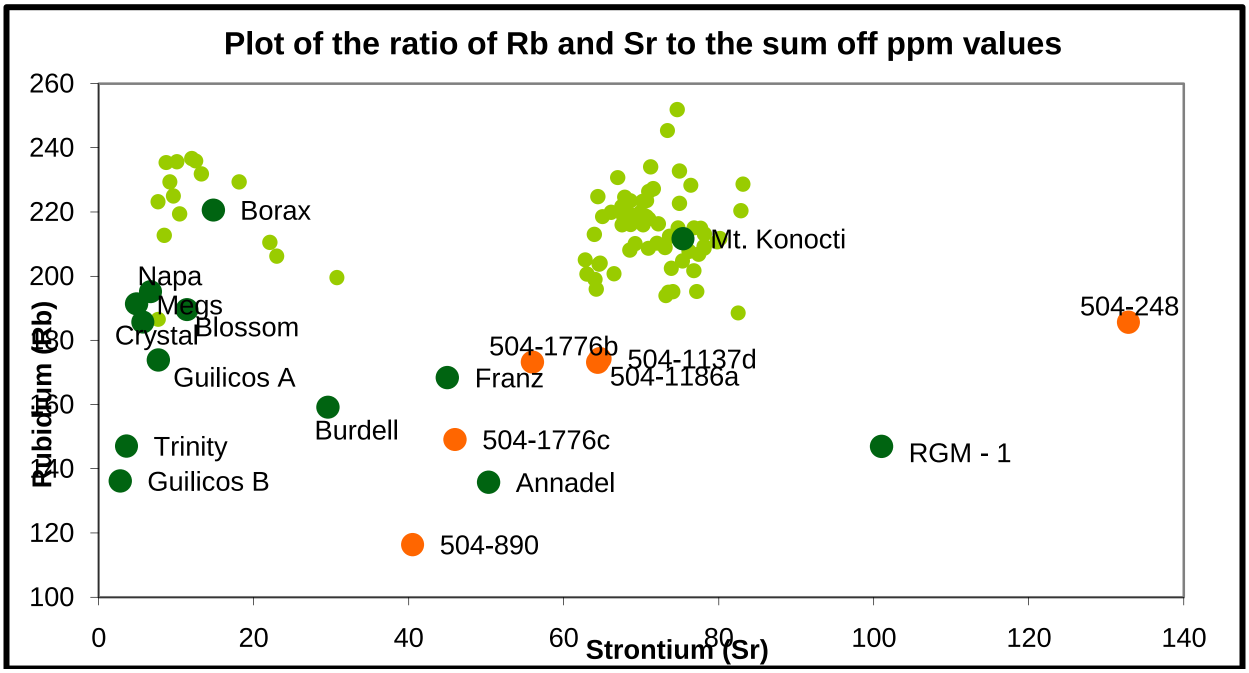
504-252	981	227	10775	236	10	42	100	11
504-256	1613	222	12061	220	66	35	187	11
504-261A	1066	200	10201	236	13	43	97	7
504-261B	1663	240	12683	223	75	36	190	12
504-261C	1570	234	11976	217	68	37	193	12
504-261D	1579	234	12152	227	72	38	194	8
504-261E	1701	232	12146	202	74	38	199	10
504-1137A	1152	215	11561	206	23	43	96	9
504-1137B	999	225	10978	232	13	43	98	10
504-1137C	1294	206	11323	199	64	33	188	12
504-1137D	1446	207	10375	174	65	31	173	9

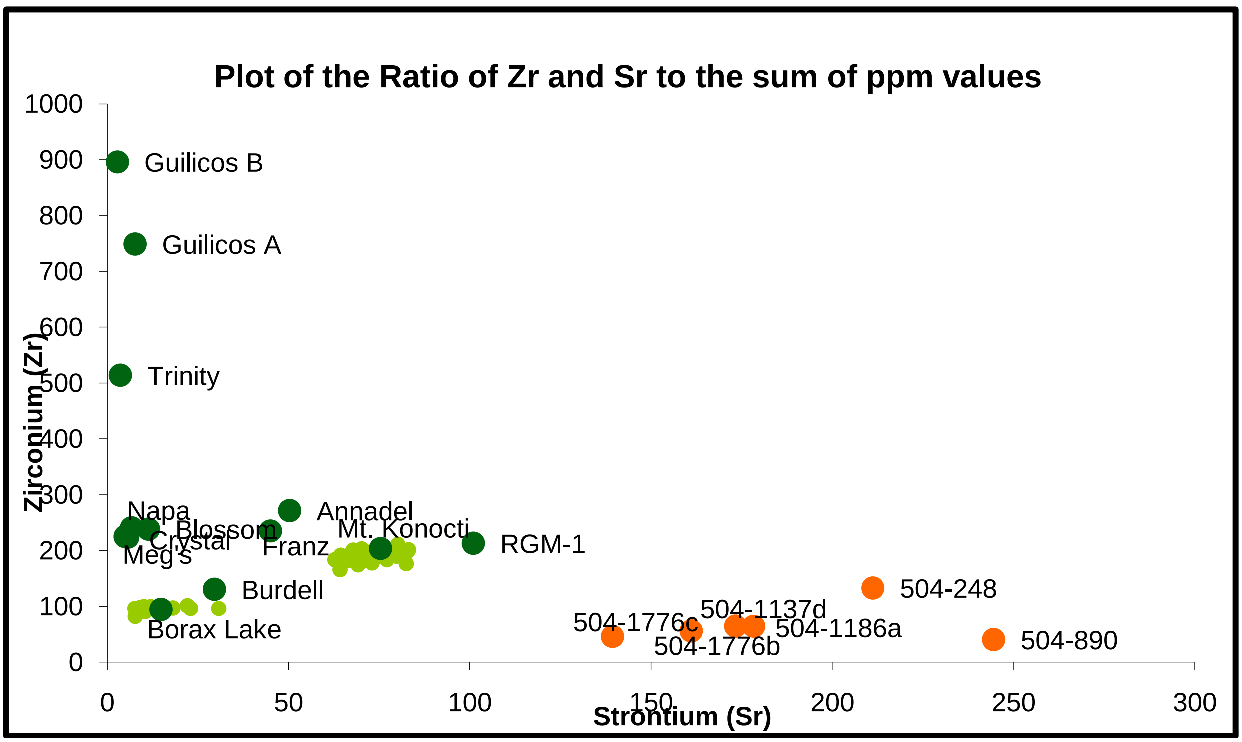
Sample #	**Ti**	**Mn**	**Fe**	**Rb**	**Sr**	**Y**	**Zr**	**Nb**
504-1142	1717	228	12347	226	71	37	199	14
504-1148	1319	265	13392	200	31	39	96	9
504-332	1038	205	10755	211	22	46	101	11
504-325	1494	238	12330	219	68	38	188	9
504-1052	1546	229	11761	195	74	34	187	6
504-1053	1693	240	11889	225	64	38	192	9
504-1055	1554	226	11784	220	70	38	196	11
504-1095	1454	238	11783	189	83	35	176	11
504-1186a	1456	215	11048	173	64	35	178	10
504-1186b	1584	248	12328	224	71	39	191	10
504-1186d	2234	258	12240	196	64	29	166	9
504-1889	1410	229	10963	204	65	34	183	12
504-1893	1588	234	11548	195	74	36	189	12
504-1898	1867	259	12753	216	68	36	191	8
504-1897	1701	245	12619	212	80	34	211	14

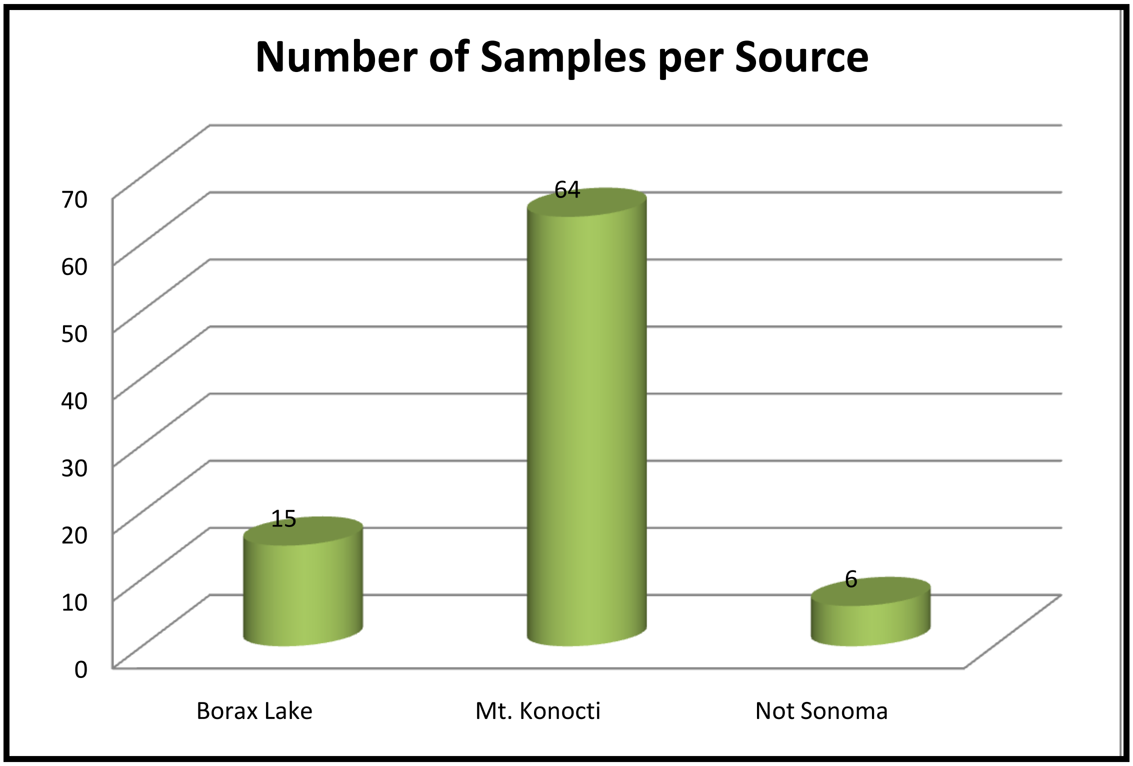
ANALYSIS

Out of the 85 obsidian artifacts we analyzed, 64 (75.3% of the assemblage) were characterized as being most chemically similar to the Mount Konacti obsidian flow, and an additional 15 (17.6%) were found to be most similar to the Borax Lake flow. These sources were assigned based on raw part-per-million inspection as well as bivariate elemental plots comparing rubidium, strontium, and zirconium concentrations within the artifacts (see figs.1 and 2attached plot ratio charts). Both Borax Lake and Mount Konacti are located in the Clear Lake Basin, within 25 miles of the HREC, making them the closest known obsidian sources to the sites from which the artifacts were collected (Jackson, 1989). Six other artifacts (7.1%) (designated 504-248, 504-890, 504-1137D, 504-1186A, 504-1776B, and 504-1776C) were recorded as having concentrations of the analyzed elements different enough from the average values of the established obsidian sources in the region to defy characterization. The samples consisted of flakes, projectile points, nodules and other debitage.

Initially, the plot ratio graph in parts per million (ppm) for rubidium and strontium, seemed quite promising for sourcing in relation to known sites within the area; however, when strontium and zirconium were plotted in the second chart, clearly the six non-Sonoma samples lay far outside the normal range. It appears those six samples: 504-248, 504-890, 504-1137D, 504-1186A, 504-1776B, and 504-1776C should be sourced to several different non-Sonoma sites. The strontium ppm counts range from 140 to 245, which is too large a range for just one site or possibly even two sites. Barium readings are currently being run on these samples to see if their provenience can be determined in another type of analysis. The samples do not come from southern California, eastern California, or Idaho. We are looking to possibly Oregon and far northern California to see if there are any matches to these six samples.


Plot of the ratio of Rb and Sr to the sum off ppm values
Rubidium (Rb)
Strontium (Sr)
260
240
220
200
180
160
140
120
100
0
20
40
60
80
100
120
140
Borax
Mt. Konocti
Napa
Megs
Crystal
Blossom
504-248
504-1776b
504-1137d
504-1186a
Guilicos A
Franz
Burdell
504-1776c
Trinity
RGM - 1
Guilicos B
Annadel
504-890


Plot of the Ratio of Zr and Sr to the sum of ppm values
Zirconium (Zr)
Strontium (Sr)
1000
900
800
700
600
500
400
300
200
100
0
0
50
100
150
200
250
300
Guilicos B
Guilicos A
Trinity
Napa
Blossom
Crystal
Meg's
Annadel
Mt. Konocti
Franz
RGM-1
Burdell
Borax Lake
504-248
504-1776c
504-1137d
504-1186a
504-1776b
504-890



References Cited

Gillette, Donna
2009 Adding Pieces to the Puzzle: A Contextual Approach to Cultural Markings on the Native California Landscape. Brownbag Lecture. Archaeological Research Facility, University of California, Berkeley. 15 April 2009

Hughes, Richard
2009 Personal communication. April 2009.

Jackson, Thomas L
1989 Late Pre-historic Obsidian Production and Exchange in the North Coast Ranges, California. *Contributions of the University of California Archaeological Research Facility.* 48:79-94.

Silliman, Stephen W
2009 Obsidian Studies and the Archeology of 19th-Century California. *Journal of Field Archaeology*. 30:75-94.

Report From Richard Hughes on Six Specimens sent from U. C. Berkeley

Geochemical Research Laboratory Letter Report 2008-27.2

April 5, 2010

Ms. Donna Gillette
3663 Solano Avenue # 199
Napa, CA 94558

Dear Donna:

This letter reports the results of energy dispersive x-ray fluorescence (edxrf) analysis of six obsidian artifacts recovered from archaeological sites (CA-Men-852, HREC-8, and HREC-9) located within the Hopland Research and Extension Center, Mendocino County, California. In an email of September 3, 2009 you wrote "I was talking to Steve Shackley yesterday at UCB. He had mentioned to me that when he ran some additional samples for me last spring that he had come up with raw data that was questionable in source. He thought, perhaps, a source in Oregon." Subsequently I received these six artifacts in question, and have analyzed them here at my lab at your request. The results appear below. Laboratory analysis conditions, artifact-to-source (geochemical type) attribution procedures, element-specific measurement resolution, and literature references applicable to these samples follow those I reported for artifacts from these sites Project (Hughes 2008).

Table 1

Quantitative Composition Estimates for Obsidian Artifacts from HREC Sites, CA

	Trace Element Concentrations											**Ratio**	
Cat. Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Fe/Mn	Obsidian Source (Chemical Type)
Men-852, 504-248	nm	nm	159 ±4	120 ±3	32 ±3	188 ±4	13 ±3	735 ±30	nm	nm	nm	77	Mt. Konocti?
Men-852, 504-890	nm	nm	144 ±4	52 ±3	49 ±3	282 ±4	12 ±3	630 ±34	nm	nm	nm	nm	Annadel
HREC-8, 504-1776b	nm	nm	227 ±4	78 ±3	41 ±3	211 ±4	16 ±3	636 ±34	nm	nm	nm	nm	Mt. Konocti
HREC-8, 504-1776c	nm	nm	218 ±4	71 ±3	36 ±3	197 ±4	13 ±3	613 ±30	nm	nm	nm	nm	Mt. Konocti
HREC-9, 504-1137d	nm	nm	202 ±4	78 ±3	35 ±3	198 ±4	13 ±3	643 ±32	nm	nm	nm	nm	Mt. Konocti
HREC-9, 504-1186a	nm	nm	182 ±4	72 ±3	32 ±3	183 ±4	11 ±3	663 ±30	nm	nm	nm	nm	Mt. Konocti
U.S. Geological Survey Reference Standard													
RGM-1	nm	nm	150	111	24	219	11	826	nm	nm	1.88	64	Glass Mtn., CA
(measured)			±4	±3	±3	±4	±3	±30			±.02		

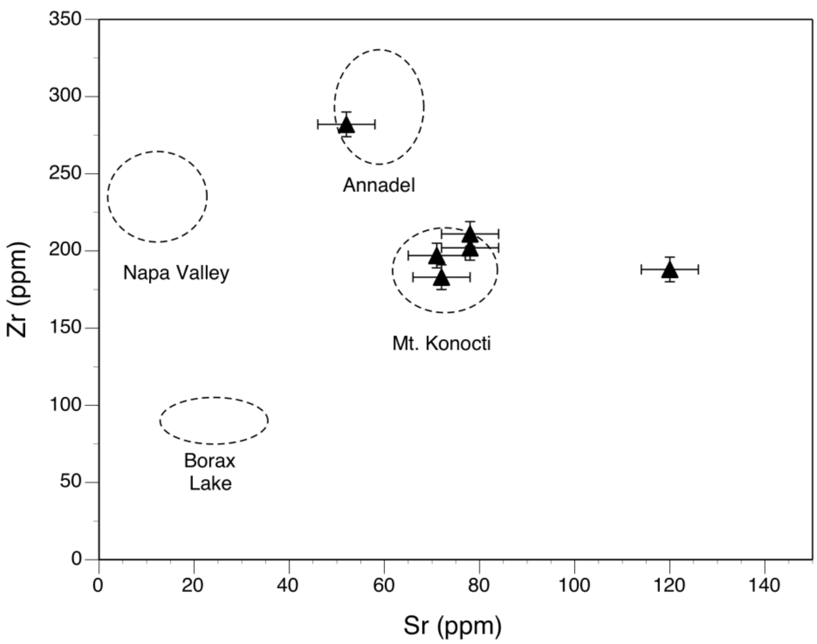
RGM-1 (recommended)	32	15	149	108	25	219	9	807	1600	279	1.86	nr	Glass Mtn., CA

Values in parts per million (ppm) except total iron [in weight %] and Fe/Mn intensity ratios; ± = 2 σ expression of x-ray counting uncertainty and regression fitting error at 120-360 seconds livetime. nm= not measured. * = burned and patinated.

Table 1 and Figure 1 show that four of these artifacts match the trace element profile of Mt. Konocti obsidian and that one other specimen (sample 504-890 from Men-852) was manufactured from Annadel volcanic glass. One biface fragment from Men-852 (cat. no. 504-248) has mid-Z trace element values that plot outside the range of my Mt. Konocti geologic reference samples (see Figure 1). However, the values do fall within the range of Mt. Konocti obsidian samples reported by Stross et al. (1976: Table 13.2), so I have provisionally assigned this artifact to Mt. Konocti. I've appended a "?" to this latter source assignment because my own geologic reference collection does not contain Mt. Konocti specimens with this much Sr, although the macroscopic appearance (abundant phenocrysts inclusion) of sample 504-248 is very typical of Mt. Konocti volcanic glass.

Figure 1

Zr vs. Sr Composition of Artifacts from HREC Sites, CA



Dashed lines represent range of variation in regionally significant obsidian source samples (from Hughes 2008). Filled triangles plot artifacts from data in Table 1. Error bars are two-sigma (95% confidence interval) composition estimates for each specimen.

I hope this information will help in your analysis and interpretation of the significance of these specimens. Please contact me at my laboratory (phone: [650] 851-1410; e-mail: rehughes@silcon.com; lab web site: www.geochemicalresearch.com) if I can provide any further assistance or information.

Richard E. Hughes, Ph.D., RPA
Director, Geochemical Research Laboratory

References

Hughes, Richard E.
2008 Energy Dispersive X-ray Fluorescence Analysis Obsidian Artifacts Recovered from Two Archaeological Sites (CA-Men-852 and HREC-9) Located Within the Hopland Research and Extension Center, Mendocino County, California. Geochemical Research Laboratory Letter Report 2008-27 submitted to Donna Gillette, April 3, 2008.

Stross, Fred H, Thomas R. Hester, Robert F. Heizer, and Robert N. Jack.
1976 Chemical and Archaeological Studies of Mesoamerican Obsidians. *In* R.E. Taylor (ed.), **Advances in Obsidian Glass Studies: Archaeological and Geochemical Perspectives**, pp. 240-258. Noyes Press, Park Ridge, New Jersey.

Appendix E

AMS Results

CENTER FOR ACCELERATOR MASS SPECTROMETRY

Lawrence Livermore National Laboratory

^{14}C results

Submitter: Gillette DATE: March 4, 2009

CAMS #	Sample Name	Other ID	$d^{13}C$	fraction Modern	±	$D^{14}C$	±	^{14}C age	±
141783	MEN-852 Unit 6 80-90cm		-18	0.9177	0.0103	-82.3	10.3	690	90
141784	MEN-852 Unit 4		-18	0.9659	0.0037	-34.1	3.7	280	35
141785	MEN-852 Unit 4		-18	0.9661	0.0037	-33.9	3.7	275	35

1) $d^{13}C$ values are the assumed values according to Stuiver and Polach (Radiocarbon, v. 19, p.355, 1977) when given without decimal places. Values measured for the material itself are given with a single decimal place.

2) The quoted age is in radiocarbon years using the Libby half life of 5568 years and following the conventions of Stuiver and Polach (ibid.).

3) Radiocarbon concentration is given as fraction Modern, $D^{14}C$, and conventional radiocarbon age.

4) Sample preparation backgrounds have been subtracted, based on measurements of samples of ^{14}C-free bone. Backgrounds were scaled relative to sample size.

5) Please note that the ∂13C values are estimates.

Appendix F

OSL Results

Date: June 8, 2011

To: Donna Gillette
1642 Tiber Ct.
San Jose, CA 95138

From: Carl P. Lipo and Sachiko Sakai
Program in Archaeological Sciences and IIRMES
California State University Long Beach
1250 Bellflower Boulevard
Long Beach, CA 90840

Re: Luminescence Results – Sediments to date the makings on split rocks

In 2009, 6 soil samples were submitted for luminescence dating to the staff of the Institute for Integrated Research in Materials, Environments, and Society (IIRMES) Lab at California State University Long Beach. Using the lab's Risø TL/OSL Reader with blue-light (BOSL) and infrared (IROSL) stimulation and a procedure that consists of a fine-grained, mixed mineral single-aliquot regeneration sequence (SAR) protocol with an IR "wash" to eliminate signals from feldspar, we analyzed each sample and calculated ages for heating events associated with the submitted material. Our methods and results for the analyses are described in this brief report.

BACKGROUND: LUMINESCENCE DATING

Luminescence dating is based on the premise that charged particles generated from environmental radiation (through radioactive decay and the release of alpha, beta and gamma particles) accumulate over time in flaws in the structure of crystalline materials. When sufficient energy is applied, these stored particles are released in the form of light (Feathers 2003: 1493). The amount of light released is a function of time and energy exposure. If the amount of light released is measured, the rate of luminescence accumulation is determined, and the amount of radiation present in the environment of deposition estimate, an age can be thus calculated that is the amount of time passed since the last point of heating or exposure to energy. Quartz and feldspar are common crystalline materials present in ceramics and sediments with properties that result in stable and well-known accumulation of luminescence over time.

In general, luminescence analysis is done on extracted quartz grains in the silt-to-sand size (90-200 microns) or polymineral fine grains (1-9 microns). In this analysis, we chose to focus on polymineral fine grains since we believed that this grain size would have the best chance of being bleached during an event of interest (accumulation of soil since after the split of the rock). The soil samples were taken by pounding a 2 in x 8 in black PVC pipe. AN endocarp was taped in place the procedure took place under a light proof tart. The samples we analyzed for our analysis were extracted from the middle of the tube submitted. We then used a mortar and pestle to disaggregate the mineral grains.

All sample preparation was conducted in a dark room illuminated with minimal filtered light (Gel 106 Primary Red filter). A small portion of each sample was used for dosimetry analyses. All of the extracted material was treated with HCl to remove carbonates and H_2O_2 to remove organic material. After chemical treatment, we employed a sieve to extract grains that were <63 micron material. The 1-9 micron fraction was extracted by settling the material in acetone and using Stoke's law to isolate the grain size of interest.

When measuring optically stimulated luminescence one stimulates samples with light, usually a particular wavelength that is known to release luminescence from the material. The amount of light released is then measured with a photomultiplier tube. The release of energy simulates a "zeroing" event that empties crystals of charged particles that accumulated since the paleo-"zeroing event" such as one that would occur during exposure of crystals to the sun. Once the accumulated paleo-signal is measured, subsequent measures are made by exposing the material to calibrated amounts of radiation to determine the rate at which luminescence signals are generated in the sample.

In addition to measurements of the paleodose and the rate at which luminescence accumulates in the sample, one must also have a good estimate of the amount of radiation that was in the environment that would have provided the particles (via alpha, beta and gamma radiation) that would be the source energy for the accumulated the luminescence signal. The annual dose rate of radiation is determined by measuring radioactivity (in uranium, thorium and potassium) in the sample and in the surrounding sediments. We also estimate the contribution of gamma via cosmic rays based on an estimated the latitude and longitude of the sample for its deposition. Using this information – the amount of the archaeologically accumulated luminescence signal, the sensitivity of a sample to radiation, and the annual dose rate of radiation – a direct date (from the time of the previous zeroing event) can be calculated for the samples.

METHODS

The analysis of the submitted samples was completed in the luminescence dating lab at the Institute for Integrated Research in Materials, Environment, and Society (IIRMES) at California State University, Long Beach. Samples were prepared according to standard procedures modified from Aitken (1985) and Banerjee et al. (2001) and adopted from the University of Washington Luminescence Dating Laboratory under the direction of Dr. James Feathers. The submitted sample were processed and analyzed using a fine-grained mixed mineral protocol utilizing grains at 1-9µ in size (see Table 1).

Table 1: Fine Grain Sample Preparation Protocol	
Step	*Procedure*
1	Calculate percent water absorption
2	Remove outer 2mm surface and edge of sample using Dremel
3	Crush sample and disaggregate sample in shaker mill/mortar and pestle.
4	Treat samples with HCL and H202 to remove carbonates and organics.
5	Settle 1-9 micron particles using Stokes Law.
6	Settle fine grain materials on stainless steel disks.

We made luminescence measurements using an automated Risø TL/OS 12B/C reader that incorporates calibrated beta (^{90}Sr) radioactive sources for evaluating the rate of luminescence signal accumulation. For the samples, we employed blue-light OSL (BOSL) stimulation with single aliquot regenerative dose (SAR) protocol outlined by Feathers (2003; Murray and Wintle 2000). Blue light LED on the Risø TL/OS 12B/C stimulates samples in the 400-550 nm range (centered at 470 ± 30 nm). A U-340 filter is used eliminate spillover from stimulation light. A double-IR wash was employed to help eliminate contribution by any feldspar contaminants (Banerjee et al . 2001). For this step, the samples were stimulated using infrared diodes in the 800-900 nm transmission range. Table 2 below outlines the BOSL protocol stimulation sequence used to measure the samples. Five to eight aliquots were measured on each sample.

Table 2: OSL/SAR Sequence (BOSL)	
Step	*Procedure*
1	Preheat sample to 240 C for 10 seconds
2	Give dose, D1, for 5 s
3	Preheat sample to 240 C for 10 s
4	Stimulation with infrared light at 125 C for 50 s
5	Stimulation with infrared light at 200 C for 50 s
6	Stimulation with blue light at 125 C for 100 s
7	Measure OSL (natural signal)
8	Give test dose, Dt, for 15 s
9	Heat reduced to 160 C for 5 s
10	Stimulation with infrared light at 125 C for 50 s
11	Stimulation with infrared light at 200 C for 50 s
12	Stimulation with blue light at 125 C for 100 s

13	Measure OSL (regenerated signal)
14	Repeat steps 2-13

We made measurements for accumulated (paleo) luminescence signal as part of the stimulation sequence. The rate at which radiation creates luminescence signals was measured through a series of incremental beta irradiations. The response curve based on these artificial doses is used to determine the amount of radiation that must have been present to generate the paleoluminescence signal.

Using the facilities at IIRMES, CSULB, dosimetric measurements were made to determine the amount of radioactivity that is present in the sample and in the local environment. Measurement of the annual radiation dose rate is calculated from the amount of these elements in surrounding sediments as well as estimates of cosmic rays at the location of the deposition. For analysis of Th and U, we utilized GBC OptiMass 8000 ICP Time of Flight Mass Spectrometer attached to a New Wave Research UP-213 Laser Ablation system (LA-TOF-ICP-MS). Samples from each sherd and surrounding sediment sample were ball-milled to ~5 μm and thoroughly mixed with 40 ppm indium internal standard and briquetting additive before being pressed into pellets using a 15-ton geological sample press. The resulting pellet was analyzed for more than 45 elements including U and Th concentrations using laser ablation ICP-MS. Replicates of 5-second acquisitions were averaged and the standard error of each analysis was reported with the sample averages. All intensity counts were normalized to the internal standard and calibration curves for each element were generated using external calibration standards (Table 3).

Table 3: Laser and sample gas settings, ICP-MS sampling parameters

Sample Pre-Ablation:
Single pass, 100 μm/second scan speed, 5 μm sampling depth, 60% laser power, 20 Hz laser repetition rate, 200 μm spot size

Sample Ablation:
Single pass, 30 μm/second scan speed, 5 μm sampling depth, 100% laser power, 20 Hz laser repetition rate, 100 μm spot size

Sample flow:
1.2 liters per minute Argon through sample chamber into ICP-MS

ICP-MS method properties:
5 second sample introduction delay, 5 second acquisition, 4 replicates

ICP-MS external calibration standards:
NIST SRM 612 and NIST SRM 612 glass reference materials, and NIST SRM 679 brick clay at 20% and 40% dilution in briquetting additive
the previously accumulated dose.

In order to obtain the concentration of K, the same pellets were also analyzed by Bruker portable X-Ray Fluorescence (XRF). The pellets were measured by XRF using Ti filter with current setting 25.5 micro amp and voltage 15 kV utilizing vacuum for 5 minutes to analyze low energy elements including K. All raw counts were calculated into the concentrations by the calibration curves based on eleven ceramic samples with known concentration by INAA and ICP-MS (Table 4 and Table 5). These data was used to calculate the years since the last zeroing event. Additionally, the elemental data from the dosimetry of the samples provides information useful for sourcing and compositional studies.

Table 4: XRF settings

For low energy elements (Mg, Si, K, Ca, Sc, Ti, V, Cr, Mn, Fe)
Voltage: 15 kV
Current: 26 micro amp
With vacuum
Time: 5 minutes

XRF calibration standards:
eleven ceramic samples with INAA and LA-ICP-MS known values.

Table 5. Dosimetry Results (all measures in ppm)

Sample ID	**U-238 (ICP-MS)**	**Th-236(ICP-MS)**	**K-39 (XRF)**
Sample 1	0.85	6.26	17732.39
Sample 2	0.65	3.85	16530.39
Sample 3	0.44	8.30	20764.98
Sample 4	1.31	9.95	21795.65
Sample 5	0.61	5.05	12475.59
Sample 6	0.43	5.36	18071.27

DISCUSSION OF RESULTS

Overall, the luminescence signals stimulated by blue-light LED (BOSL) for the aliquots were relatively weak. However, regeneration curves that examine the sample for the ability to recovery a known dose were linear. Using the dosimetric information in Table 5 and the measured paleodose values (equivalent dose in Gy) in Table 6-9, we were able to calculate age values for each of the samples. Dates based on aggregating aliquot values produce dates with reasonable precision and majority of results fall within 2 standard deviations (Figures 1-3).

The double IR wash part of the measurement protocol minimizes the signals contributed by feldspars. This process makes sure that the signals from the polyminerals are primarily composed of quartz. Thus, there is only a remote chance that feldspar was present to produce the measured signal. This would have been a concern since feldspar is known to have "anomalous fading" in which the luminescence signal grows smaller over time.

To conclude the ages for the sample, a "mean age" model was used and the average from multiple aliquots was calculated. A mean age model is appropriate when it can be assumed that there was one zeroing event that affected the entire sample.

The average date of Sample 1 (Horizon A) is AD1060 +/- 163 and all dates are within 2 standard deviations. Two samples were taken from the Horizon B. There seems to be two age ranges recognized in Sample 2 (Horizon B). The average of the earlier dates is BC1814 +/- 531 and that of the later dates is AD 141 +/- 191. The reason for obtaining two ranges of dates are unknown, however, some kind of transformation process such as intruding current tree roots may cause the mixture of dates. Both dates in this sample 2 (Horizon B) are older than Samples 1 (Horizon A) which consistent with the depth of the deposit. Sample 3, another sample taken from the same horizon (Horizon B), however, had measured hardly any reasonable paleodose except one. The date of this sample by only aliquot is BC1371 +/- 514, which is similar to one of the Sample 2 dates in the same horizon. There are three samples from Horizon C. Although no reasonable paleodose was measured for the Sample 5 in the Horizon C, six of reasonable paleodoses were measured in the Sample 6 from the same horizon with relatively stronger signals. The average date of the Sample 6 is BC 3269 +/- 1865. The other sample (Sample 3) provide only one reasonable paleodose, which generate the date BC 4836 +/- 1312. In sum, the dates within the same horizon are consistent with stratigraphic order.

Table 6. Luminescence measurements (Sample 1__Horizon A)

Sample ID	Mineral	Sample Prep Type	AD/BC	Date	Error	BP(ka)	Error	ED(Gy)	Error
sample1	polymineral	fine grain	AD	798	334	1.1183	0.3337	3.25	0.88
sample1	polymineral	fine grain	AD	823	245	1.0956	0.2449	3.18	0.64
sample1	polymineral	fine grain	AD	918	101	1.0084	0.1009	2.93	0.23
sample1	polymineral	fine grain	AD	959	145	0.9705	0.1446	2.82	0.36
sample1	polymineral	fine grain	AD	1111	162	0.8302	0.1619	2.41	0.42
sample1	polymineral	fine grain	AD	1123	130	0.8188	0.1304	2.38	0.33
sample1	polymineral	fine grain	AD	1131	138	0.8112	0.1380	2.36	0.35
average	***polymineral***	***fine grain***	***AD***	***1060***	***163***	***0.9504***	***0.1630***	***2.76***	***0.46***
youngest	***polymineral***	***fine grain***	***AD***	***1131***	***138***	***0.8112***	***0.1380***	***2.36***	***0.35***
oldest	***polymineral***	***fine grain***	***AD***	***798***	***334***	***1.1183***	***0.3337***	***3.25***	***0.88***

*ED: Equivalent Dose

Figure 1. Distribution of dates (Sample 1)

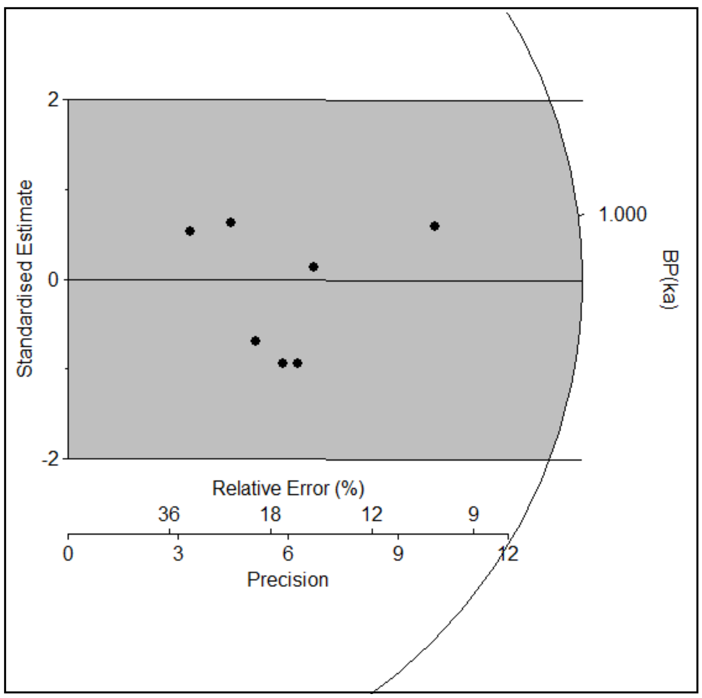


Table 8. Luminescence measurements (Sample 2__Horizon B)

sample	Mineral	Sample Prep Type	AD/BC	Date	Error	BP(ka)	Error	ED (Gy)	Error
sample2	polymineral	fine grain	AD	258	161	1.7244	0.1610	4.24	0.34
sample2	polymineral	fine grain	AD	227	272	1.7826	0.2720	4.38	0.64
sample2	polymineral	fine grain	AD	198	165	1.7835	0.1648	4.38	0.35
sample2	polymineral	fine grain	BC	119	167	2.0962	0.1671	5.15	0.33
sample2	polymineral	fine grain	BC	1198	199	3.1577	0.1993	7.76	2.84
sample2	polymineral	fine grain	BC	1871	535	3.8206	0.5348	9.39	1.22
sample2	polymineral	fine grain	BC	2374	859	4.3160	0.8591	10.61	2.02
average	polymineral	fine grain	BC	697	337	2.6687	0.3369	6.56	1.11
youngest	***polymineral***	***fine grain***	***AD***	***258***	***161***	***1.7244***	***0.1610***	***4.24***	***0.34***
oldest	***polymineral***	***fine grain***	***BC***	***2374***	***859***	***4.3160***	***0.8591***	***10.61***	***2.02***
young average	***polymineral***	***fine grain***	***AD***	***141***	***191***	***1.8467***	***0.1077***	***1.96***	***0.25***
old average	***polymineral***	***fine grain***	***BC***	***1814***	***531***	***3.7647***	***0.5311***	***9.26***	***2.03***

*ED: Equivalent Dose

Figure 2a. Distribution of dates (Sample 2 younger dates)

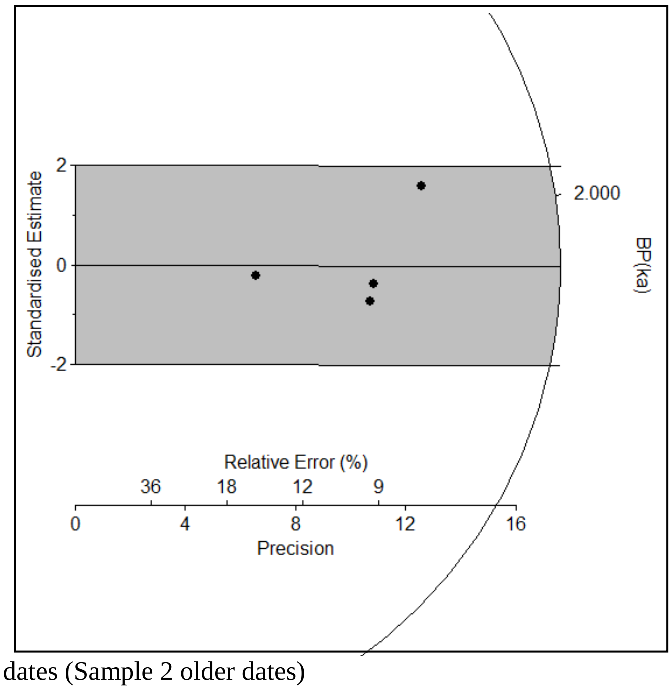


Figure 2b. Distribution of dates (Sample 2 older dates)

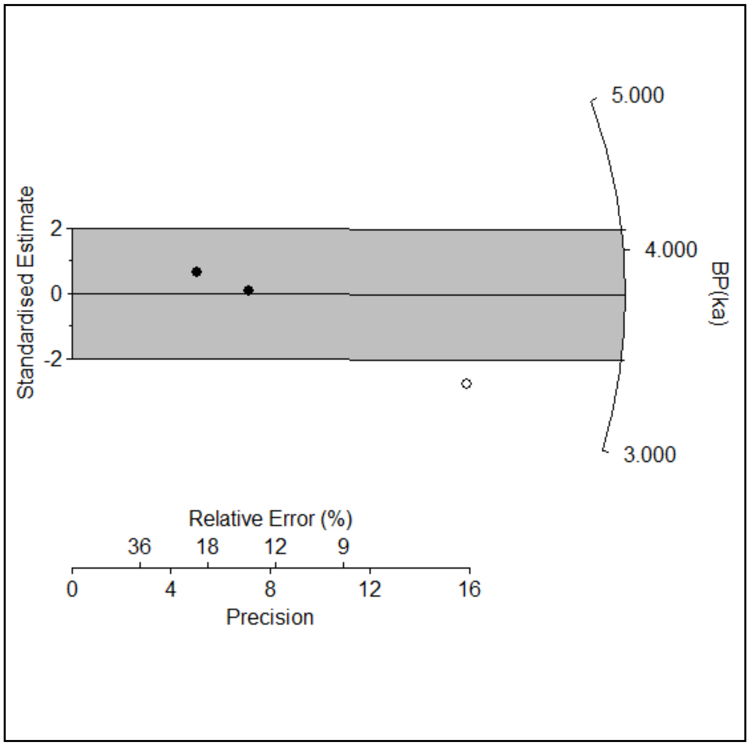

5.000
4.000
3.000
BP(ka)
Standardised Estimate
2
0
-2
Relative Error (%)
36
18
12
9
0
4
8
12
16
Precision

Table 9. Luminescence measurements (Sample 6__Horizon C)

Sample ID	Mineral	Sample Prep Type	AD/BC	Date	Error	BP(ka)	Error	ED (Gy)	error
sample6	polymineral	fine grain	BC	2350	813	4.1672	0.8133	11.14	2.02
sample6	polymineral	fine grain	BC	2354	964	4.1713	0.9644	11.15	2.41
sample6	polymineral	fine grain	BC	2807	864	4.6037	0.8644	12.31	2.14
sample6	polymineral	fine grain	BC	3298	484	5.0731	0.4836	13.57	1.07
sample6	polymineral	fine grain	BC	4401	1646	6.1273	1.6461	16.38	4.14
sample6	polymineral	fine grain	BC	4405	6421	6.1314	6.4206	16.40	3.63
average	***polymineral***	***fine grain***	***BC***	***3269***	***1865***	***5.0457***	***1.8654***	***13.49***	***2.57***
youngest	***polymineral***	***fine grain***	***BC***	***2350***	***813***	***4.1672***	***0.8133***	***11.14***	***2.02***
oldest	***polymineral***	***fine grain***	***BC***	***4405***	***6421***	***6.1314***	***6.4206***	***16.40***	***3.63***

*ED: Equivalent Dose

Figure 3. Distribution of dates (Sample 6)

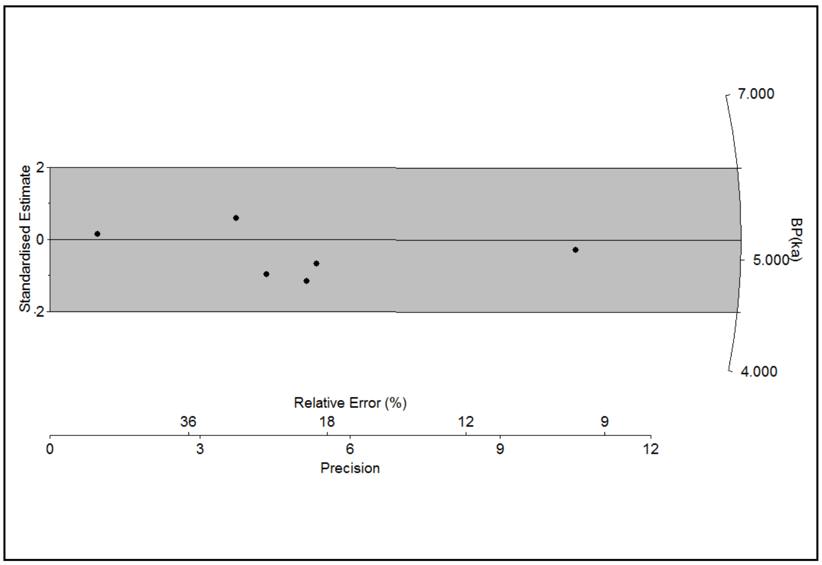


Table 10. Luminescence measurements (Sample 3__Horizon C and 4__Horizon B)

Sample	Mineral	Sample Prep Type	AD/BC	Date	Error	BP(ka)	error	ED (Gy)	Error
sample3	polymineral	fine grain	BC	4836	1312	6.6482	1.3120	21.41	3.96
sample4	polymineral	fine grain	BC	1371	514	3.4320	0.5140	13.03	1.86

*ED: Equivalent Dose

CONCLUSIONS

The results of our luminescence analysis suggest the dates of bleaching events for sediments around the split rock are shown in Table 11.
Figure 4. The photos of samples taken in situ.

Table 11: Summary of Sample Ages

Sample ID	Horizon	Number of aliquots	Average dates	Range of Dates
Sample 1	Horizon A	7	AD 1060+/-163	AD798+/-334 ~ AD1131+/- 138
Sample 2 young	Horizon B	4	AD 141+/-191	BC119+/-167 ~ AD258+/-161
Sample 2 old	Horizon B	3	BC 1814+/-531	BC2374+/-859 ~ BC1198+/-199
Sample 4	Horizon B	1	BC 1371+/-514	
Sample 6	Horizon C	6	BC 3269+/-1865	BC4405+/-6421 ~ BC2350 +/- 813
Sample 3	Horizon C	1	BC 4836+/-1312	

Overall, these results and interpretations provide our current best estimate of the age of the last zeroing events for the submitted samples. The results are based on the material we analyzed and the current laboratory procedures. Additional work such as using coarse grain extraction (90-200 micron) form the samples might possibly be conducted to evaluate the accuracy of these conclusions since they would be an independent measure of age.

We hope these results are suitable for your study and are in alignment with your expectations. If you have any questions, need additional information or wish to discuss the results please feel free to contact us at (562) 985-2393 or email us at clipo@csulb.edu (Carl Lipo) or sachikosak@gmail.com (Sachiko Sakai)

Sincerely,

Carl P. Lipo and Sachiko Sakai
Program in Archaeological Sciences and IIRMES
California State University Long Beach
1250 Bellflower Boulevard
Long Beach, CA 90804

REFERENCES CITED

Aitken, M. J.
1985 *Thermoluminescence Dating*. Academic Press, London.

Banerjee, D., A. S. Murray, L. Bøtter-Jensen and A. Lang
2001 Equivalent dose estimation using a single aliquot of polymineral fine grains. *Radiation Measurements* 33**:**73–94.

Feathers, J. K.
2003 Use of luminescence dating in archaeology. *Measurement Science and Technology* 14:1493-1509.

Murray, A.S. and Wintle, A. G.
2000 Luminescence dating of quartz using an improved single-aliquot regenerative-dose protocol. *Radiation Measurements* 32 (1): 57-73.